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CONTENTS

Volume 19, Number 2

July-December 2019

1.	Estimation of Stature by Measuring Foot Length in Adult Females in a Tertiary Care Centre in Kanpur	01
	<i>Ankita Kakkar, Sushil Kumar, Pooja Rastogi, Alok Kumar</i>	
2.	Estimation of Age from Shoulder Joint by Radiographic Assessment of Epiphyseal Fusion of Related Bones in Population of Chhattisgarh: A Cross Sectional Study	07
	<i>Aloke Mazumder, Ninad Nagrale</i>	
3.	Necrophilia: A Study of the Psychoanalysis in the Characteristics of the Offenders Who Sexually Molest the Dead	12
	<i>Anand Kumar Vasudevan, Prashanthi Krishna Dharma, L. Eccleston</i>	
4.	Nutrition Education Intervention for the Management of Polycystic Ovary Syndrome (PCOS)	21
	<i>Anjana Simha Shubhi Agarwal</i>	
5.	Effects of Placental Characteristics on Perinatal Outcome among Singleton Deliveries	28
	<i>Aswathy Krishnan S, Anju Philip T, Anjaly R Prasad, Anjana Nirmala Devi</i>	
6.	Facial Width and Inter-Pupillary Distance - A Useful Tool for Superimposition Technique	34
	<i>Singh Rattan, Atal Devinder, Angrish Shreya, Kala Shivang, Mittal Shivang, Singh Shravi, Sharda Shreshtha</i>	
7.	Retrospective Study of Analysis of Deaths Due to Burns in GMERS Medical College and Hospital, Dharpur-Patan	38
	<i>Bhargav B. Oza, Gaurang J.Patel</i>	
8.	Protocols Play a Crucial Role in Bio Psychosocial Assessment of Patients by Staff Nurses- A Methodological Explanation	42
	<i>Jasna T, Biju Soman, Aswathi Raj L, Keerthana Wilson , Joseph George Nandagaon, Priyadarshini Joseph</i>	
9.	Prevalence of Congenital Hypothyroidism; in Rural Area of District Gautam Budha Nagar (U.P.)	49
	<i>Chandra Prakash Sharma, Widhi Dubey, Suryakant Nagtilak</i>	
10.	Beliefs, Preferences and Practices of End of Life Care among Elderly	53
	<i>Karma Doma Bhutia, Latha T, Elsa Sanatombi Devi</i>	
11.	Suicide Death from Paraquat Auto-Inoculation: A Case Report	57
	<i>Giovanni Battista Paliani, Silvestro Mauriello, Andrea Cammarano, Saverio Potenza</i>	
12.	Pattern of Mortality in Sudden Natural Death in North Delhi: A Prospective Autopsy Study	62
	<i>Gupta Neha, Panigrahi MK</i>	

13.	Profile of Accused in Alleged Cases of Sexual Assault in Children – A Prospective Study	66
	<i>S. B. Punpale, A. A. Taware, H. V. Vaidya, H.S. Tatiya</i>	
14.	A Study to Assess the Knowledge on Factors Influencing Childhood Obesity among School Children in Selected School, Kanchipuram District, Tamilnadu	70
	<i>Indra B, Vinitha Ravi R, Udhaya Kumar G, N Thivya</i>	
15.	Study of Correlation between Age and Closure of Cranial Sutures – A Post-Mortem Observational Study	73
	<i>B. B. Oza, J. A. Tanna, A. K. Pathak</i>	
16.	Video Assisted Teaching Program on Knowledge and Preventive Practices of Catheter Related Blood Stream Infections among Health Care Professionals: A Hospital-based Prospective Study	78
	<i>Jeffin Thomas Jacob, Elsa Sanatombi Devi, Janet Prameela D'Souza, Vandana Kalwaje Eshwara, Chiranjay Mukhopadhyay</i>	
17.	Study on Profile of Acute Poisoning in a Rural Tertiary Care Hospital in Telangana	84
	<i>K. Srinivasulu, Vishal Pratik. K, T Rahul Reddy, Harsha Kumari, Sangam Anurag Reddy</i>	
18.	Pattern of Sudden Natural Deaths in Adults: An Autopsy based Study	89
	<i>Kaulaskar Shashikant, Pandey S K, Pathak Manoj, Kumar Gyanendra</i>	
19.	A Study on Factors Influencing Road Traffic Accidents Including Survival Period of Victims, Mortality Pattern and Preventive Measures for Road Traffic Accidents	94
	<i>Manish Kumar Sharma, Yogesh Sharma, Manisha Sharma</i>	
20.	Cross-Sectional Study on the Pattern of Skull Fractures & Intracranial Hemorrhages in Fatal Road Traffic Accidents in Chitradurga	101
	<i>Chandan V, Manjunatha K, Sidramappa V, Venu R.P.</i>	
21.	An Autopsy based Study for Estimation of Stature from Anthropometry of Combined Length of Forearm and Hand in Female Population of Indore Region (M.P.)	107
	<i>Kushwah N., Thakur P.S., Rastogi. A.K., Dadu S.K, Singh B.K.</i>	
22.	Rise in Deaths Due to Fall from Height: A 3-Year Retrospective Study	113
	<i>Naveen Kumar T, Jagannatha.S.R, V.T. Venkatesha</i>	
23.	A Comparative Study of Lip-prints on Bond Paper and Cloth	117
	<i>Chhikara P, Singh A</i>	
24.	Appraising Perception and Knowledge of Medical Practitioners in Context with Ubiquitous Aspects of Consent	120
	<i>Pawan A.Wankhade, Prakash.M.Mohite, Sudhir V Ninanve, Swapnil K Patond</i>	
25.	A Prospective Study of Pattern of Custodial Deaths of Autopsies Conducted at SMS Hospital Jaipur During 2017-18	126
	<i>Sumanta Dutta, Priyanka Sharma</i>	
26.	Feature of Ligature Mark and Fractures in Hanging and Ligature Strangulation Cases in Ajmer Region Population of India	131
	<i>R K Boyal, Shiv Kochar</i>	

27.	An Observational Study of Radiological Age & Documented Age in 16-20 Years of Age Group in Jaipur	134
	<i>P.C. Saini, R. K. Punia, Naveen K. Simatwal</i>	
28.	Cybersecurity Threats and Solutions in the Current E-Healthcare Environment: A Situational Analysis	141
	<i>Aneesh Remani Ravi, Rajeesh R Nair</i>	
29.	Effect of Time Since Death on Morphological Changes of Red and White Blood Cells-An Autopsy based Study at S.M.S. Medical College & Attached Group of Hospitals, Jaipur During the Year 2016-2017	145
	<i>Shiv Shanker Jat, R.K. Punia, Mukesh Kumar Khichi, Shashank Sharma</i>	
30.	An Assessment of Perceived Stress Levels and Coping Strategies for the Same among Married Women Clerical Employees in a Tertiary Care Teaching Hospital	151
	<i>Shika Jeppu, Rajesh Kamath, Ida D'Souza, Aswathi Raj, Biju Soman, Amrita Sharma, Prachi Kerkar</i>	
31.	A Study on PTSD and associated Autonomic Dysfunctioning	160
	<i>Richa Choudhury, Pradeep Kumar Yadav, Vibha Gangwar</i>	
32.	Effectiveness of Concept Mapping on Conventional Teaching Method in Terms of Knowledge Regarding Arterial Blood Gas (ABG) Analysis among B.Sc. Nursing IV Year Students	165
	<i>Sachin Yadav, Ishak Mohammad</i>	
33.	Correlation of Histopathological Changes with the Manner of Death in Fatal Burns in a Tertiary Care Hospital in Northern India	170
	<i>Pradeep Kumar Yadav, Richa Choudhury, Anoop Kumar Verma, Rajiv Ratan Singh</i>	
34.	Role of 2 nd Digit:4 th Digit Ratio(2D:4D Ratio) in Establishing the Biological Profile of an Individual	175
	<i>Santosh Sheelavant, Manjula Patil</i>	
35.	Knowledge and Attitudes of Mental Health Professionals Regarding Informed Consent and Patient Confidentiality in Clinical Practice and Research in Udupi District	180
	<i>Vidyashree S.V, Naveen Kumar, Rajesh Kamath, Brayal D'Souza, Lena Ashok, Sagarika Kamath</i>	
36.	Insights about Child Abuse among Dentists in Tamilnadu	185
	<i>Adil Ahmed M A, V Anu, Shruthi Parthasarathy, Saravana S Devi, Sophia C Eveangelin, Shalini ST</i>	
37.	A Retrospective Study of Motorised Two Wheeled Vehicular Accident Cases Attending the Emergency Department of a Tertiary Care Hospital	191
	<i>Slong D, Marak AR, Ropmay AD, Patowary AJ</i>	
38.	Suicidality with Time Distribution and Serum Cholesterol Estimation	197
	<i>Sneha S, D.Ganesh Rajahan, P SampathKumar, Santhi Silambanan, L Shalini</i>	
39.	Human Bite Mark – A Physical Evidence	202
	<i>Sujith Sreenivas C</i>	
40.	Pattern of Organophosphate Poisoning in Bapuji Hospital, Davangere (2011 - 2013)	207
	<i>Geetha K.B, Tejas J, Vishwanathan K.G</i>	
41.	A Study on Adherence to International Patient Safety Goals in a Tertiary Care Cardiac Centre in India	211
	<i>R. Ananya, Sagarika Kamath, Ashalata Pati, Amrita Sharma, Aswathi Raj, Biju Soman, Rajesh Kamath</i>	

42.	Morphometric Analysis of Sexual Dimorphism in Foramen Magnum	216
	<i>Varsha Shenoy, Tejas J</i>	
43.	Various Risk Factors Associated with Severity of Liver Disease in ALD Patients	221
	<i>Tripti, Karuna Singh</i>	
44.	Study of Facial Index in Andhra Pradesh Population	227
	<i>Ch. Venkateswara Rao</i>	
45.	An Analysis of Socio-Economic Profile of Working Professionals in Chennai, Tamil Nadu, South India ..	230
	<i>V. Nithyananthan, Christhu Raj M R, B.Kalpana</i>	
46.	Cheiloscopy in Transgenders	234
	<i>Vahanwala Sonal, Chintan Shah, Sandeep Pagare, Kapil Gavand, Hemant Bhutani, Naveen Shetty, Mandavi Waghmare</i>	
47.	Pattern and Prevalence of Congenital Malformation of fetus- Autopsy Based Study in BTGH (Basaweshwara Teaching and General Hospital) Mahadevappa Rampure Medical College(MRMCK). Kalaburgi. From Jan 2016- Jan 2017	240
	<i>Vandana Mudda, Seemantkumar Saini, Aditya Kumar Awati</i>	
48.	Orofacial Granulomatosis: A Review	247
	<i>Saloni Banga, M K Sunil, Hina Padaliya</i>	
49.	Pattern of Visceral and Peritoneal Injuries in Fatal Blunt Abdominal Trauma at a Tertiary Care Teaching Hospital in South India	253
	<i>Ramu Yangala, Suraj Sundaragiri, Vijaya Durga Koppada</i>	
50.	Awareness of Medico-Legal Aspects and Documentation amongst Health Professionals in a Tertiary Care Hospital	257
	<i>Sayed Hisham, Bryal D-Souza</i>	
51.	Study of Cephalic Index among the Tamil Population	264
	<i>S. K. Nawaz Ahmed, M. Sreenivasan</i>	
52.	A Model for Stature Prediction from Percutaneous Ulnar Length in Adult Males of Tamil Population	268
	<i>M. Sreenivasan, S. K. Nawaz Ahmed</i>	
53.	Deaths Due to Electrocution- A Retrospective Study	273
	<i>Mohd Kaleem Khan, Umar Bin Abdul Aziz, Faiz Ahmad</i>	
54.	Ancient Drug Standardization Versus Modern Technology	276
	<i>Basavaraj S Hadapad, Anupama V. Nayak, Amrita Sharma, Rajesh Kamath</i>	
55.	Sentiment Ontology Analysis for Adverse Drug Effect	280
	<i>P Rajalakshmi, S.P. Rajagopalan</i>	
56.	A Study of Asphyxial Deaths	286
	<i>Z.Sasi Kanth, Bharathi Ramarao</i>	

57.	Deaths Due to Electrocution in Central India: A Study of Two Years	289
	<i>Umesh Kumar Choudhary, Vinod V Rathod, Pankaj S Ghormade, Ajay N Keoliya</i>	
58.	Effect of an Aggression Management and Violence Prevention (AMVP) Training Programme among Nurses Working in Psychiatric and Emergency Settings	295
	<i>Binil V, Christopher Sudhaker, Supriya Hegde, Tessy Treesa Jose</i>	
59.	Road Traffic Accidents: Development's Collateral Damage and a Major Public Health and Economic Concern	302
	<i>Lena Ashok, Zinnia Sharma, Trupti Kambe Zodge, Pranav V, Namesh Malarout, Alric D'Souza, Sagarika Kamath</i>	
60.	Custodial Torture: A Two Years Prospective Study	307
	<i>Vijay Kumar Vohra, Deep Rattan Mittal, Harish Kumar S Agarwal, Dildar Singh, Shamsher Malik</i>	
61.	Assessment of Knowledge Regarding Prevention of Peptic Ulcer among Adolescents in Selected College at Shimla, Himachal Pradesh, India	313
	<i>Jinu K Rajan</i>	
62.	A Case of Quick Mummification: The Influence of Intrinsic and Extrinsic Factors in the Post Mortal Processes	317
	<i>Anastasia Margot Faedda, Andrea Cammarano, Stefania Urso, Filippo Milano</i>	
63.	The Immunoreactivity of Uroplakin III in Urothelial Carcinoma of Urinary Bladder and Other Non-Urothelial Carcinoma	319
	<i>Ali Zaki Naji, Ammar Eesa Mahdi, Hadeel A. Kerbel</i>	
64.	Overview of Selected Native Seeds in Agricultural Wastes and its Properties	324
	<i>Asaad Abbas Khalaf, Shakinaz Desa, Syarul Nataqain Binti Baharum</i>	
65.	Legal Protection Based on Trancendental Perspective Against Child Sexual Abuse in Indonesia	331
	<i>Fitriani Nur Damayanti, Absori Absori, Kelik Wardiono</i>	
66.	The Sifon Culture (The Practice of Traditional Circumcision) of the Soe People, in the Aspect of Law and the Risks of the Female Reproductive Health	336
	<i>Siti Syahida Nurani, Absori, Khudzaifah Dimyati, Kelik Wardiono</i>	
67.	Effectiveness of an Educational Program on Nursing Students' Abilities Regarding Drug Dosage Calculation	341
	<i>Abid Salih Kumait, Dhiaa Alrahman H. Abdullah, Qasim Hussein Mohammed</i>	
68.	Low level laser Therapy in Management of Oral Lichen Planus (OLP)	346
	<i>Ali Mihsen Hussein Alyassiri</i>	
69.	Middle Age Knowledge Regarding Health Screening	349
	<i>Rusul S. Ghazal, Eman A. Jaber</i>	
70.	Determination Knowledge of Second Stage Student in Nursing College about Blood Iron Deficiency (Anemia)	355
	<i>Abdulmahdi A. Hasan</i>	

71.	Molecular Characterization of <i>Malassezia spp</i> Isolated from Human Pityriasis Versicolor	362
	<i>Farqad M. Al-Hamdani, Ihsan E. Al Saimary, Khalil I. Al Hamdi</i>	
72.	Physiological Important of Minerals in Fertility of Women: Comparison of Pregnant Women's Minerals in Urban and Rural Areas	373
	<i>Nada Saad Naji Al-Taee</i>	
73.	Self-Confidence upon Nursery Children in Al-Mahaweel with some Variables at the Babylon City	379
	<i>Abdulahdi A. Hasan</i>	
74.	Gene Polymorphism Vitamin D receptor FokI in Thalassemia Children in AL-Muthanna Province	383
	<i>Mohammed Qasim Waheeb, Hanaa Ali Aziz, Yasir Adil Jabbar Alabdali</i>	
75.	Botulinum Toxin Vs Lateral Internal Sphincterotomy for Anal Fissures	390
	<i>Ameer Salah Tawfeeq</i>	
76.	Assessment of Serum Glucose and B12 in the Pregnant Women and their Correlation with the Blood Hemoglobin	393
	<i>Bushra Mohammad Kadhim, Haifa Nori Mater</i>	
77.	Relaxing Melody from Flute Combined with a Foot Massage Can Reduce Systolic and Diastolic Blood Pressure in Elders	398
	<i>Dewi Anggraini Nurjanah, Harmayetty, Eka Mishbahatul</i>	



Medico-Legal Update

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CONTENTS

Volume 19, Number 2

July-December 2019

78. The Comparisons of Different Abdominal Drawing-in Maneuver During Plank Exercises on Trunk Stability 404
Eun-Song Kim, Da-Song Gil, Su-Bin Kim, Ji-Heon Hong, Dong-Yeop Lee, Jae-Ho Yu, Jin-Seop Kim
79. Impact of Transfer Income on Cognitive Impairment in the Elderly 411
Jin Jung, Jai-Woo Oh
80. Perceptions of Child Abuse among the Undergraduate Students in Korea 417
Misoon Jeon
81. Changes of Periodontopathic Bacteria According to Gingival Health, Dental Plaque Control and
Toothbrushing Behavior in Adults 422
Hyun-Ja Jeong, Hyejin Kim
82. Changes in Toothbrushing Behavior and Knowledge through Dental Health Care Education and
Experience for Elementary School Students 428
Ji-Hee Kim, Hyejin Kim
83. A Study of Smart Healthcare Service Model Based on Cloud Platform: Focus on Small and
Medium Sized Hospitals 434
Jai-Woo Oh, Jin-Kyu Kang, Jae-Young Park
84. Affect of Different Intensities of Queens College Step Tests on Cardiopulmonary Function and
Body Composition in Students 441
Seulgi-Choi, Sumi Sim, Minjin-Kim, Ji-Heon Hong, Dong-Yeop Lee, Jae-Ho Yu, Jin-Seop Kim
85. A Study on the Effects of Functional Emotions Occurring at the Workplace on the
Resting Activities and Emotional Recovery 447
Ji-Hun Lee, Jeong-Suk Lee, Jun-Mo Kang
86. The Effect of Experiencing School Violence Victimization and Stress on School Life Adaptation of
Adolescents: The Moderated Mediation Model of a Growth Mindset 454
Chang-Seek Lee, Eun-Kyung Ryu
87. Mother's Babyface and Children's Happiness: The Dual Mediating Effects of Self-Efficacy and
Resilience 461
Chang-Seek Lee, Su Ji Lim
88. Dual Mediating Effect of Spousal Support and Child Support in the Effects of Marital Intimacy on the
Spousal Caregiving Awareness 468
Hye-Yeong Do, Yun-Jeong Kim, Sang-Jin Lee
89. A Study on the Psychological Characteristics of Rural Life on the Continuity of Rural Life 474
Ji-Hun Lee, Ki-Tae Kim

90. The Affects of Different Nordic Hamstring Exercise in Normal Adults	481
<i>EunBI-Lee, SoYeon-Kwon, Dong-Yeop Lee, Ji-Heon Hong, Jae-Ho Yu, Jin-Seop Kim</i>	
91. The Effect of Employment Stress and Growth Mindset on the Happiness of Korean College Students: The Moderated Mediation Model of Grit	487
<i>Yeoun-Kyoung Hwang, Mi-Na Jung, Chang-Seek Lee</i>	
92. Comparison between Kinesio Taping and Compression Garments on physical muscle Strength and Stability	494
<i>Woo-Jae Kang, Hyun-Jin Lee, Seo-Hee Cho, Ji-Heon Hong, Jin-Seop Kim, Dong-Yeop Lee, Jae-Ho Yu</i>	
93. Comparison of Proprioception, Lower Limb Stability, Blood Pressure and ROM after Proprioceptive Exercise by AR Exercise and Therapist Instruction	500
<i>Yeoung-Jun Park, Hyun-Seok Yoo, Jong-Hun Im, Ji-Heon Hong, Jin-Seop Kim, Dong-Yeop Lee, Jae-Ho Yu</i>	
94. Moderating Effect of Disability Acceptance in the Influence of Discrimination Experience by Individuals Disabled Regarding the Sense of Happiness	507
<i>Young Ran Lee, Yun-Jeong Kim</i>	
95. Employment Stress and the Happiness of Korean University Students: Multiple Mediating Effect of Growth Mindset, Grit and Hope	513
<i>Yeoun-Kyoung Hwang, Chi-Hwan Ji, Chang-Seek Lee</i>	
96. A Double Mediation of Stress and Growth Mindset between School Violence Victimization and Happiness of Adolescents	520
<i>Chang-Seek Lee, Ha-young Jang</i>	
97. Comparative Analysis of Skin Condition after Using Cleansing Oil and Cleansing Water for Removing Facial Makeup	526
<i>Ji-Yeon Yu, A-Young Jang, Byung-Soo Chang</i>	
98. Morphological Damage Procedures of Hair Surface Treated with Repetitive Oxidation Coloring Agent	533
<i>Myung-Sook Lee, Byung-Soo Chang</i>	
99. A Study on Heavy Metal Materials in Cosmetic Makeup Concealers	540
<i>A-Young Jang, Byung Soo Chang</i>	
100. New Strategies for the Application of the Latest Information System on the Strengthening Pelvic Muscle for Treatment of Uterine Prolapse	547
<i>Seong-Ran Lee</i>	
101. Investigation for How Koreans Construct the Concept of Dying Well	552
<i>Moon-gee Choi, Moon-Joon Kim, Arma Park, Hyeon-Dong Song, Kwang-Hwan Kim</i>	
102. Analysis of MRI Image to Develop the Aid During the Radiological Test of Femoro Acetabular Impingement	559
<i>In-Ki Jeon, Hong-Ryang Jung</i>	
103. The Convergence Study on Korean Consumers' Perception of Cosmeceuticals in the Aging Society	563
<i>Kyu-Ok Shin, HyeJin Lee</i>	
104. Change of Quadriceps Muscular Strength and Muscle Activity According to Knee Extension Angle and Body Mass Index	570
<i>Su-min Kim, Eun-Ju Sim, Dong Yeop Lee, Jae Ho Yu, Jin Seop Kim, Ji Heon Hong</i>	

105. Study on the Needs of Health Care for Establishment of Regional Health Care Plan-Focused on Cheonan City	577
<i>Misoon Jeon, Yoonyoung Hwang</i>	
106. A Study on Antioxidative and Antioxidative Effects of <i>Codonopsis lanceolate</i> and <i>Platycodon grandiflorum</i> Extracts	583
<i>Ji-sun Moon, Seon-hee You, Mi-yun Yoon</i>	
107. Effects of Various Squats Intervention Methods on the Muscle Activity of the Trunk and Lower Extremity	589
<i>Ji-Won Kim, Byoung-Hyoun Moon, Young-Jin Lim</i>	
108. The Effect of Self-Control and Parenting Attitude on Cyberbullying: Focus on Mediating Cyber Ethics	596
<i>Young-Joo Lee</i>	
109. A Study on Pregnancy Stress and Related Factors in Pregnant Women	603
<i>Misoon Jeon, Yoon-Young Hwang</i>	
110. A Study on Resveratrol on the Antioxidative and Whitening Cosmeceutical Ingredients	609
<i>Mi-Yun Yoon, Ji-Sun Moon, Seon-Hee You</i>	
111. The Effect of Embelin's Physiological Activity as Cosmetics Ingredients	616
<i>Mi-Yun Yoon, Su-Kyung Hong</i>	
112. Effects of Treadmill Walking Speed on Lower Extremity Muscle Activity Ratio in College Students	622
<i>Inhyouk Hyong, Jaehyun Kim</i>	
113. Effects of Elastic Band Exercise Using Proprioceptive Neuromuscular Facilitation on Strength and Dynamic Balance of Adults with Ankle Instability	628
<i>Jung-Hyun Choi</i>	
114. Smoking Behavior, Smoking Motivation, Stress, Physical Condition and Health Promotion Behavior of College Students with NO Smoking Intention	635
<i>Hee Jeong Kim</i>	
115. The Validation of Intentions toward Assessments about Fitness of Disabled Students Scale in University Students Majoring in Adapted Physical Activity	641
<i>Kyung-Jin Kim, Ah-Ra Oh</i>	
116. Effects of 8-week Rehabilitation Exercise on Vascular Health	648
<i>Do-Jin Kim, Jong-Hyuck Kim</i>	
117. Nutrition Management and Support Effect of Food Service at Home Childcare Center	654
<i>Joo-Eun Lee</i>	
118. Differences in Attention Levels between Preliminary Nurses and Pre- Service Early Childhood Teachers Using ANT (Attentional Network Test) Computer Test	660
<i>Rae-Eun Kim, Sang-Mee Koo</i>	
119. The Effect of Kinder Therapy on Improvement of Teachers' Interaction of Toddlers' Problem Behavior	666
<i>Minkyong Kim</i>	
120. The Effects of Dynamic Neuromuscular Stabilization Exercise on Forward Head Posture and Spine Posture	670
<i>Won-Sik Bae, Keon-Cheol Lee, Dong-Yeop Lee</i>	

121. Study of Knowledge and Attitude about Brain Death and Donation of Cornea	676
<i>Kihun Ye, Soonyoung Yun, Shinhong Min</i>	
122. Comparison of Balance and Muscle Activity of Normal Male and Female in Squats Exercise According to Knee Joint Angle	682
<i>Jun-Hyeok Park, Dae-ho Yoon, Hyeon-ji Choi, Ji-Heon Hong, Jin-Seop Kim, Dong-Yeop Lee, Jae-Ho Yu</i>	
123. The Emergency Medical Services System of South Korea: The Present and Future of Emergency Medical Technicians	688
<i>Hong-Seok Baek, Sang-Sub Park</i>	
124. Effects of Intensity and Set Method on iEMG of Flexor Carpi Ulnaris and Performance Speed Decrease Point during Barbell Curl Exercise	693
<i>Ki-hong Kim, Sung-sik Ko, Chun-ho Yang, Chul Yoon, Byung-Kwan Kim, Song-young Jung</i>	
125. Study on the Knowledge, Optimistic bias and Engagement with AIDS in Nursing Students	699
<i>Shinhong Min, Soonyoung Yun</i>	
126. Study on the Consciousness of Sex and the Attitudes of Homosexuality in Students Majoring in Health Care	705
<i>Shinhong Min, Soonyoung Yun</i>	
127. Analysis of Walking-speed of Cruise Ship Passenger for Effective Evacuation in Emergency	710
<i>Wook-Jung Na, Byeung-Hun Son, Won-Hwa Hong</i>	
128. A Qualitative Study of Hospice Perceptions and Image of the Elderly in Health Care College Students	717
<i>A Young Park, Ja-Sook Kim, Hae-Ryoung Park</i>	
129. Evaluation of Usability on Mobile Detector X-ray Absorption, Scattering, and Phased Image Phantom	722
<i>Chang-Gyu Kim</i>	
130. Effects of Open and Closed Kinetic Chain Exercises on the Balance Using Elastic Bands for the Health Care of the Elderly Females	728
<i>Sang-Ho Lee, Dong-Yeop Lee</i>	
131. Fundamental Study for Establishing Standardized e-IRB Computer System in Healthcare	734
<i>Kwang-Hwan Kim, Jeoung A Kwon, DooRee Kim</i>	
132. A Novel Hybrid FLANN-PSO Technique for Real Time Fingerprint Classification	740
<i>Annapurna Mishra, Sachidananda Dehuri</i>	
133. The Dual Mediation Effect of Satisfaction with the Quality of Service and Satisfaction with Resident in the Relationship between Subjective Health and Depression among the Elderly in Long-Term Care Facilities	747
<i>Yun-Jeong Kim</i>	
134. Variance of Rates and Costs of Unplanned Readmissions in Tertiary Hospitals in South Korea	753
<i>Min Sun Shin, Won Jae Lee, Hyun Sook Oh</i>	

Estimation of Stature by Measuring Foot Length in Adult Females in a Tertiary Care Centre in Kanpur

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Abstract

Background: Identification of an individual is the core element in forensic investigations. Accurate estimation of height is of paramount importance which has been carried out by several researchers by the measurement of various long bones. However, foot measurement has not been frequently used for this purpose, particularly in females of our region.

Method: Present study was performed in the department of Forensic Medicine at Rama Medical College, Hospital and Research Institute, Kanpur. The material comprised of 88 young and healthy female medical students of Rama medical College, Mandhana, Kanpur.

Results and Conclusion: A statistically significant correlation was established between height and foot lengths (Right and Left). The regression equation for height and foot length was also developed.

The correlation between stature and foot measurements was found to be positive and statistically significant (p -value < 0.001). Linear regression models and multiple regression models were derived for estimation of stature from the measurements of the foot. The results also indicated significant differences between left and right foot length measurements.

The present study indicates that anthropometric measurements of foot are extremely valuable in the estimation of stature. This is a meaningful tool to estimate stature with greater accuracy.

Conclusion: Prediction of stature was found to be most accurate by linear regression analysis. Present study has established definite correlation between stature and foot length. It will help in medico-legal cases; particularly in establishing identity of an individual when only a few body remains are available as in mass disasters, bomb explosions, accidents etc. This study will be of immense value for Doctors, Police and other concerned authorities, investigating these cases.

Key words: Forensic; Anthropometry; Stature; Foot Length; Female; India.

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Introduction

In medico-legal practice, establishing personal identity is of prime importance and often required. In forensic anthropology, estimation of stature from feet dimensions plays a significant role in establishing personal identity. There is a scarcity of literature on the estimation of stature from foot length and foot breadth

among various Indian populations.¹ Accurate stature estimation plays an important role for this purpose and is necessary for reconstructing living body mass, skeletal rigidity and activity levels. Different body parts, long bones and appendages have been used for the estimation of stature.

Stature is the height of the person in the upright posture and it refers to the distance from the vertex, the highest point on the head in the Frankfurt horizontal plane, to the sole of the foot in an upright position. Stature is an important measure of physical identity. Establishing the identity of an individual from mutilated, decomposed and amputated body fragments has become an important necessity in recent times due to natural or manmade catastrophes e.g. earthquakes, floods, accidents, bomb explosions, war victims etc.

At times, the mutilation of dead body can also be done by the criminals who want to destroy all traces of identity to facilitate the easy disposal of the victim. Various studies have shown the correlation of stature with different body parts eg. Face, upper limb, lower limb and long bones.

Most studies utilized the long bones for estimation of stature, a very few studies have been conducted so far to find out the stature with the help of foot measurements. The reliability of prediction of stature from foot length is as high as that from long bones.

The relationships of stature to length of bones differ among populations, and different regression equations are required for individuals belonging to different populations. So, there are inter-racial & inter-geographical differences in measurements & their correlation with stature which may be true for the other.

Present study has established definite correlation between stature and foot- length and also developed regression equations. It will help in establishing an individual's identity particularly when only some body remains are found as in mass disasters, bomb explosions, accidents etc. If either of the measurement (foot length or total height) is known, the other can be calculated and this would be useful for anthropologists and forensic experts.

Material & Method

Present study was conducted in the department of Forensic Medicine at Rama Medical College, Kanpur.

88 young and healthy female medical students of 17 to 25 years had been selected for this study. Apart from taking detailed medical history clinical examination of all subjects was done and cases having any disease or orthopedic deformities, metabolic or developmental disorders which could have affected the general or bony growth were excluded from this study.

Measurement of foot length (Right & Left) and measurement of height were taken as maximum height of an individual is attained during this period. We have observed the correlation of height (in anatomical position) with foot length of subjects. .

Equipments Required

- Vernier caliper
- Measuring tape.
- Stadio meter

Method

Foot length was measured as a direct distance from the most prominent point of the back of the heel to the tip of the hallux or second toe (when the second toe was longer) by spreading caliper when the subject was sitting in a relaxed position putting same weight on both feet after taking off the shoes and the stockings. The foot length of both right and left foot were measured.

For Height measurement, the subject was requested to stand barefoot on the foot place of the stadio meter with the head held in the Frankfurt horizontal plane. The heels were kept together and hands hanged down on each side with the palm facing the thighs. The subject inhaled deeply and maintained this upright posture during measurement and the wooden plate was gently placed on the centimeter scale keeping the eye on the same level where the vertex was in touch with the wooden plate. The measurement was carried out at a particular period of time between 10 am to 2 pm to avoid diurnal variation.

In Vernier caliper, Length = reading of the main scale + Vernier coincidence x Vernier constant + mechanical error (Here Vernier constant = 0.01 and Mechanical error = 0)

Calculation of stature using regression equation:

Stature = value of constant + regression coefficient x foot length.

Value of the constant and the regression coefficient were calculated using SPSS version 16.0 program. Present study was done exclusively for estimation of stature by forming the regression equations using percutaneous length of foot length. Total numbers of cases were subjected to statistical computations.

Table-1 Distribution of Subjects

Age (in yrs.)	Frequency
17	1
18	2
19	16
20	27
21	17
22	7
23	4
24	6
25	8
Total	88

Table-2 Measurement of Height in females

Total Number	88
Height Range (in cm)	148-174
Mean Height	157.78
Standard Deviation of height	5.906

Table-3 Right Foot indices of females

	Female
Right foot length Range	10-23
Mean foot length	15.40
Standard Deviation of right Foot length	2.39
Correlation coefficient(r) between height & right foot length	0.3608
Regression coefficient (b) of right foot	0.8905
Value of constant (a)	144.07

Table-4 Left Foot indices of females:

	Female
Left foot length Range	9.4 – 22.6
Mean left foot length	15.10
Standard deviation of left foot length	2.38
Correlation coefficient (r) between height & left foot length	0.347
Regression coefficient (b) of left foot	0.8506
Value of constant (a)	144.936

Regression Equation:

Stature (Y) = Value of constant (a) + Regression coefficient (b) * foot length

Table -5 {table (3) & (4)} Showing Regression equation of foot length

	Female
Right	Stature (Y) = 144.07+ 0.8905* foot length
Left	Stature (Y) = 144.936+0.8506* foot length

Results

The data was collected, analyzed and subjected to statistical package for social sciences (SPSS) -21.0 version to know the correlation of stature with the length of foot and simple linear regression were derived for various combinations.

There was a significant correlation between height p & Right foot length ($r = 0.329$, $p < 0.01$ for male and $r = 0.3608$, $p < 0.01$ for female) and height and entire subjects mean foot length ($r = 0.5964$, $p < 0.01$). It means that there is a positive correlation between height and right foot length.

There was a significant correlation between height p and Left-foot length ($r = 0.343$, $p < 0.01$ for male and $r = 0.347$, $p < 0.01$ for female) and height and entire subjects mean foot length ($r = 0.5960$, $p < 0.01$). It means that there is a positive correlation between height and left foot length.

The regression equations for height and foot length were found to be as follows:

Stature (Y) = 144.936 + 0.8506 * foot length (for left foot of female)

Stature (Y) = 144.07 + 0.8905 * foot length (for right foot of female)

Discussion

In day to day medico legal practice, difficulties are being experienced in the estimation of stature particularly in dismembered bodies in mass destruction. To overcome these problems, new methods are being developed for calculation of stature. This study was dedicated to the derivation of regression formulae for estimating stature from length of foot whenever needed. In addition multiplication factors devised in this study would be of importance for calculating stature thus minimizing erroneous estimation.

Present study deals with observations on the correlation of standing height with right and left foot lengths. Our study was conducted on a population group where students belonging to various regions of Uttar Pradesh were studied to predict the stature by percutaneous measurement of foot (Right & Left) and height. A positive correlation between height and foot was established and the stature is determined by applying linear regression equations. There is no statistically significant difference in the lengths of right foot and left foot ($Z=0.83$, $P>0.05$).

We devised the linear regression equations as well as multiplication factors for estimation of stature. There was bilateral variation in left and right foot dimensions, with left side preponderance. In this study foot length is found to be good parameter for predicting stature compared to foot breadth in both the genders. The linear regression equation derived from foot length for estimation of stature showed a statistically significant relationship. However, foot breadth was not found to be a good parameter for estimation of stature.

Vidya CS in her study concluded that left foot is slightly lengthier than that of right foot in both the sexes.² In the present study even though there is no statistically significant difference in right and left footprint lengths.

Theodoros B Grivas (2008) stated that right foot length and left foot length is independent predictor of

stature.³ These findings are supported by the present study.

Abraham Philip⁴ estimated stature from known foot size by regression method. In the present study regression equations are derived to predict stature separately for right foot length and left foot length.

Agnihotri A K⁵ in his study found general multiple linear regression model was highly significant ($P<0.001$) and multiple correlation coefficient was (r) 0.877. In present study correlation coefficient of +0.82 and +0.80 respectively obtained for right and left footprint lengths.

Our results are in consistent with the study of Qamra et al⁶ who computed linear regression equations for estimating stature from either foot length or foot breadth and found that foot length was found to be more suitable. He suggested that a true relationship existed only between foot length and stature.

Giles et al⁷ also suggested that foot length displays a biological correlation with height and the latter can be estimated from foot length. Gordon et al⁸ estimated stature from foot dimensions and models containing both foot length and foot breadth were found to be significantly better than those containing only foot length. In this study, strong relationship was established between foot/boot lengths.

Singh and Phookan⁹ examined Thai male population of Assam and suggested foot length to be a better indicator of stature than foot breadth.

Nath et al¹⁰ formulated multiplication factors for reconstruction of stature from foot length of Rajputs and Brahmins of Srinagar, Garhwal (U.K.) with reasonable accuracy.

Jain et al¹¹ formulated multiplication factor as 6.59 for reconstructing stature among Jats females of Delhi between 17-20 years whereas in our study these were 7.76 and 7.71 for right and left foot length for females. Again the differences could be due to variations in the study group belonging to different regions.

Agnihotri et al⁵ developed a relationship between foot length and stature using linear and curvilinear regression analyses on a study group comprising of 250 medical students (125 males and 125 females) aged 18-30 years. It was concluded that general multiple linear regression model was highly significant ($P<0.001$)

and validated with highest values for the coefficients of determination $R^2=0.769$ and multiple correlation coefficient $r=0.877$.

Krishan and Sharma¹² examined the relationship between stature and dimensions of hands and feet among Rajputs of Himachal Pradesh on a group of 246 subjects (123 males and 123 females) 17 to 20 years old. In their study also the highest correlation coefficient existed between stature and foot length. Their lowest standard error of estimate indicated that the foot length provides highest reliability and accuracy in estimating stature.

Kanchan et al¹³ examined the relationship between stature and foot dimensions among 200 (100 males and 100 females) Gujjars (North Indian community). They devised linear and multiple regression equations for estimating stature using foot dimensions. Their results are similar to our study.

Sen and Ghosh¹ established the relationship between stature and feet dimensions among Rajbanshi male and females of North Bengal. Stature, foot length and foot breadth are positively and significantly correlated with each other. Contrary to our study, they found foot breadth to be more accurate in estimating stature. They concluded that their study provided equations to estimate stature from the feet dimensions among the Rajbanshis. It would be unwise to use the same equations for stature estimation for different Indian populations.

Present study illustrates that foot measurements have a strong relationship with stature in the young female population of North India. Hence, the stature of an individual can be successfully estimated from the foot using different regression models derived in the study. It was observed that the regression models derived from foot length measurements were more reliable than those from foot breadth measurements in the prediction of stature in forensic examinations. Stepwise multiple regression models tend to estimate stature more accurately than linear regression models in female sub-adults. Similar studies on a male population are proposed. It is highlighted here that the findings of the present research apply to a very specific population (North Indian females) and hence, should not be generalized. Researchers are encouraged to conduct similar studies in different population groups to look into the generation of additional standards which can further be used in the identification of individuals from human remains.

Conclusion

Foot dimensions give better prediction of stature than the other measurements as they are strongly correlated with stature. It is further concluded that the reliability and prediction of stature by the regression method is better than that of the division factor method. There are lot of variations in estimating stature from limb measurements among people of different region & race. It is, therefore, studies are required to collect the data from the different part of globe as the stature is the inherent characteristic of the individual, though influenced environmentally, therefore regional, simple and multiple regression equations can be of great value and quite handy for use by a lay public like police etc, also.

Conflict of Interest: None

Ethical Clearance: Taken from the Ethical Committee from the Institute

Source of Support: Nil

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Estimation of Age from Shoulder Joint by Radiographic Assessment of Epiphyseal Fusion of Related Bones in Population of Chhattisgarh: A Cross Sectional Study

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Abstract

Age estimation of an individual is of medico legal importance in both civil & criminal cases. Ossification centres appear & fuse in a fairly definite sequence at a particular age group from which age of an individual can be determined. This study aims to investigate the relationship between the stage of epiphyseal union at shoulder joint & biological age in Chhattisgarh population. The study was carried out in 100 healthy subjects (40 girls and 60 boys) aging from 13 to 20 years. The obtained results from the radiographs revealed that the complete fusion of epiphysis of shoulder joint is seen at 18-20 years. Females were consistently developing epiphyseal union at a younger age than their male counterparts, with two years of difference. Results also suggest that the age of epiphyseal union is found to vary greatly all over the world indicating the need for separate standards of age of epiphyseal union for separate regions.

Keywords: Epiphyseal Union, Shoulder Joint, Proximal End of Humerus.

Introduction

In law, crime and punishment is entirely based on criminal responsibility and this in turn depends on the age of a person. Determination of age of an individual from epiphyseal union is a well accepted fact in the field of medical and legal professions. Epiphysis of the bone unites during age periods which are remarkably constant for a particular epiphysis. This is possible due to complex but dependable system by which the osseous framework of his body develops, grows & matures. Extensive work for the determination of age by epiphyseal union has been carried out in abroad and different states of India which revealed differences in the ages of epiphyseal union. The differences may be an account of varying dietetic, geographic, hereditary and other factors. Present study has been undertaken in indigenous population of Chhattisgarh from ossification around shoulder joints roentgenographically.

Aims & Objectives

To evaluate age specific difference in epiphyseal union at shoulder joint.

1. To estimate age from epiphyseal union at shoulder joint.
2. To compare bisexual difference in epiphyseal union at shoulder joint.
3. To compare the findings in the epiphyseal union at shoulder joint in Central Indian population with other parts of India on the basis of previous studies.

Material & Method

The present study was carried out in the Department of Forensic Medicine & Department of Radiology, SSIMS, Bhilai, Chhattisgarh (Central India). A total of 120 individuals participated in this study. The subjects included were students of 13-20 years of age from schools & colleges from Bhilai city. They are born to parents living in Central India and have lived here since birth. The subjects do not have any disease/deformity

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pertaining to bones or chronic disease affecting the general health. An informed consent was taken from all subjects prior to each investigation.

Procedure of Radiography: After taking written consent, thorough physical examination & radiological evaluation was done. X-Rays of right shoulder joint were taken with the help of X-Ray machine in the Department of Radiology. Minimum shots were taken to expose the joints involved in study. Minimum & appropriate voltage settings of X-Ray machine were applied so as to avoid unnecessary radiation exposure of the subjects. All the radiological procedure was undertaken according to the

prescribed standards. Skeletal maturity was evaluated according to the Jits & Kulkarni's⁷ classification of four stages: Appearance, Non fusion, Partial fusion & complete fusion ("A", "NF", "PF", "CF" respectively). The master chart was prepared and tabulated as per code given above. The data was examined and tallied by experts in Forensic Medicine and Radio-diagnosis. It was classified, analysed and compared with known standards. At the end conclusions were drawn, which were compared with available results of various previous studies.

Results



Fig 1.



Fig 2.



Fig 3.

(showing NF, PF & CF of proximal end of humerus respectively)

TABLE 1: Age & gender wise distribution of subjects.

Age in years	Males		Females	
	No	%	No	%
13-14	6	10	4	10
14-15	7	11.67	4	10
15-16	9	15	8	20
16-17	10	16.67	7	17.5
17-18	12	20	7	17.5
18-19	8	13.33	5	12.5
19-20	8	13.33	5	12.5
Total	60	100	40	100

Table 2: Epiphyseal fusion at proximal end of humerus:

Males				Females		
Age (years)	NF	PF	CF	NF	PF	CF
13-14	5 (8.33%)	1 (1.67%)	0 (0%)	2 (5%)	2 (5%)	0 (0%)
14-15	4 (6.67%)	3 (5%)	0 (0%)	0 (0%)	4 (10%)	0 (0%)
15-16	2 (3.33%)	6 (10%)	1 (1.67%)	0 (0%)	3 (7.5%)	5 (12.5%)
16-17	0 (0%)	6 (10%)	4 (6.67%)	0 (0%)	2 (5%)	5 (12.5%)
17-18	0 (0%)	2 (3.33%)	10 (16.67%)	0 (0%)	0 (0%)	7 (17.5%)
18-19	0 (0%)	0 (0%)	8 (13.33%)	0 (0%)	0 (0%)	5 (12.5%)
19-20	0 (0%)	0 (0%)	8 (13.33%)	0 (0%)	0 (0%)	5 (12.5%)
Total	60 (100%)			40 (100%)		

In males, proximal end of humerus shows: non fusion in 11 (18.33%) cases in age group of 13-16 years, partial fusion in 18 (30%) cases in age group of 13-18 years & complete fusion in 31 (51.67%) cases in age group of 15-20 years. Complete fusion is seen in all the subjects in age group of 18-20 years.

In females, distal end of humerus shows: non fusion in 2 (5%) cases in age group of 13-14 years, partial fusion in 11 (27.5%) cases in age group of 13-17 years & complete fusion in 27 (67.5%) cases in age group of 15-20 years. Complete fusion is seen in all the subjects in age group of 17-20 years.

Table 3: Epiphyseal fusion at acromion process:

Males				Females		
Age (years)	NF	PF	CF	NF	PF	CF
13-14	6 (10%)	0 (0%)	0 (0%)	4 (10%)	0 (0%)	0 (0%)
14-15	7 (11.67%)	0 (0%)	0 (0%)	2 (5%)	2 (5%)	0 (0%)
15-16	7 (11.67%)	2 (3.33%)	0 (0%)	1 (2.5%)	7 (17.5%)	0 (0%)
16-17	0 (0%)	8 (13.33%)	2 (3.33%)	0 (0%)	5 (12.5%)	2 (5%)
17-18	0 (0%)	9 (15%)	3 (5%)	0 (0%)	1 (2.5%)	6 (15%)
18-19	0 (0%)	2 (3.33%)	6 (10%)	0 (0%)	0 (0%)	5 (12.5%)
19-20	0 (0%)	0 (0%)	8 (13.33%)	0 (0%)	0 (0%)	5 (12.5%)
Total	60 (100%)			40 (100%)		

In males, acromion process shows: non fusion in 20 (33.34%) cases in age group of 13-16 years, partial fusion in 21 (35%) cases in age group of 15-19 years & complete fusion in 19 (31.66%) cases in age group of 16-20 years. Complete fusion is seen in all the subjects in age group of 19-20 years.

In females, acromion process shows: non fusion in 7 (17.5%) cases in age group of 13-16 years, partial fusion in 15 (40.5%) cases in age group of 14-18 years & complete fusion in 18 (45%) cases in age group of 16-20 years. Complete fusion is seen in all the subjects in age group of 18-20 years.

Table 4: Fusion of Coracoid Process:

Males				Females		
Age (years)	NF	PF	CF	NF	PF	CF
13-14	4 (6.66%)	2 (3.33%)	0 (0%)	2 (5%)	2 (5%)	0 (0%)
14-15	4 (6.66%)	3 (5%)	0 (0%)	0 (0%)	4 (10%)	0 (0%)
15-16	2 (3.33%)	7 (11.67%)	0 (0%)	0 (0%)	2 (5%)	6 (15%)
16-17	0 (0%)	2 (3.33%)	8 (13.33%)	0 (0%)	0 (0%)	7 (17.5%)
17-18	0 (0%)	0 (0%)	12 (20%)	0 (0%)	0 (0%)	7 (17.5%)
18-19	0 (0%)	0 (0%)	8 (13.33%)	0 (0%)	0 (0%)	5 (12.5%)
19-20	0 (0%)	0 (0%)	8 (13.33%)	0 (0%)	0 (0%)	5 (12.5%)
Total	60 (100%)			40 (100%)		

In males, coracoid process shows: non fusion in 10 (16.65%) cases in age group of 13-16 years, partial fusion in 14 (23.33%) cases in age group of 13-17 years & complete fusion in 36 (60%) cases in age group of 16-20 years. Complete fusion is seen in all the subjects in age group of 17-20 years.

In females, coracoid process shows: non fusion in 2 (5%) cases in age group of 13-14 years, partial fusion in 8 (20%) cases in age group of 13-16 years & complete fusion in 30 (75%) cases in age group of 16-20 years. Complete fusion is seen in all the subjects in age group of 16-20 years.

Discussion

Table 5: Comparison of average ages of fusion of epiphyses around shoulder joint in males and females:

Sr. No	Researcher	Humerus (years)	Acromion (years)	Coracoid (years)
1.	Davies & Parson (1927) ¹	19-21	-	-
2.	Flecker (1932) ²	17-19	17	18-20
3.	Pillai (1936) ³	17	18	14
4.	Galstaun (1937) ⁴	17-19	17-19	-
5.	Cardoso Hugo (2008) ⁵	20-23	19-20	17-18
6.	Buri S et al (2017) ⁶	18-19	19-20	16-17
7.	Present study	17-19	18-20	16-18

Proximal end of humerus: The observations of present study matches with works of Flecker (1932)² in Australian population, Pillai (1936)³ in South Indian population & Galstaun (1937)⁴ in Indian population. Studies conducted by Davies & Parson (1927)¹ in English population, Cardoso Hugo (2008)⁵ in Portuguese population & Buri S et al (2017)⁶ in Rajasthani population show comparatively late fusion of epiphysis by 1-3 years.

Acromion: The observations of present study matches with work of Pillai (1936)³ in South Indian population. Studies conducted by Galstaun (1937)⁴ in Indian population, Cardoso Hugo (2008)⁵ in Portuguese population & Buri S et al (2017)⁶ in Rajasthani population show comparatively late fusion of epiphysis by 1-2 years.

Coracoid: The observations of present study matches with works of Buri S et al (2017)⁶ in Rajasthani population. Studies conducted by Flecker (1932)² in Australian population & Cardoso Hugo (2008)⁵ in Portugese population show late fusion by 1-2 years whereas there is early fusion at 14 years in study conducted by Pillai (1936)³ in South Indian population.

Summary and Conclusions

1. This study was conducted exclusively on the young indigenous population of Chhattisgarh region.
2. The epiphyseal union of bones at right shoulder joint in males is completed in all instances (100%) at the age of 19-20 years.
3. The epiphyseal union of bones at right shoulder joint in females is completed in all instances (100%) at the age of 18-20 years.
4. As the sample size is limited further studies are necessary. Region wise studies should be conducted for better correlation and comparison.
5. Due to changing lifestyle pattern, dietary, climatic, behavioural factors age of ossification is changing as mentioned in the available literature. So as to evaluate these changes, studies are recommended in every region of India at regular time period for academic and judicial interest.
6. The opinion about age should be given always in the range. From this study it can be concluded that the opinion about age can be given in a range having margin of error of 1-2 years.
7. Radiological interpretations are observer dependent so the set standards should be considered under expert guidance to arrive at conclusion in such radiological studies.
8. For estimation of age relevant joints should be radiologically examined for different centres and opinion should be arrived considering the status of multiple centres.

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Necrophilia: A Study of the Psychoanalysis in the Characteristics of the Offenders Who Sexually Molest the Dead

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Abstract

Deviance, then may be considered one of the facts of social life. Almost all people, one may be sure, can recall some act of deviance from their own experience, they have committed either knowingly or unknowingly. This paper deals chiefly with the psychoanalysis in the characteristics of one particularly macabre sexual disorder – Necrophilia. Necrophilia, which is the erotic attraction to or obsessive fascination with death and corpses⁸, as far as we know is the rarest of all the perversions, nevertheless it expresses succinctly a facet of the perverse strategy that is common to all perversions. In its larger meaning this perversion is about the deadening and dehumanization of otherwise humanly alive and therefore threateningly dangerous or unpredictable desires. Especially alarming are those who murder to obtain a body for subsequent sexual violation (e.g. Dennis Nilsen). Researchers dealing with this study on necrophilia have conducted their investigations by psychoanalytic approach of the existing literature and an aggregation of data from the case histories to draw generalizations of the typology of the characteristics of these necrophiliacs.

Keywords: Necrophilia, Psychoanalysis, Characteristics

Introduction

What sets us apart as human beings is our level of culture, traditions, and social attitudes that have been acquired over the millennia? We are all products of our environment... each and every one of us. Of course, much of our make up is genetic but I tend to think that just as equally we are also influenced by life once we have left the womb. Nature simply provides us with the various abilities to survive in this world, but it's our personal experiences (and our interpretation of those experiences) as we continue to live life, that makes us

who we are and how we define ourselves and evolve sexually. Sexuality, whether one like it or not, is a major part of our psyche. To ignore it only serves to stifle the brain, making us something less than we really are. Our individual thoughts, dreams and fantasies set us apart from each other. The challenge to each of us remains how far we wish to share our innermost thoughts and desires and with whom. Necrophilia literally means "love of the dead" According to Hucker (1990) the term was introduced by Guislain, a Belgian psychiatrist. It is defined as the act of defiling the dead by sexual intercourse with or carnal attraction to corpses.

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May my quivering lips taste the coolness of your's as the warmth of my eternal love enters you and stays with you forever. - Unknown

There were only two assumptions on which most of the investigators agreed upon. One is that necrophilia is exceeding rare. The other is that the literature on the subject is severely limited⁶. This research not only

questions the first assumption but also establishes that the second might be demonstrably false. Moreover, attempts to locate some measures of constancy among the psychoanalytic theories relating to necrophilia which are reviewed, and supplemented by other relevant theoretical abstracts, to evaluate their effect on scholarship by critical analysis of the psychodynamics influencing necrophiles, and also generates the typology of the characteristics of such offenders who sexually molest corpses.

Necrophilia – an overview

Historically, perversion has been the dark side of sexuality that was itself already shrouded in a repressive silence and taboo. Viewed as the unspeakable incarnation of evil, perverse sexual behavior has been considered sinful, blasphemous, immoral, corrupt, and as a crime calling for severe punitive measures. In more recent times, it has been perceived as incorrigibly abnormal, pathological, and a loathsome disease unvarying in its relentless downward course²¹.

“The dead person who loves will love forever and will never be weary of giving and receiving caresses.”
- Ernest Jones¹⁷

It appears from history, that sexual interference with the dead was known and abhorred by the ancient Egyptians as Herodotus (484-425 BC) noted:

“When the wife of a distinguished man dies, or any woman who happens to be beautiful or well known, her body is not given to the embalmers immediately, but only after the lapse of three or four days. This is a precautionary measure to prevent the embalmers from violating her corpse, a thing which is actively said to have happened in the case of a woman who had just died”¹².

However, male corpses may have been treated differently, as pseudo-copulation ritual was performed with the mummy to restore the dead man's virility. Another example, refers to the Luo of East Africa who believed that the ghost of a virgin was particularly dangerous and had to be pacified by deflowering the girl's corpse by a stranger. “Necrophilia may appear as the culmination of a pattern of multiple and increasingly perverse practices rather than as an isolated, abrupt deviation”¹⁸. Specific acts and fantasies of necrophiles evolved from a sexual arousal caused by contact with corpses, in activities

such as vaginal intercourse, anal intercourse, biting, fondling or suckling of the breasts, hugging or sleeping with the bodies, manipulation of the corpse's genitals, decapitation, mutilation of only the sexual organs, drinking the corpse's blood (vampirism), washing the body, preserving the body or body parts, and insertion of foreign objects into the orifices¹⁷, or sometimes, just masturbation fantasies involving dead bodies, as well as other less “dainty acts.” Necrophiliacs most commonly gain access to dead bodies through occupation most commonly were hospital orderlies, cemetery employee, morgue attendant, funeral parlor assistant, soldier, cleric, ambulance driver, anatomy student, volunteer fireman, and pathologist¹⁷. Moreover, some individuals may seek out corpses at mortuaries, funerals, or graveyards (grave-robbers) or preserve the bodies of loved ones¹³, homicide, and chance occurrences. The victim may be male or female, usually a female corpse is preferred, but for some necrophiles the dead or dying body of a male, a child, or an animal suffices⁴. Most of the perpetrators are men employed as mortuary assistants, hospital porters, and workers in funeral parlors, embalmers, or gravediggers^{12, 20}. The crime usually takes place before burial but in rare cases may occur after burial. Often the corpses are not fresh but rather are dug up from the grave in a putrefied or mummified condition²⁰. Some even like only the bones. For example, Ed Gein. Sometimes the perpetrator breaks into the mortuary to get a corpse (criminal corpse snatching) or even kills to satisfy his or her craving⁵. Necrophilia can be a dramatic part of the power/control serial killers' rituals too. In more recent times, necrophilia has been associated with cannibalism (necrophagist) and myths of vampirism.

Typology of the Characteristics of Necrophiliacs

To most people, anyone who violates such a strong societal taboo appears capable of any inhuman outrage. However, even though most of us find necrophilia completely alien to our own range of experiences. Necrophilia can be classified as a clear-cut sexual aberration or as a harmless fantasy that involves no actual physical contact with corpses¹². Other forms of necrophilia include lust murder or necrosadism, in which homicide has the goal of obtaining a corpse for sexual assault; necrostuprum, meaning “stealing of a corpse”; and necrophagy, where the corpse is physically mutilated or parts of it are eaten³. In this variation, is an underlying necrofetishism, where by dead human bodies are the object of sexual interest, based on the existence

of “a persistent sexual attraction to corpses”¹³.

Typology of the Characteristics of Necrophiliacs can be classified in 11 broad categories derived from various case studies and review articles by some renowned authors^{1,11,12,17} (refer to Table: 1)

TYPE 1 Necrophiliacs: Genuine necrophilias have a persistent sexual attraction to corpses. Over a period of at least 6 months, of recurrent intense urges and sexually arousing fantasies involving corpses, which are either acted upon or been markedly distressing. It includes case in which the corpse represents a fetishistic object.

TYPE 2 Necrophiliacs: Pseudo-necrophilias have a transient attraction to a corpse, but corpses are not the object of his sexual fantasies. He prefers sexual contact with living partners too. This group includes sadistic necrophiles, opportunistic necrophiles, and transitory cases. For instance, it includes “incidental” cases in which the subjects had sexual relations with cadavers without preexisting fantasies of doing so.

TYPE 3 Necrophiliacs: Violent necrophilias who kill to obtain corpses for sexual acts, or get a sexual charge out of mutilating dead bodies (necrophilic homicide). They are also referred as lust murderers or homicidophilia who are extremely dangerous necrophiles who enjoy the act of killing and copulating the warm fresh bodies.

TYPE 4 Necrophiliacs: Fantasy necrophilias, who imagine or play-act sexual contact with corpses, often without direct physical contact (vivid erotic imagery involving sex with corpses). Fantasy necrophiles, range from those timid persons whose only sexual outlet is the thrill and arousal they experience when viewing the dead bodies of strangers in funeral homes or morgues. According to the famous German sexologist, Dr. Magnus Hirschfeld role play of the dead are enacted in these luxury brothels which typically have dimly lit “mortuary chambers” with walls covered in black cloth, burning candles, and other funeral trappings associated with death are arranged near a casket. In a typical scenario the prostitute, dressed in white, lies motionless in a casket. She has been previously painted blue death spots on her body and has made her skin feel cold with cold compresses. The necrophile, perhaps dressed as a priest, will kneel before her and recite prayers for the dead, accompanied with faint organ music in the background. The finale comes when he can no longer

control his excitement and throws himself on her body, which remains rigid and immobile throughout the act, though, of course, still very much alive¹¹.

TYPE 5 Necrophiliacs: Romantic necrophilias, the bereaved who because of their extreme grief cannot bear to be separated from their loved one, and continue to relate sexually to their beloved, much as they did in life. However, such behaviors have been referred to as “inhibited necrophilia” as “little more than an extension of the part played by love in mourning.” Ancient customs and traditions have permitted romantic necrophilia allowing survivors to display a certain amount of loving attention to a dead lover in order to help them deal with their profound and extreme grief. Some mourners cannot bear to be separated from their loved ones and continue to relate sexually to their beloved after their death. For example, Some Polynesian tribes and Indians of British Columbia at one time allowed a man to express his grief by copulating with his dead wife¹¹.

TYPE 6 Necrophiliacs: Sadistic necrophilias are involved in biting, devouring, overtly attacking, or sexually assaulting a dead body. Some instances can lead to mutilation of the body parts of the deceased while performing the sexual act.

TYPE 7 Necrophiliacs: Regular necrophilias who perform a variety of sex acts with corpses, as they are often found in jobs that afford an opportunity to come in contact with dead bodies e.g. working as mortuary attenders, hospital orderlies, funeral home personnel, or grave diggers.

TYPE 8 Necrophiliacs: The true necrophilias are only interested in the corpse, not the living person. If he kills, it's only to get a corpse. He's often incapable of even making a sexual approach to the living. “True necrophilia” is very rare. This is not surprising as the act is typically carried out in secret and there is no victim to complain. For example, according to a legend, King Herod had sex with his wife Marianne for seven years after he killed her¹².

TYPE 9 Necrophiliacs: Opportunistic necrophilias usually have sexual intercourse with the living and would not normally think to engage in sex with the corpse but if an opportunity arises they would molest the dead.

TYPE 10 Necrophiliacs: Platonic necrophilias are those who never touch the dead but find sexual gratification merely from looking at them, and often experienced erections whenever the thought of a funeral arises.

usually are not interested in the actual sexual act with the non-living but rather get sexual gratification by collecting portions of the dead body or the undergarments worn by them as souvenirs and perform fetishtic activities with it. This practice of perversion is commonly referred as

TYPE 11 Necrophiliacs: Fetishtic necrophilias

necrofetishism.

Type	Typology of Necrophiliacs	Characteristics
1	Genuine necrophilias	Persistent sexual attraction to corpses with recurrent intense urges and sexually arousing fantasies involving corpse over a period of six months.
2	Pseudo necrophilias	Transient attraction to a corpse and prefers sexual contact with living partners too.
3	Violent necrophilias	Homicidal necrophiliac tendencies to kill to obtain corpses for sexual intercourse.
4	Fantasy necrophilias	Fantasize or play-act sexual contact with corpses, often without direct physical contact. Arousal by viewing the dead bodies of strangers in funeral homes or morgues.
5	Romantic necrophilias	Continue to relate sexually to their beloved as they cannot bear to be separated from their loved one.
6	Sadistic necrophilias	Sadistic acts involving biting, devouring, overtly attacking and mutilating the body parts of the deceased while performing the sexual act.
7	Regular necrophilias	Performance of sexual acts with corpses, as their jobs provide access to come in contact with dead bodies.
8	True necrophilias	They are exclusively interested in the corpses and not in the living person. They are capable of killing a person to get a corpse.
9	Opportunistic necrophilias	They usually have sexual intercourse with the living but if an opportunity arises they would molest the dead.
10	Platonic necrophilias	Sexual gratification obtained by viewing the dead body rather than touching them. They also experience erections whenever the thought of a funeral arises.
11	Fetishtic necrophilias	They are not interested in the actual sexual act with the dead but rather get sexual gratification by collecting portions of the dead body or the inner wears worn by them as souvenirs.

Table 1: Typology of the Characteristics of Necrophiliacs

The psychoanalytical background of a necrophilous character

The explanation offered for necrophilia in the literature has been primarily psychoanalytic, as the psychodynamic hypotheses that have been proffered

in the literature are often based on single cases. They are thus very difficult to confirm or deny empirically. Psychoanalytic interpretations become highly elaborate, when these however, have limited value in understanding the disorder, especially when they are derived from fantasy material compared to cases in which actual sexual contact with a corpse has occurred.

Life and death instincts are the most fundamental

forces in human nature. Some of the most popular children's folklore in western culture are infanticidal and necrophilous in character, the fairy tale of "Sleeping Beauty" being cited as an example¹². However, Calet and Weinshel (1972) concluded that although necrophilia may appear to have some characteristics in common with somnophilia (sleepy sex), the two syndromes do not necessarily reflect the same underlying pathology. The wish to return to the maternal body, oedipal conflict, pregenital fixations, and castration anxiety may contribute to somnophilia. In addition, munchausen's syndrome and necrophilia are uncommon disorders which do not appear to be related. It is suggested, however, that both of them center on "return to the womb" fantasies and may represent variants of each other. Specifically, the munchausen patient's symptom triad (factitious illness, peregrination, pseudologia fantastica) is seen to reflect a wish for death and reunion with the maternal object¹⁰.

The general theme, however, is that of unconscious suppressed hostility towards parental figures and sadistic impulses to explore the mother's body¹². For instance, Calet and Weinshel (1972) hypothesized that the bizarre mutilations sometimes found in sexual killings indicate that in some of these cases "the wish to re-enter and to explore the interior of the mother's body may be an important ingredient." This issue was criticized by Liebert, (1985) that "How would we confidently determine, for instance, if 'unconscious' forces to explore his mother's womb truly did lead an offender to kill and mutilate a female stranger?"¹⁵. For example, in 1890 in Paris, a woman was found dead in her home, her son sleeping next to her. She had been raped and then thoroughly disemboweled by him and he had managed this by reaching into her vagina, puncturing the organs and pulling the intestines back out by the same route. He threw them over her shoulder. Then he lay down on that bed and went to sleep. The autopsy revealed that the mother had died before any of this occurred. He had ravaged her corpse¹⁴. The typology of the necrophilous character existing in the given scenario is consistent with the combination of Type 3: Violent or Homicidal Necrophiles and Type 6: Sadistic Necrophiles.

Some psychoanalytic theories relating to necrophilic fantasies were described (refer to Table: 2), emphasizing separation anxiety, sadism, and anal masturbation, all compellingly manifest in the transference and rooted in infantile trauma². This includes the possibilities of a genetic factor or temporal lobe abnormalities

which may underly the "necrophiliac rampages"¹⁷. Calet and Weinshel (1972) also described a woman whose necrophilic fantasy of making love to a dead man was traced to her excitement of "playing dead, being a "stiff"... and hoping to be able, by her own deadness, to ignore her own frightening excitement. The intimate and complex inter-relationships between birth fantasies, coprophilia and sadism, regarding necrophilic tendencies, were first described by Freud (1908). Some psychoanalysts claim that the need to overcome the primal scene trauma is responsible for causing later necrophilia¹¹. The primal scene refers to the young child's actual or imagined observation of parental intercourse. For example, the child misinterprets the sex act as the father's mounting a murderous attack on the helpless mother, which causes overwhelming traumatic anxiety in the child. This interpretation of parental sex then forms the unconscious foundation for the later emergence of the necrohomicide. He identifies the father (the attacker) and the victim (mother) who has been rendered harmless and safely immobile.

One central theme in necrophilia is a profound lack of self-esteem¹⁷ and deep-seated feelings of inferiority. Unusually sensitive to rejection, they seek out a safe sex partner who is permanently incapable of rejecting them. At first they are fearful of the dead. However, through the defense mechanism of reaction formation, whereby an unacceptable emotion is replaced by its opposite, they become enamored of the dead and obsessed with them. They develop elaborate fantasies involving corpses, and when environmental or occupational circumstances cooperate, they will act on their hidden desires¹¹. Rosman and Resnick (1989) in their study with 122 cases of necrophiles found that only 11% of "genuine necrophiles" showed evidence of psychosis (Schizophrenia was diagnosed in some). Most of them were of average intelligence, although alcohol abuse seemed common, especially in the homicidal group. Most of them were heterosexual, though homosexual cases are known. The majority the psychopathology usually related to personality disorders' and a variety of sexual anomalies' such as pedophilia, exhibitionism, voyeurism, sadism, zoophilia, masochism, exhibitionism, asphyxiophilia, and fetishism, were also reported. As Stoller (1975) included necrophilia amongst the fetishisms.

"These range from necrophilia...through the use of inanimate objects ... to the ubiquitous fetishism of treating people as if they were only organs...or functions"

Table: 2**Psychodynamic themes included in the necrophilias characteristics^{11,17}:**

- 1) A fusion of aggressive and libidinal drives
- 2) Sadistic and destructive wishes
- 3) Developmental problems of pre-genital fixation or oedipal conflicts
- 4) Identification with the mother, or an attempt to deal with separation anxieties
- 5) Attempt to deal with loss or the fear of loss
- 6) Fears of death or of women
- 7) A moral deficiency or degeneracy

Necrophiles frequently have more than one motive. The most common motive of the true necrophiles is to possess an unresisting and unrejecting partner¹². For example, Dennis Nilsen, in his detailed interview with the police, said he wanted to possess the body of his homosexual victims, as he did not want them to leave him as they did every night, and also his childhood emotional trauma caused by the death of his grandfather at the age of six. Other motives are; reunion with a romantic partner, conscious sexual attraction to corpses, an attempt to gain comfort, or to overcome feelings of isolation; an attempt to gain self-esteem by the expression of power over a homicide victim^{17,18}, and less common motives are; unavailability of a living partner (for example, historical accounts of battles have soldiers with no history of homosexual leanings nevertheless sodomizing the wounded or dead on battlefields), compensation for a fear of women; a belief that sex with a living woman was a moral sin; a need to achieve a feeling of total control over a sexual partner; compliance with a command hallucination; performance of a series of destructive acts; expression of polymorphous perverse sexual desires; and, need to perform limitless sexual activity^{8, 17}.

A critical analysis of the psychodynamic influences in necrophiles

All aspects of our lives contain both deviant and non-deviant acts, this includes everything from the most mundane aspects of our lives, how we dress, the language we use to communicate, how we decorate our homes, to our most private activities, such as our sexual

behavior. As with most paraphilias, sexual interaction with the dead has been reported widely over time and place. It is believed that the act is carried out secretly and with a victim who is unable to complain. Some authors have included cases in which no actual contact with a corpse has occurred (pseudonecrophilia)¹¹. The authors intuition suggests, necrophilic tendencies are presumed to bud from early childhood development, for example, "Sleeping beauty" a classical folklore, which presents information of reincarnation, or life after death, by sexual union, makes a child think in an eccentric manner, or Shakespeare's "Romeo and Juliet" conveys a similar fantasy, some "Heavy Metal" songs explicitly deal with necrophilia¹⁷. Also, necrophiles may possess a confused sexual identity and/or sexual orientation and masturbation may be a sole sexual outlet well into adulthood. They may have feelings of extreme guilt towards masturbation, as sex may be a taboo topic at home. There is a possibility that they may masturbate to gruesome murders on T.V, for example, victims of torture, rape, concentration camps, sexual murders etc. According to Torre & Varetto (1987), "No doubt, that a subject who was depraved enough to perform acts of necrophilia could equally well have masturbated and ejaculated, using a pornographic cartoon as a means of arousal." Briefly, necrophiles sees the perverse act as the use of hostility in converting a childhood trauma into an adult triumph, the fantasy of revenge being crucial and risk taking an essential part. A triumph is celebrated and the sex object dehumanized each time the perverse act is performed, whether acted out or privately in

masturbation.

Necrophiles should have a tremendous amount of fascination to death, “Unintended necrophilous actions” such as the tendency of some individuals to turn first to the obituary columns rather than other items in a newspaper (i.e. arousal by viewing the photograph of a dead person), or they may attend funerals of unknown persons or get an erection on witnessing the death or even by perceiving the information related to some individuals’ death. Offensive acts such as, breaking and entering into a mortuary, or cemeteries to steal burial clothes or shrouds from the coffins are not uncommon²⁰. Often necrophiles may like to wear the attire and/or footwear, stolen from a dead individual. He may also gratify himself sexually by masturbating in the empty coffin and commit other gruesome acts involving skinning the dead body and fastening the skin flap to his naked body in order to proceed masturbating⁹. For instance, the insertion of a foreign objects into the vaginal orifice followed by a masturbatory act, thus are clearly acts of sexual substitution (regressive necrophilia). Necrophiliacs may even possess the knowledge of a thanatologist, to know the different stages after death, such as the facial pallor, cooling of the body, the stiffness of the cadaver (rigor mortis)¹⁶, even the smell of putrefaction or decomposition, may stimulate them.

A necrophile would have his fears of his own death, or experienced loss of his loved ones, quite frequently. They may assume that reunion with the dead is possible by turning a passive body into action by his sexual interventions. He may desire to engage sexually with someone who is sleeping, according to Calet and Weinshel (1972), who proposed the “Sleeping Beauty” syndrome (somniaophilia), as a neurotic equivalent of necrophilia. He would have tried sex with inanimate objects, such as using mannequin, shoes etc., which

eventually result in behavioral try-outs with other associated paraphilias (autoerotic asphyxia, bestiality). His first sexual encounter could have ended in abject failure, an event which probably precipitated his acute deterioration and subsequent referral to prostitutes¹⁶. For instance, “Symbolic necrophilia” includes individuals who frequent prostitutes who are prepared to simulate a dead body, complete with shroud, coffin, etc., and to permit intercourse under those circumstances¹¹.

Necrophiles frequently prefer sex partners who are helpless, unresisting, and completely at their mercy, or who are either unconscious or immobile, in order to avoid critical remarks about their performance, the fulfillment of which gives them a sense of power and control over the women whom they considers as a sex object. A necrophile will continue his acts, as he believes, that the dead lover never rejects him, and is always available when required; makes no demands, is never unfaithful, does not compare his love-making skills with others’, will go along with any sort of “kinky” sex, and will never file a complaint against him.

While critically analyzing the issue, necrophilia is simply another type of behavior problem that is acquired when the proper learning conditions are present along with major defense mechanisms that have been attributed to necrophiles (refer to Table: 3). For example, it is common for a man during sexual intercourse to try to delay orgasm while he is inserted and enjoying the preliminaries. However, this may be hard if his partner is moving very enthusiastically. He may then ask her to slow down or remain motionless before his excitement reaches the point of no return. If having a motionless partner allows him to prolong sexual pleasure, this could be a powerful motive for seeking out other immobile sex partners. Later, he moves on to an unconscious or dead person. Therefore, can a necrophile rape a male or

female who is living is an area to explore? This could be possible if the victim is drugged or rendered unconscious.

Table: 3

The major defense mechanisms that have been attributed to necrophiles are^{11,12,17}:

1. Denial of separation and loss
2. Identification with a parental figure
3. Introjections of a parental image
4. Counter phobic reaction against a fear of the dead

5. Transforming passive into active

Necrophiliacs are motivated by a desire to obtain an immobile, helpless, and unresisting partner as a laboratory for their sexual experiments, which in turn, precipitates them to choose jobs that would allow them to be close to corpses. The frequency of occupational access to corpses among necrophiles suggests that careful screening and supervision of employees should be done in cemeteries, morgues, funeral homes, and pathology departments. The ready availability of corpses in a job environment does not, therefore, preclude the possibility that a necrophile will commit homicide. Several necrophilic murderers had access to corpses through their occupations¹⁷. For example, an individual who has a fetish for female underwear often begins by stealing from clotheslines. When the fetishistic object is no longer easily available, the subject may commit a burglary in order to obtain it. Similarly, with necrophiles, when there is a crisis for corpses; they tend to kill to obtain the body of the victim for sexual assault. Also, some necrophiles, like fresh, warm bodies to mutilate and perform sexual rituals. For example, Edmund Kemper, went cruising for co-ed teenage girls, killed them, later decapitated them, before his sexual acts, and lastly performed similar rituals with his own mother. Mutilation and necrophagia were not committed by several true necrophiles, according to Rosman & Resnick (1989). Although it appears that there may be an overlap between vampirism and necrophilia, the distinction between the two is based on the observation that vampirism is sometimes directed towards the living¹³. The myths of vampirism can be criticized as a person, who has been romanticized by the Dracula tales, obtains a feeling of power from his victims.

Conclusion

Necrophilia is often acknowledged as a very rare and poorly understood phenomenon. The reasons behind this were; limited research publications in the psychological aspects of necrophiliacs, often due to the limitations of retrospective case assessment or statistical analysis. Whereas, this study explored the sexual deviancy in a necrophile from the point of view to critically analyse the psychodynamic assessment which is basically an in-depth inquiry into the nature of how the sexual symptomatology is related to and embedded within core characterological and interpersonal dynamics, that serves in evaluating the sex offenders necrophilous

characteristics and to encourage in future psychological therapeutic interventions. Different societies have different rules about what is forbidden and what is permitted. The rules we inherit depend upon the accident of birth. In order to study the problems that arise from sex objectively, in terms of attraction to the dead, we need an entirely new way of classifying behavior. (E.g. true necrophile or fantasy necrophile) The dividing line should be between what people do with mutual consent, and what people do against another's will, (especially, in this disorder a non-complainant) in other words, moral judgment between social and anti-social acts.

If, questioned as an author of this psychoanalytical study as to where to draw the line, my answer is that as regards to my understanding no line can be drawn. We should never stop trying to understand the vagaries of sexual behavior, no matter how bizarre or extreme. The simple rule is that every human being has a claim to sympathetic understanding by virtue of belonging to the same human family. Also, every human being has the right to express himself in his own way provided he does not infringe the rights of others. This article has delivered the message that necrophilia may range all the way from harmless masturbation fantasies to an unusual kind of "kinky sex" or even murder. We can now understand how the necrophilic characteristics and behavior might develop and the psychoanalytic influences that take place on these sex offenders. Since our society maintains certain dignified rituals regarding the dead body, the question still persist, what if one's partner only plays dead, or if sexual enjoyment is greatly increased when partners enjoy sex in coffins or cemeteries. Are these forms of necrophilia truly beyond the bizarre? Moreover, it is almost impossible to estimate the incidence of imaginal necrophilia, since such fantasies are subject to strong social taboos and are most likely to be confided to only a very limited audience, such as one's therapist or sex partners.

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Nutrition Education Intervention for the Management of Polycystic Ovary Syndrome (PCOS)

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Abstract

Polycystic Ovary Syndrome (PCOS) is an endocrine disorder that is characterized by hyperandrogenism (clinical or biochemical), anovulation (chronic) and polycystic ovaries. The intervention study aimed at creating awareness among women with PCOS, improving their nutritional knowledge, attitudes and practices, enhancing their quality of life and physical activity through Nutrition Education Program. Using random sampling technique, 521 respondents were screened and 40 respondents were selected for this study based on the inclusion criteria and were divided into experimental and control group. Majority of the subjects were college students with 19.5 years being the average age of the selected subjects. Various questionnaires were used to elicit the general information, nutritional knowledge, attitudes and practices, information on PCOS, physical activity level and quality of life of subjects. Nutrition education sessions were conducted using various education materials for a period of 2 months with a minimum of 3 sessions per subject through one to one sessions or video conferencing. The statistical analysis of Pre and Post intervention study revealed a significant improvement in the mean scores of Knowledge (81.75 to 97.10) and Attitude (46.60 to 52.95), post intervention. The study helped the subjects in improving their knowledge about the importance of Nutrition in PCOS and instilled a positive attitude which was reflected in the scores of various quality of life dimensions and intensity of physical activity.

Key words: PCOS, Nutrition Education Program, Knowledge and Attitude, Quality of Life, Physical activity.

Introduction

Polycystic Ovary Syndrome (PCOS) is also known as “Stein-Leventhal” syndrome and was first described by Stein and Leventhal in 1935. It is one of the most prevalent endocrine disorders that occur in women of child bearing age and is around 5-10% prevalent worldwide and in India it is 52% prevalent.¹

PCOS is characterized by hyperandrogenism (clinical or biochemical), anovulation (chronic) and polycystic ovaries.² Clinical features include hirsutism,

irregular menstrual cycles, acne, thinning of hair and infertility. It is also associated with obesity, increased pregnancy related complications, cardiovascular disease risk, diabetes mellitus, insulin resistance etc.

This condition involves hormonal imbalance which affects the follicular growth during the ovarian cycle and leads to the formation of cysts. PCOS is one of the major causes of infertility among women. It is emerging as one of the fastest growing health disorder among women. The growing incidence is a result of lifestyle disorder, inappropriate dietary habits, genetic disorders etc.

Rotterdam European Society for Human Reproduction/American Society of Reproductive Medicine (ESHRE/ASRM) in 2003 proposed that PCOS diagnosis must include any two of the following three criteria:

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1. Oligo- and/or anovulation
2. Clinical and/or biochemical hyperandrogenism
3. Polycystic ovaries on ultrasound

Other etiologies must be excluded such as androgen secreting tumors, cushing syndrome, congenital adrenal hyperplasia, thyroid dysfunction and hyperprolactinaemia.³

PCOS is on an increasing trend and a holistic approach is required for its management. As per studies, the first line of intervention for women with PCOS is lifestyle modification that includes dietary modifications, increased physical activity and weight management along with medications which were found to be effective in preventing the cardio-metabolic risk factors. Considering the individual's risk profile and treatment goals would help in managing this condition effectively.

Nutrition education is useful in order to disseminate information on healthy diet and nutrition. To bring about a positive change in the attitude of people towards PCOS, nutrition, healthy eating, good lifestyle pattern etc. different methods are adopted as nutrition education tool.

Educational program that provides general information about the lifestyle modification should be included for women with PCOS to encourage them for effective management of this condition which will also improve their quality of life. Many studies have shown that Educational program conducted regarding PCOS, Diet and Lifestyle intervention have improved the knowledge among women with PCOS regarding these aspects.

Objectives

1. To screen and select the subjects with PCOS using standardized PCOS screening questionnaire.
2. To assess the Nutritional Knowledge, Attitudes, Practices, Quality of Life and Physical activity of the screened subjects using validated questionnaires pre and post intervention.
3. To develop nutrition education materials for the

management of PCOS and to conduct an intervention study on the experimental group using the developed education materials.

Material & Method

Inclusion criteria:

i. Pre-University, Undergraduate and Post Graduate students aged between 15-30 years of age.

ii. Confirmed cases of PCOS were selected based on Rotterdam criteria which requires the presence of any two of the following:

1. Oligo/anovulation
2. Clinical or biochemical signs of hyperandrogenism

3. Polycystic Ovaries on Ultrasound

iii. Subjects willing to be a part of the study.

Exclusion criteria:

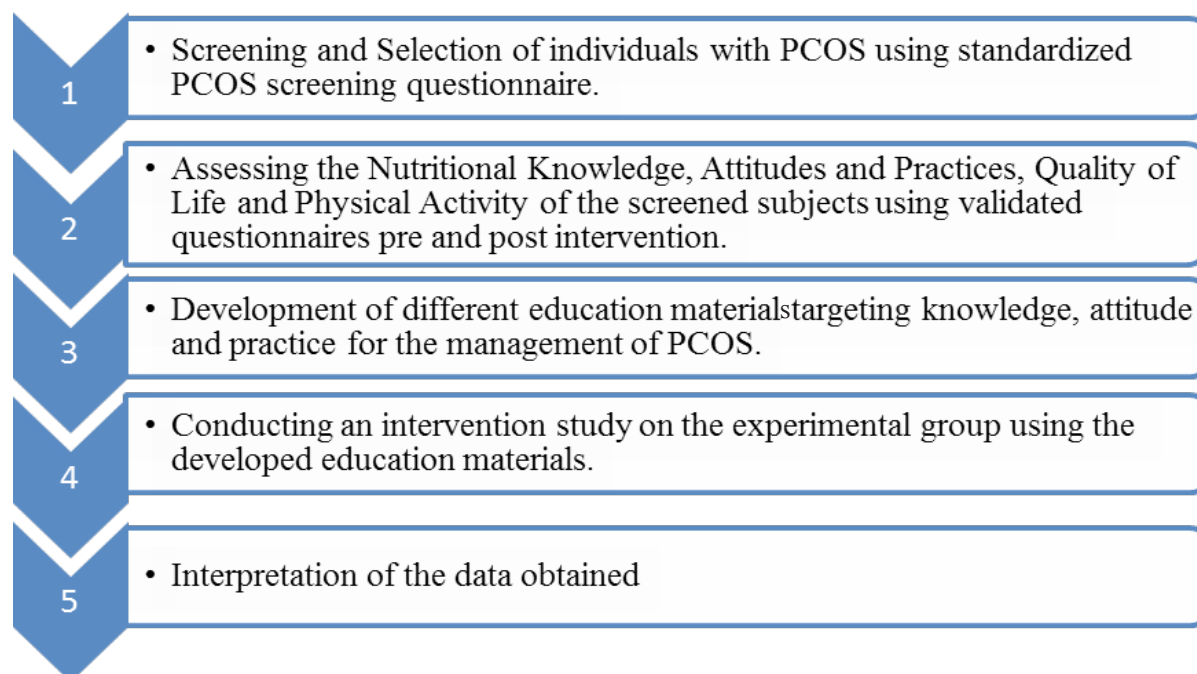
i. Subjects beyond the required age group.

ii. Individuals with congenital adrenal hyperplasia, androgen secreting tumors, Cushing syndrome, thyroid dysfunction and hyperprolactinaemia as mentioned in the Rotterdam criteria of PCOS diagnosis.

iii. Subjects who are not willing to be a part of the study.

Sample size and Selection of subjects: Subjects were selected using random sampling technique. The sample size was 40. Average age of the selected subjects was 19.5 years. Screening questionnaire was distributed to 600 subjects along with the pamphlets which were developed as a part of Nutrition Education material to give general information about PCOS. Out of 600 subjects, responses were received from 521 subjects. Based on the inclusion criteria, 56 subjects could be considered for the study. Out of 56, few candidates did not respond and few did not wish to participate in the study and therefore 40 respondents were selected to undertake the study.

Research Design



Evaluation Tools

SCREENING QUESTIONNAIRE

A pre-developed screening questionnaire was used to screen subjects and identify women with PCOS. The questions were based on the awareness, diagnosis and treatment taken for PCOS, regularity of menstrual cycles and other related information, presence of symptoms of PCOS, weight gain and weight fluctuations, family history of metabolic syndrome, presence of any psychological conditions, frequency and intensity of physical activity, eating and sleep patterns.

KAP QUESTIONNAIRE

Validated KAP questionnaire was used for the present study in order to assess the knowledge, attitude and practices of subjects having PCOS pertaining to nutrition. The questionnaire also included certain questions eliciting information about social and economic background.

POLYCYSTIC OVARY SYNDROME - QUALITY OF LIFE QUESTIONNAIRE

The PCOS Health-related 'Quality of Life' questionnaire is a validated and reliable questionnaire developed by the researcher to analyze the health-related concerns of women with PCOS and its effect on their quality of life. The questionnaire involves questions

pertaining to different aspects such as psychosocial and emotional status of the individual, fertility related concern of the individual, sexual function/satisfaction, obesity and menstrual disorders related concern, hirsutism disorders related concern and the individual's coping with the condition.

GLOBAL PHYSICAL ACTIVITY QUESTIONNAIRE (GPAQ)

GPAQ is a validated questionnaire developed by the World Health Organization for Physical activity surveillance. It covers several components such as intensity, frequency and duration of physical Activity and evaluates the physical activity based on various domains in which it is performed.

NUTRITION EDUCATION MATERIAL

Nutrition Education Materials that were used for effective communication of the subject matter during Nutrition Education sessions included Powerpoint presentation, Brochure, Pamphlet, Handbook, Memory games and Videos of medical experts of various specializations.

Summary of the Intervention programme:

Location: Nutrition education sessions were conducted as per the availability of college going students, for few subjects sessions were conducted through video conferencing and for few at their residence

Duration: Nutrition education sessions were conducted for a period of 2 months with a minimum of 3 sessions per subject

Pre-Intervention: At the beginning of the session, the subjects were instructed to fill a consent form and

Intervention:

Session 1	Session 2	Session 3 & 4
Tools used: Powerpoint presentation, Brochure (distributed at the end of the session). Topics covered: Awareness on PCOS and basics of Nutrition.	Tool used: PowerPoint presentation Topics covered: Importance of diet, physical activity and behavior modification for the overall health improvement.	Tools used: Videos (comprised of medical experts of various specializations talking about PCOS and its management), Handbook (distributed in this session), Memory Games. Subjects were provided with a feedback form and the filled forms were returned to the educator.

Post-Intervention: After the completion of the education sessions, the overall improvement in the subjects' dietary habits, physical activity and psycho-emotional health were analyzed using Validated KAP questionnaire, Quality of Life and Global Physical Activity questionnaires.

Results and Discussion

The **screening questionnaire** helped in eliciting the basic information and signs and symptoms, diagnosis, co-morbidities, medication consumption, diet and eating pattern, physical activity level and emotional well-being of the subjects

Analysis of 521 respondents revealed that:

79% of the screened subjects were interested in knowing about nutritional management of PCOS and 39% were anticipating few nutrition education sessions.

return it to the educator. Prior to the Nutrition Education session, the subjects were instructed to fill 3 questionnaires including Validated KAP questionnaire, Quality of Life and Global Physical Activity questionnaires.

56 respondents were found positive for PCOS. Chi square test confirmed significant relationship between PCOS and excess facial hair (chi square value - 21.1607) and PCOS and menstrual irregularity (chi square value - 18.2345) (Significant at 1% level).

BMI and physical activity were independent parameters and no significant relationship was found (chi square = 16.5240 – Not Significant) between the two parameters.

BMI and eating outside food were independent parameters as seen in the chi square value which was 13.7445 (Not Significant).

The **KAP questionnaire** helped in acquiring the information regarding Knowledge, Attitude and Practices of the selected subjects pertaining to Nutrition and PCOS.

Table 1. Comparison of mean scores of Knowledge, Attitude and Practice between Experimental and control group subjects

Dimension	Experimental group (n=20)		Control group (n=20)		Significance of t value
	Mean	SD	Mean	SD	
Knowledge	81.75	14.80	80.05	15.02	0.3605 ^{NS}
Attitude	46.60	6.44	43.95	6.61	1.2842 ^{NS}
Practice	63.35	5.42	60.10	6.86	1.6624 ^{NS}

NS Not significant

From the Table 1, it can be observed that among the subjects belonging to experimental group, the mean score of Knowledge was higher (81.75) when compared to Attitude (46.60) and Practice (63.35) and it was seen that even among the subjects belonging to control group, the mean score of Knowledge was higher (80.05) when compared to Attitude (43.95) and Practice (60.10).

The table also depicts that the mean score of Knowledge, Attitude and Practice was higher in the experimental group when compared to the control group. It can be noted that no significant difference was found among the two groups with respect to the three parameters.

Table 2. Comparison of mean scores of Knowledge, Attitude and Practice Experimental group subjects (Pre v/s Post Intervention)

Dimension	Pre Intervention (n=20)		Post Intervention (n=20)		Significance of Paired t value
	Mean	SD	Mean	SD	
Knowledge	81.75	14.80	97.10	7.71	4.2502**
Attitude	46.60	6.44	52.95	5.13	4.3694**
Practice	63.35	5.42	65.00	6.93	1.1512 ^{NS}

** Significant at 1% level NS Not significant

A higher significance was found in Knowledge (4.2502) and Attitude (4.3694) among the subjects belonging to experimental group, post intervention and it can be concluded that the intervention had helped the subjects in improving their nutritional knowledge and helped in instilling a positive attitude related to nutrition in the subjects. This was also revealed by an increase in the mean score of Knowledge (81.75 to 97.10) and Attitude (46.60 to 52.95).

Similar findings were obtained in one of the study where educational intervention improved KAP scores significantly post education intervention and these scores sustained for 3 months.⁴

Another study observed that most of the subjects in the study had poor knowledge regarding polycystic ovarian syndrome. After the educational sessions there was enhancement of knowledge score on polycystic ovarian syndrome.⁵

Table 3. Correlation between Knowledge, Attitude and Practice among Experimental group subjects (Pre Intervention) and (Post Intervention)

Pre Intervention				Post Intervention			
	Knowledge	Attitude	Practice		Knowledge	Attitude	Practice
Knowledge	1.0000			Knowledge	1.0000		
Attitude	0.5699**	1.0000		Attitude	0.1091 ^{NS}	1.0000	
Practice	- 0.2196 ^{NS}	0.1187 ^{NS}	1.0000	Practice	- 0.0039 ^{NS}	0.0177 ^{NS}	1.0000

** Significant at 1% level NS Not significant

It is noted that higher significance (0.5699) exists between Knowledge and Attitude among the experimental group pre intervention and this was reflected in their responses to the questions related to nutritional knowledge and attitude.

It can be observed that there was no significant relationship among Knowledge, Attitude and Practice in the subjects belonging to experimental group post

intervention although an improvement in mean scores of knowledge (81.75 to 97.10) and attitude (46.60 to 52.95).

The **Quality of Life questionnaire** helped in eliciting the different dimensions of quality of life such as Psychosocial & Emotional, Fertility, Sexual function, Obesity & Menstrual disorders, Hirsutism Disorders and Coping ability of the subjects.

Table 4. Comparison of mean scores of different dimensions of Quality of Life between Pre and Post Intervention among Experimental group subjects

Dimension	Pre Intervention (n=20)		Post Intervention (n=20)		Significance of Paired t value
	Mean	SD	Mean	SD	
Psychosocial & Emotional	42.85	10.15	45.35	10.42	0.7686 ^{NS}
Fertility	33.80	11.14	33.50	11.55	0.0836 ^{NS}
Sexual function	3.25	10.04	6.95	13.08	1.0035 ^{NS}
Obesity & Menstrual Disorders	29.40	5.56	29.30	6.72	0.0512 ^{NS}
Hirsutism Disorders	19.05	8.05	19.70	8.62	0.2464 ^{NS}
Coping	27.25	4.79	26.75	8.16	0.2363 ^{NS}

NS Not significant

From the statistical analysis, it was found that significant difference was not found among the various dimensions pre and post intervention in the experimental group. However, a significant improvement was observed in the mean scores, post intervention, wherein a higher mean score was found in the Psychosocial & Emotional (45.35), Sexual function (6.95) and Hirsutism disorders (19.70) dimensions when compared to the pre intervention mean score which is 42.85, 3.25 and 19.05 respectively.

Similar findings was stated in one of the study where an impaired Quality of Life and increased prevalence of psychological morbidity in PCOS was compared with population norms and therefore it was observed that the perception of inadequate information about the condition correlated with poorer Quality of Life scores and improved information delivery may lead to an improvement in Quality of Life and needs to be tested with an intervention study.⁶

Global Physical Activity Questionnaire (GPAQ) was used which helped in understanding the kind and intensity of physical activity that the subjects were involved in.

From the analysis of GPAQ it can be concluded that, among the experimental group, there was an increase in the no. of hours spent in physical activity and reduction in no. of hours spent in sedentary activities post intervention.

Conclusion

From the study it can be concluded that there was a significant improvement in knowledge and attitudes among subjects pertaining to Nutrition and PCOS. There was also an improvement in the various dimensions of quality of life and the intensity of physical activity level of the subjects.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: N/A

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Effects of Placental Characteristics on Perinatal Outcome among Singleton Deliveries

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Abstract

Introduction: Placenta, the organ that links mother and fetus during pregnancy have a crucial role in determining the perinatal outcome. Placental problems can lead to both mortality and morbidity among mothers and fetus¹.

Aim: The main purpose of the study is to find out the relationship between placental characteristics and maternal outcome.

Method and Materials: A quantitative study with descriptive design was conducted among 100 intranatal women at labor room of Amrita Institute Of Medical Sciences And Research Centre,Kochi.The samples were collected through convenience sampling technique and data collected regarding maternal characteristics,newborn characteristics and placental characteristics.

Statistical Analysis used: Analysis was done by using mean,frequency,percentage and Pearson Chi-Square test.

Results: It was observed that among 100 samples collected the mean placental weight was 475.15gm and there was a positive correlation between fetal birth weight and placental weight [$r=0.551$]and it is significant [p value,0.001]. Also there was a positive correlation between placental weight and fetal distress.In babies with fetal distress the mean placental weight[440.71g] is decreased [SD=85.092] and in babies without any fetal distress had increased placental weight [mean=484.30],[SD= 71.184], [P-value=0.019].

Conclusion-Awareness among healthcare professionals regarding the placental findings will helpfull in managing perinatal time

Keywords: Neonatal outcome, Placenta, Placental characteristics, Placental weight,Perinatal outcome

Introduction

Placenta is the life of the fetus during the intra uterine period, which serves as the link between the mother and fetus.It is a versatile organ and has many functions like transfer of gases, transport of nutrients,

excretion of wastes, and production of various proteins and steroid hormones^{2&3}.

Placental examination can light up factors pertaining to the current pregnancy and its outcome, guide postpartum management, provide insight into clinical problems (such as seizures, pulmonary hypertension, renal failure) that become evident hours or days after delivery, and even play a role in medico-legal situations⁴. Placental abnormalities are represented as the leading causes of stillbirths and are frequently mentioned as the primary cause of death. Maternal risk factors are often associated with placental growth restriction, hypertrophy or both, which are likely to be compensatory mechanisms

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for the pregnancy risks². Placenta reflects the pregnancy complications which are associated with high perinatal morbidity and mortality. After delivery if the placenta is examined it provides much insight into the prenatal health of the baby and the mother. Recently placenta has drawn attention as valuable indicator for maternal and fetal diseases⁵

The perinatal outcome in pregnancies are in terms of perinatal mortality and morbidity, maternal and neonatal outcomes⁶. Maternal outcomes include eclampsia or preeclampsia, congestive heart failure (CHF), length of stay, preterm labor, anemia complicating pregnancy, placental abnormalities, complications and infection during labor, and in-hospital mortality. Fetal outcomes includes birth weight, growth restriction, NICU admission, fetal distress, and death⁷.

The study was done to assess the effects of placental characteristics on perinatal outcome among single ton deliveries. The main aim of the study was to estimate placental characteristics in pregnancy, to find out relationship between placental characteristics with neonatal and maternal outcome.

Method and Materials

The study was conducted from January 2018 to April 2018. This study was a quantitative study with descriptive design, conducted among 100 intranatal mothers with singleton pregnancies, who were delivered vaginally at term with their new born and freshly delivered placentae obtained from the labour room of Obstetrics department of Amrita Institute Of Medical Sciences And Research Centre, Kochi. The samples were collected through convenience sampling technique⁸ using a data collection instrument which consists of demographic variables of the mother and newborn and their clinical data. Placenta were collected immediately after delivery

in a plastic transparent cover. It was examined within one hour of delivery. Placentae was examined for its characteristics like completeness, size, cotyledons number, insertion of umbilical cord, cord abnormalities, presence of infarction, presence of vessels and presence of calcification. Gross abnormalities of cords and membranes if present, were noted. Weighing of placenta was done after draining off the superficial vessels and residual blood, adhered blood clots were removed and weighed in a weighing machine. Weight was noted in grams. For calculating surface area of the placenta, diameter of the placenta was measured with the measuring scale. The maximum diameter was measured with a paper scale graduated in centimeters (cm). The maternal surface and fetal surface of the placenta were observed by placing the placenta in a tray and numbers of cotyledons, and abnormalities in the form of infarction and calcification were examined. After the examination of placenta and umbilical cord, weight of the newborn baby, APGAR score, NICU admission were obtained. Then maternal height, maternal weight and BMI of both pre-pregnant and antenatal periods and abnormal maternal characteristics during antenatal, intranatal and postnatal periods were also obtained.

The data was analyzed on the basis of objectives of the study by both descriptive and inferential statistics with the help of SPSS package, version 18.

Findings

The results are described under four sections. They are the following

Distribution of socio demographic variables and clinical data

A total of 100 women who had singleton deliveries were studied. The socio-demographic and clinical data of mother and newborn elicited in [Table.1]

Table 1: Distribution of Mothers and their Newborns based on their socio demographic and clinical data
n=100

Socio demographic & Clinical variables		Frequency(f)
Maternal Characteristics		
Age in years	<20	2
	20-35	87
	>35	11

Cont... Table 1: Distribution of Mothers and their Newborns based on their socio demographic and clinical data
n=100

Parity	Multi gravida	55
	Primi gravida	45
Gestational age	≤37	14
	>37	86
Antenatal complications	Present	35
	Absent	65
Intranatal complications	Present	7
	Absent	93
Postnatal complications	Present	4
	Absent	96
Newborn Characteristics		
Birth Weight in Kilo gram	≥2.5	79
	1.4– 2.4	19
	1 -1.5	2
Fetal distress at the time of birth	Present	21
	Absent	79
APGAR score at 1'	7-10	94
	4-6	6
APGAR score at 5'	7-10	98
	4-6	2
NICU admission	Yes	17
	No	83

Table:1 shows that 87% of mothers are between the age group of 20-35yrs , 55% were multiparous women and 86% with the gestational age >37weeks. 35% of mothers had complications during their antenatal period like, 7% had during the intranatal period like and 4% had during their postnatal period like.

Majority of Newborns have birth weight ≥2.5 Kg .21% of newborn had fetal distress at the time of delivery. Most of them had an APGAR score between 7-10 at one minute and five minute. Only 17% of newborn need NICU admission.

PLACENTAL CHARACTERISTICS**Table 2: Distribution of Mothers based on their Placental Characteristics n=100**

Placental characteristics		Frequency(f)
Completeness	Incomplete	4
	Intact and Complete	96
Placental Size	Normal	61
	Thick	26
	Thin	13
Insertion of Cord	Center	49
	Marginal	51
Cord Abnormality	Absent	63
	Present	37
Presence of Infarction	No	99
	Yes	1
Presence of vessels	Yes, normal	100
Presence of Calcification	No	66
	Yes	34
Placental Weight	>400	16
	400-600	79
	<601	5

The Placental Characteristics are described in [Table 2]. On placental examination 96% of the placentae were intact and complete and 26% were thick placentae, 37% had cord abnormalities like and 34% had calcifications in their placentae and the mean placental weight was 475.15g.

Birth weight and Placental weight**Table 3: Correlation between birth weight and placental weight****n=100**

Parameters	Correlation coefficient	p-value
Placental weight	0.551	<0.001
Placental Diameter	0.368	<0.001
Cotyledons number	0.374	<0.001

From [Table.3] it is evident that a positive correlation existing between placental weight and birth weight of newborns ($P < 0.001$), ($r = 0.551$). Moderately positive correlation exists between placental diameter and birth weight ($r = 0.368$), and cotyledons number and birth weight ($r = 0.374$).

Table 4: Correlation between placental weight and fetal distress**n=100**

fetal distress					
Variable	Present (n=21)		Absent (n=79)		p-value
	Mean	S D	Mean	S D	
Placental weight	440.71	85.092	484.30	71.184	0.019

[Table 4] shows a positive correlation between placental weight and fetal distress. In babies with fetal distress the mean placental weight [440.71g] is decreased [SD=85.092] and in babies without any fetal distress had increased placental weight [mean=484.30], [SD=71.184], [P-value=0.019]

Discussion

In this study the placental characters, maternal and fetal characteristics of 100 mothers and their newborns were taken. It showed that 87% of them were between the age group 21-34yrs. The mean placental weight seemed to be less than the previous studies 475.15gm compared to 518.21gm in Ashwini Nayak U⁹ and birth weight obtained was 2.9538g. The results of the study show that placental weight increases are associated with increased birth weight in normal pregnancy ($P < 0.001$) which concurs with other studies^{1,7}. Among the 100 samples 21 babies had fetal distress and their placental weight seemed to be decreased [mean placental weight=440.71g]

Conclusion

The findings of this study revealed the link between the fetus and the placenta and verified the existing knowledge about the association between placental weight and birth weight of fetus. Correlation between placental weight and fetal distress is statistically significant and there is a decrease in placental weight of babies with fetal distress and correlation between maternal BMI and placental weight is very weak.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Aspects : Ethical clearance was obtained from Institutional Thesis Review Committee after

presenting the proposal. Informed consent was obtained from the participants.

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Original Research Article

Facial Width and Inter-Pupillary Distance - A Useful Tool for Superimposition Technique

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Abstract

Craniofacial superimposition technique was used for identification, when a skull of a missing person is recovered, by comparing with ante-mortem photographs or video. Parameters like inter-pupillary distance and bizygomatic width/ facial width of the human face are used in the superimposition technique in order to identify a missing person. The study was conducted to find out the mean facial width and mean inter-pupillary distance separately in both males & females and correlation between these parameters. This study was conducted in 100 healthy subjects (50 males & 50 females) in the age group of 19 to 22 years at the Himalayan Institute of Medical Sciences, Uttarakhand. Interpupillary distance (IPD) and facial width (FW) were measured by means of vernier callipers. The data was compiled and analyzed by computer software SPSS version 20. Among the females, descriptive analysis of quantitative data showed that the mean IPD was $4.8272 \pm .37395$, mean FW was $12.4240 \pm .69151$ and Pearson Correlation coefficient was 0.168. Among the males, mean IPD was found out to be 5.9365 ± 0.37072 , mean FW was 16.8290 ± 1.11108 and Pearson Correlation coefficient was 0.216. The mean value of both, IPD and FW were higher in males as compared to females.

A weak correlation was found in both sexes and no statistically significant correlation was found in face width and Interpupillary distance in both males and females as the p value for male was 0.133 and for female it was 0.245.

Keywords: Anthropometry, Interpupillary distance, Facial width, Vernier calliper, Superimposition technique

Introduction

Forensic Anthropology is the application of physical anthropology in a legal setting, usually for identification of recovered skeletonized human remains.^{1,2,3} It was first

mentioned by Professor Brash in 1935 that missing persons can be traced by matching antemortem photograph and skull of the deceased as an identification technique.¹ This technique of craniofacial superimposition which compares photographs or video shots of missing person with the recovered skull remains can be found to be more beneficial if measurement of interpupillary distance and bizygomatic width/ Facial width of human face are included. Thereby, anthropometry could be used to help the law enforcement agencies in establishing personal identity, in cases of unknown human remains.

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Interpupillary distance is the distance between the centre of pupils of both eyes which varies mainly by 3 major factors i.e. race, gender and age and it remains nearly constant after the age of 14 years.⁴⁻⁶ Mean interpupillary distance has been quoted in the stereoscopic literature as being anything from 58mm to 70mm.⁷ Face width as such does not have significant medico legal importance but it is used as a factor in facial framework and certain plastic surgeries.⁸ It too depends on factors such as genetics, age, gender, race as well as on environmental factors.⁹

Materials and Method

The study was descriptive, observational and cross-sectional in nature, carried out in the Himalayan Institute of Medical Sciences, Dehradun during July-October 2015. A total of 100 subjects (50 males and 50 females) were selected; demographic information like age and sex was recorded. The age ranged between 19 and 22 years. The individuals with conditions like history of craniofacial trauma, squint and congenital abnormalities

of face or surgery of the eye were excluded from the study. Informed consent was duly taken from all the subjects for using their data in research.

For measuring the interpupillary distance, participants were seated comfortably in an upright position and asked to look straight. The measurements were made from the mid pupil of one eye to the mid pupil of other eye using a manual vernier calliper with 0.02 mm accuracy. Facial width was measured according to the bizygomatic width (the distance between the most prominent points on bilateral zygomatic arches). The subject was made to sit in a chair with the backrest, head positioned normally. The two cardboard plates were placed vertically touching the most prominent points on bilateral zygomatic arches either side, horizontal distance between the two plates were measured using a metric scale.

Each parameter was measured two times and the average value was computed and recorded.

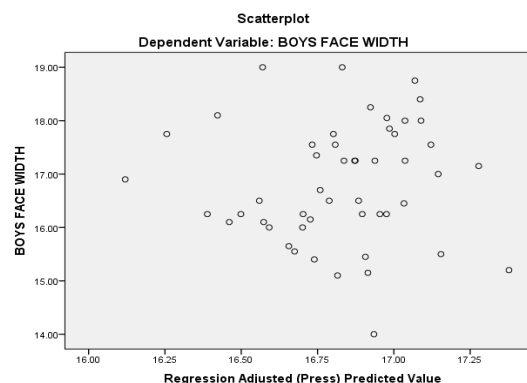
Observation and Results

Table 1: Descriptive analysis of various parameters in both sexes.

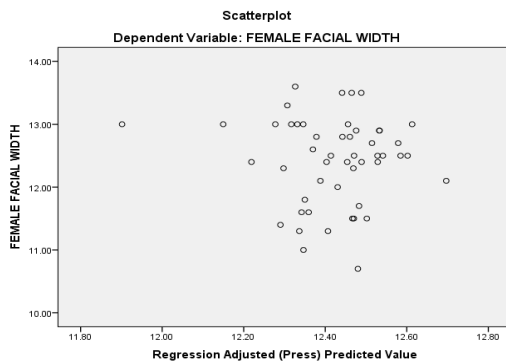
SEX	PARAMETER	MEAN	STANDARD DEVIATION	PEARSON CORRELATION	P VALUE
MALES	Interpupillary Distance	5.9365	.37072	.216	.133
	Face width	16.8290	1.11108		
FEMALES	Interpupillary Distance	4.8272	.37395	.168	.245
	Face width	12.4240	.69151		

As depicted in table no.1 above, mean Interpupillary Distance in males (5.9365 ± 0.37072) is more than females (4.8272 ± 0.37395). Also, mean Facial Width in males (16.8290 ± 1.11108) is more than that in females (12.4240 ± 0.69151). The Pearson Correlation of males (0.216) and females (0.168) showed a weak positive correlation and p value in both males (0.133) and females (0.245) were found to be more than the level of significance (0.05). Hence, null hypothesis was accepted and it was found that there is no statistical significant correlation. The same findings were corroborated in

scatter diagram of both males and females which showed weak positive correlation as showed in graph no.1 and 2.



Graph 1: Scatter diagram of facial width in males



Graph 2: Scatter diagram of facial width in females

By regression analysis of the quantitative data, regression equations were derived as depicted in table 2, where the Interpupillary distance is being considered as an independent variable and Facial Width as a dependant variable. If the value of Interpupillary distance is entered, by this regression equation value of face width can be predicted or vice a versa.

Table 2: Regression equation for male and female

Regression equation for Male	$Y(\text{Male Facial Width}) = 12.995 + .646 * X$ where *X is Male Interpupillary Distance (a = 12.995, b = .646)
Regression equation for Female	$Y(\text{Female Facial Width}) = 10.927 + .310 * X$ where *X is Female Interpupillary Distance (a = 10.927, b = .310)

Discussion

The mean IPD for males is found to be more than that for females. This is consistent with the study of various authors.^{7,9-14} However, study of H NS et al¹⁵ is not consistent with the present study; variation in the result as compared to present study could be attributed to factors in current study such as smaller sample group, single race & restricted age group.

In present study, both male (0.216) and females (0.168) showed a weak positive correlation between interpupillary distance and facial width and the p value in both males (0.133) and females (0.245) were found to be more than the level of significance. Some studies have been conducted which failed to establish correlation between interpupillary distance and anterior teeth¹⁶ or anterior teeth to bizygomatic width.¹⁸ However, a study similar to present study was conducted by Latta GH et al but, no correlation was found between these widths for the population as a whole, nor when the population was further divided into race, sex, or

group.¹⁷ On the other hand, it is also known that the value of IPD, Inner Outer Inter Canthal Distance (IOICD) and other orbital measurements are strongly and positively correlated.^{15,19,20} Though, statistically both the variables in present study are not found significant, regression equation thus obtained by these values can be used for deriving inter-pupillary distance or face width when either of the two is known.

One of the most reliable tools for identification in cases of skull remains where DNA or fingerprinting is not possible is the superimposition technique. This involves enlarging the comparison photographs to the size of unknown skull and then positioning the skull in the same orientation as the facial photographs followed by testing for the agreement between distances of certain anatomical points in the photograph as well as skull.²² The calculation of values of facial/ bizygomatic width and IPD thus play an important role in this technique which can be similarly used as one of the important parameters for cross matching. However, elaborate studies are still required to test their use in skeletal remains.

Conclusion

In India, superimposition is mainly employed in situations where investigation has suggested that a set of remains relates to a particular missing person whose photograph is made available. Generally, this technique is best used for exclusion as the issue of reliability in these comparisons for making positive identification is commonly debated among researchers.²² However, if the morphological features are unique, it becomes more valuable when it is coinciding with other data of identification.²³ In this era of advanced technology, the craniofacial superimposition technique can prove to be more beneficial if measurement of interpupillary distance and bizygomatic width/facial width of human face may be integrated with them, in order to establish the identity.

Conflict of Interest: No conflict of interest associated with this work.

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Ethical Clearance: The ethical clearance was taken from the Institutional Ethical Committee.

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Retrospective Study of Analysis of Deaths Due to Burns in GMERS Medical College and Hospital, Dharpur-Patan

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Abstract

Fire, one of the pure elements forming the world and one of the elements to provide life energy to all living beings, sometimes turns deadly. In Forensic Medicine departments, one of the most common cases for post mortem examinations is Burns case. But it becomes difficult many a times to comment on the manner of death in cases with a brief survival period. So, the current retrospective study was undertaken at Mortuary complex of GMERS Medical college, Dharpur-Patan, Gujarat during the period from 1st Jan 2016 to 31st Dec 2017.

Keywords - Burns, Epidemiology, Survival period.

Introduction

Fire, one of the pure elements forming the world and one of the elements to provide life energy to all living beings, sometimes turns deadly. And so some authors have called it a “necessary evil” for society. Amongst the various cases of Post mortem Examinations, Burns remains one of the most common, yet most perplexing cases.

One of the reasons for such high number of cases is easy availability of the materials for causing burns and that is also one of the common reasons for getting higher number of female cases than males. It is quite common for not being able to give exact manner of death, survival period, if any, adds to the confusion of whether death may have been prevented by some superior treatment or not?

So, the present data was collected at Mortuary complex of GMERS Medical college, Dharpur-Patan, Gujarat during the period from 1st Jan 2016 to 31st Dec 2017 to gain insight of the parameters related with burns cases.

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Material & Method

From all dead bodies coming for Post-mortem examination at the mortuary complex of GMERS Medical college, Dharpur-Patan, Gujarat during the period from 1st Jan 2016 to 31st Dec 2017, cases with history burns were selected. In this retrospective study 110 such cases were taken.

Inclusion Criteria:

1. All deaths with history of Burns.
2. All cases with history of Electrocution, where cause of death is Burns.

Exclusion criteria:-

1. Cases not satisfying above criteria.
2. Undetermined causes (Negative autopsy)

Collection of data :

Each burns case has been studied in detail using specific proforma, The primary data in each case were collected from different sources such as Inquest reports, In case of hospitalized victims, indoor notes were noted & The autopsy reports. All data collected from different sources were recorded in specially designed proforma for each case for further collective evaluation.

Results

From all dead bodies coming for Post-mortem examination at the mortuary complex of GMERS Medical college, Dharpur-Patan, Gujarat, cases with history of burns were selected. In this retrospective study 110 such cases out of total autopsies during a 2 years period i.e. from 1st January 2016 to 31st December 2017 were taken and we got results as under –

Age Wise Distribution

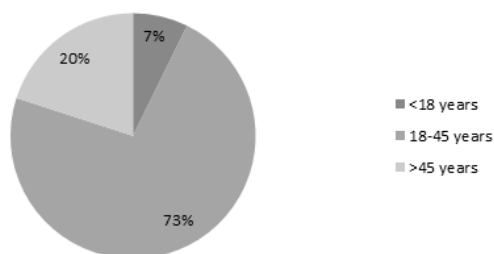


Fig.1 Age Wise Distribution

Age Wise Manner of Death

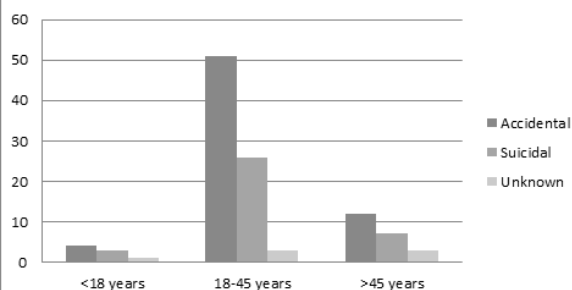


Fig.2 Age Wise Manner of Death

Here, it must be noted that no case of Homicidal Burns was noted. And amongst the Younger age group of < 18 years, 3 cases were detected to be suicidal nature, and 4 cases were to be accidental and 1 was of unknown in nature. However majority of the cases 80 were in the age group of 18-45 years and 22 cases were of more than 45 years age.

Sex Wise Distribution

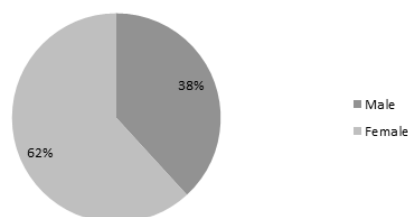


Fig.3 Sex Wise Distribution

Sex Wise Manner of Death

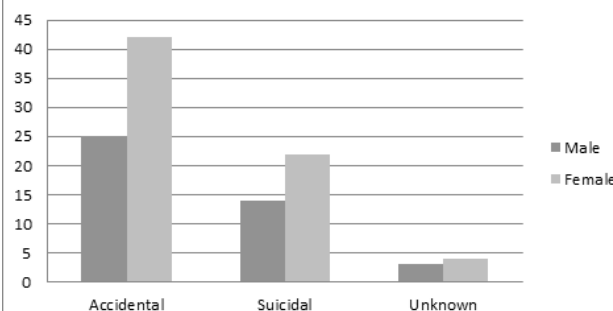


Fig.4 Sex Wise Manner of Death

Among the all cases there were 68 female and 42 male. In both the sexes accidental burns are highest followed by suicidal in nature.

- Religion wise distribution

Of Total 110 cases, 107 (97.2%) cases were of Hindu and 3 (2.7%) cases of Muslims were encountered.

- Locality of the victims

Of Total 110 cases, 23 deceased were from urban area, 87 deceased were in rural area.

Time of Incidence

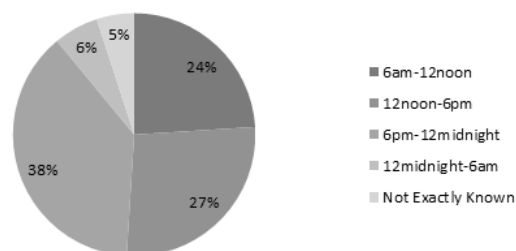


Fig.5 Time of Incidence

- Time of Incidence

Maximum number of incidence occurred between 6pm to 12midnight, probably when everyone is out for their work.

- Place of Incidence: Of Total 110 cases, 107 incidences were in Home, 2 incidences were in Work place, 1 incidence was in Public places.

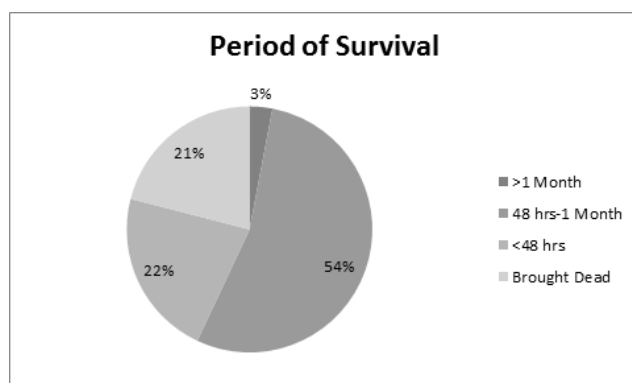


Fig.6 Period of Survival

- **Period of Survival:** Out of 110 cases - 23 were brought dead - died almost immediately following incident. Out of 87 cases that reached Hospital - 3

cases survived for more than a month, 59 survived for more than 48 hours, 25 cases survived for <48 hours.

Discussion

Fire, being a daily use thing, it is one of the “necessary evils” to the society, and we cannot get rid of Fire. Being easily available, it is notorious for its use for Suicide and also being in common use, Accidents also happen commonly with fire. Findings of our study were compared with the earlier studies.

In current study, Females (62%) outnumber the Male (38%) victims. While earlier studies show contrast results than our study & Middle age group - 18 to 45 years form the majority of cases (72%), which is similar to other studies. Here, it must be noted that no case of Homicidal Burns was noted. And amongst the Younger age group of < 18 years, 3 cases were detected to be suicidal nature, and 4 cases were to be accidental and 1 was of unknown in nature and among the middle age group, the females outnumber the male victims. In Females - 61% cases were Accidental and in Males - 59% cases were accidental which is in contrast of the findings of earlier researchers that burns is a preferred method of suicide in Females.

As per, Vaghela Prithviraj et al, Maximum incidence (82.26%) seen in females. Most of the victims (42.09%) were in the age group of 21-30 years which supports our study. Most burns were domestic, in low socio-economic class and in house-wives. 74.57% of cases were accidental in nature as per reports¹ which supports our study. Similarly, in an earlier study, Chawla et al had

observed 64% cases belonging to females and 52% cases were in the Age group of 21-30 years.^{2,3} In Haralkar et al, More than half were in the age group between 21 and 40 years. More than two third were females. Rural patients outnumbered urban patients. Majority of patients were unemployed and among unemployed majority of patients were housewives which supports our study. 40% patients were literate. 79.33% of burns were accidental. 36% patients had hospital stay less than one day. Among 450 cases, 65.78% died, 16.44% were discharged against medical advice.⁴ As per earlier studies, the majority of the victims are women and of them, married outnumber the rest by a great margin^{6,7} and a huge chunk of these incidents get labeled as “Kitchen Accidents”.⁹ Burns are the only unnatural cause of death in India in which females outnumber males by a large margin.¹⁰ In earlier study Tanna JA et al of Total 122, 21 deceased were from urban area, 100 deceased were in Rural area. Males (58%) outnumber the female (42%) victims which is in contrast to our study and 18 to 45 years form the majority of cases (65%), which is similar to our study.⁸

In our study, Of Total 110, 107 cases Hindu, 3 cases of Muslims were encountered; this corresponds to the earlier study, as the population itself consists of majority of Hindu in the study region. Of Total 110 cases, 23 deceased were from urban area, 87 deceased were in rural area corresponding with the earlier studies. As per, Harish D. et al, Maximum victims were Hindus, followed by Sikhs and the least number were Muslims. Eighty percent of the male -victims were in service – either government or in private as compared to 15% females. Of the married female victims, 84% were housewives. Eighty one percent of deaths due to burns were accidental in nature and there was not much difference in the deaths alleged to be accidental, between the 2 genders; however, in case of suicidal & homicidal burns, females far outnumbered males.⁵

In our study, Maximum number of incidence (38%) occurred between 6pm to 12midnight in evening, probably when everyone is out for their work. Followed by, 12noon to 6pm (27%) and 6am to 12noon - (24%) again when everyone else is out for their own work. Place of Incidence - Of Total 110 cases, 107 incidences were in Home, 2 incidences were in Work place, 1 incidence was in Public places.

In Haralkar et al, Maximum number of burns occurred between 5pm and 11 pm. Majority of burns

(97.56%) took place at home.⁴ In, Harish D. et al, Kitchen was the most common place of occurrence, accounting for overall 76% deaths. In the case of males, about 1/3rd, incidence of fires occurred outside their homes, while in females, it was just 5%. Kerosene/ kerosene stove and the other sources of fire in the household for cooking purposes were the predominant cause of the victims catching fires.⁵

In our study, Out of 110 cases - 23 were brought dead - died almost immediately following incident. Out of 87 cases that reached Hospital - 3 cases survived for more than a month, 59 survived for more than 48 hours, 25 cases survived for <48 hours.

Conclusion

So, in two years study of Burns cases in Dharpur-Patan (North Gujarat) region of Gujarat, It was found that Females outnumber the Males and most of the female cases were accidental. And in males too there were accidental cases followed by suicidal. Even young adults of 16 and 17 year age were found to commit suicide by burns. Period of survival following burns is one area, which needs further research.

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Conflict-of-Interest Statement - Nil

Source of Funding - Self

Statement of Human and Animal Rights – No ethical issue involve.

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Protocols Play a Crucial Role in Bio Psychosocial Assessment of Patients by Staff Nurses- A Methodological Explanation

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Abstract

Use of protocols in various nursing care activities do enhance the performance of nurses. This study was conducted with the aim of evaluating the effectiveness of the protocol on bio-psychosocial assessment of patients among the staff nurses in the general wards of a selected hospital. An evaluative approach was used to measure the effectiveness of the protocol on bio-psychosocial assessment of patients among the psychiatric nurses. The study was held among 60 staff nurses chosen by non-probability purposive sampling, who were working in the General ward of Father Muller Medical College hospital, Mangalore, India, on 60 admissions to the same general wards of the same hospital. The results revealed that post –interventional practice has increased from Day1 to Day5. The data demonstrated that there was a significant change in practice day by day. Participants have shown a great improvement in the bio-psychosocial assessment of the patients and 80% of the nurses accepted the procedure.

Keywords: Biopsychosocial assessment, staff nurses, practice, protocol.

Introduction

Developing research based protocols helps in improving quality nursing care. A research based nursing care standard may be written as a protocol that describes and defines how research findings are to be implemented in a specific clinical situation.¹ Protocols have evolved into comprehensive tools to direct the episodic care and management of patient problems and phases of hospitalization.²

The first step in caring for a patient and in soliciting active co-operation is to carefully gather a complete

history of the illness. ³ A thorough clinical assessment consists of objective and subjective data related to the patient's present and past physical and mental health status. Performing assessment in a systematic manner helps to eliminate errors and oversights in data collection.⁴

Relationship of physical health with mental and social dimensions of health as evidenced by the study conducted by Desmond Deidre M, among 130 patients admitted to a community general hospital in Chennai for medical or surgical treatment showed that cognitive decline was diagnosed in 54 subjects (41.5%). On the Global Rating of Memory Decline (GRMD), 71 patients had subjective decline in memory, 62 of them reported that the decline interfered with their daily life. On Global Rating of Intellectual Decline (GRID) scale, subjective decline in intellectual function was found in 91 patients, with 55 reporting that the decline interfered with their daily lives.⁵

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A study conducted by Irish Research Council to investigate the prevalence of symptoms of depression and anxiety in a sample of predominantly elderly males with acquired limb amputations (n=138) and examined the contribution of coping strategies to the prediction of psychosocial adjustment by using a questionnaire. Results showed that the prevalence of significant depressive symptoms was 28.3%. Prevalence of significant anxiety symptoms was 35.5%. Coping styles emerged as important predictors of psychosocial adaptation. In particular, avoidance was strongly associated with psychological distress and pair adjustment.⁶

Simpson Nancy and Black William conducted a study among 25 brain damaged and 25 routine medical patients to assess memory using the Strub– Black Mental Status Examination and Wechsler Memory Scale. Results indicate that significant differences in almost all scores between the brain damaged and normal groups.⁷

Holmes Bentley, Cameron did a study in Chesterfield Royal Hospital to find out the effectiveness of protocol for consultant nurse role in developing mental health liaison. The Prevalence rates of mental health problems among older people in Chesterfield Royal Hospital have been reported up to the following rates: depression 53%, dementia 35% and delirium 61%. Also it is shown that the rates of detection and treatment of these mental health problems are frequently low. Around 20% referrals to old age psychiatric services come from general hospital wards. The majority of older people referred have multiple medical diagnoses with cardiac, cerebrovascular, neurological, endocrine, gastro intestinal and neoplastic disorders prominent.⁸

A descriptive study was conducted in an Irish intensive care unit to examine the experiences of nurses with a protocol on end tracheal tube suctioning. Focus group interview of 17 nurses in six focus groups provided a significant insight into the experiences of these nurses in relation to policies, protocols and guidelines. Analysis of the data afforded some highly relevant findings, including the fact that nurses adapt clinical protocols as they see fit, thus demonstrating the importance that they place on their own professional judgment and autonomy.⁹

Administering a protocol for staff nurses on bio-psychosocial assessment of patients admitted in general wards will facilitate integration of their physical, psychological, social, economic and spiritual care.¹⁰

Aim

To evaluate the effectiveness of the protocol on bio-psychosocial assessment of patients among the staff nurses in the general wards in a selected hospital in South India.

Objectives

1. To assess the practice of the staff nurses related to bio-psychosocial assessment before administering the protocol on bio-psychosocial assessment as measured by the bio-psychosocial assessment check list.
2. To prepare and validate the protocol related to bio psychosocial assessment.
3. To evaluate the effectiveness of the protocol on bio psychosocial assessment related to the practice of the staff nurses as measured by the bio-psychosocial assessment check list.

Materials and Method

Research approach

The evaluative research approach was used to evaluate a problem, treatment, practice or policy.

Research design

Pre-experimental one group pre test, post test design (O₁ X O₂) was adopted for the study.

O₁ - Pre interventional practice assessment.

X - Protocol.

O₂ - Post interventional practice assessment.

Variables in the study

1 Independent variable

Bio psychosocial assessment protocol.

2. Dependent variable

Practice of bio-psychosocial assessment by the staff nurses.

3. Attribute variable

Age of the staff nurses.

Qualification of the staff nurses.

Gender of the staff nurses.

Clinical experience of the staff nurses.

Research setting: Research was conducted in ten general wards of 1000 bedded multispecialty Father Muller Medical College Hospital, Mangalore, India.. Averages of 5 admissions were there to these general wards daily during the time of data collection.

Population: Staff nurses of general wards of selected hospital and admissions taking place to those general wards.

Sample: 60 staff nurses from the general wards of selected hospital and the 60 admissions to the same general wards.

Sampling technique: Purposive sampling technique was used to select samples.

Sampling criteria (staff nurses)

Inclusion criteria

1. Staff nurses working in general wards who have minimum 6 months of experience.
2. Staff nurses who have diploma or baccalaureate degree in nursing.

Exclusion criteria

1. Staff nurses working in specialty areas (OT, psychiatric ward, NICU, de-addiction ward, pediatric ward)
2. Staff nurses who are not willing to participate.

Sampling criteria (admission)

Inclusion criteria

1. Admissions taking place to the general wards.
2. Admissions in which patients are not critically ill.

Exclusion criteria

1. Admissions in which patients and nurses are relatives.
2. Re admissions to the same wards during the time of data collection

Data collection tool

The tool used for this study were: (1) Baseline proforma, (2) Bio-psychosocial assessment checklist (3) Opinionnaire regarding the acceptability of the protocol. The opinionnaire was pre tested by administering to 10 staff nurses. Reliability of opinionnaire was obtained by split half method. Karl Pearson's coefficient of correlation formula was utilized to find out the reliability of the test. The reliability quotient obtained for the tool was $r=0.78$ that indicated the opinionnaire was reliable.

Data collection process

Protocol and the user guidelines was given after the pre interventional practice assessment. Protocol consists of four parts in which admission / orientation, biological assessment, mental assessment and social assessment were included. Protocol was introduced in all ten general wards after the pre interventional practice assessment was done. Post interventional practice assessment was done on the 8th day with the same checklist. Fifty admissions were observed after the administration of protocol in which admissions were observed for 5 consecutive days in 10 general wards done by the 60 staff nurses. Admissions were observed in the morning as well as in the evening. The presence of ward in charge, the number of staff nurses and student nurses present at the time of admission were also considered during the post interventional practice assessment. After the post interventional practice assessment, the opinionnaire was collected from the 60 staff nurses to know the acceptability and applicability of the protocol.

Results

Evaluation of protocol in terms of practice scores

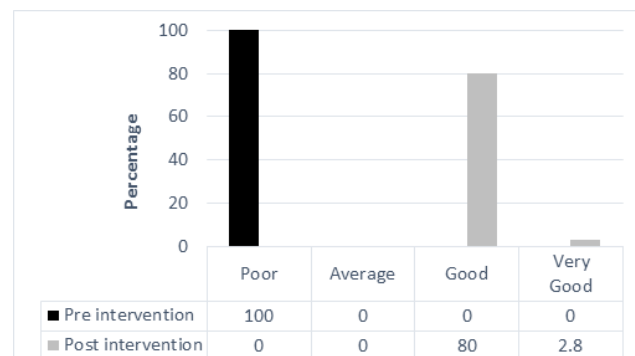


Figure 1: Frequency and Percentage Distribution of Sample According to the Practice Score.

Pre- interventional practice score of nurses among admissions were 100% which indicates nurse were not practicing bio-psychosocial assessment in efficient. However in post interventional assessment 80% of the admissions nurse has shown an improvement in practice of bio-psychosocial

assessment procedure and 20% of them have shown a very good protocol practice. It indicates that there was considerable gain in practice scores on bio-psychosocial assessment procedure in the post interventional practice assessment than the pre interventional practice score.

Table 1: Mean, Mean percentage score and Standard deviation of pre interventional and post interventional (five consecutive days) practice scores of bio-psychosocial assessment

Mean						Mean % score						Standard deviation					
Pre inter- ventional practice	Post interventional practice					Pre inter- ventional practice	Post interventional practice					Pre inter- ventional practice	Post interventional practice				
	D1	D2	D3	D4	D5		D1	D2	D3	D4	D5		D1	D2	D3	D4	D5
28.5	85.9	113.9	117.7	129.2	139.9	16.2	49.0	65.0	67.2	73.8	79.9	3.43	20.5	5.78	7.02	6.17	10.95

The mean practice score and mean percentage practice score were higher in post interventional practice assessment than that of pre interventional assessment. Mean of the pre –interventional practice was 28.5 whereas post –interventional practice has

increased from Day 1(85.9) to Day 5(139). In pre - interventional assessment, the mean percentage of pre-interventional practice score was 16.2% which was escalated from the Day 1(49.0) to Day5 (79.9).

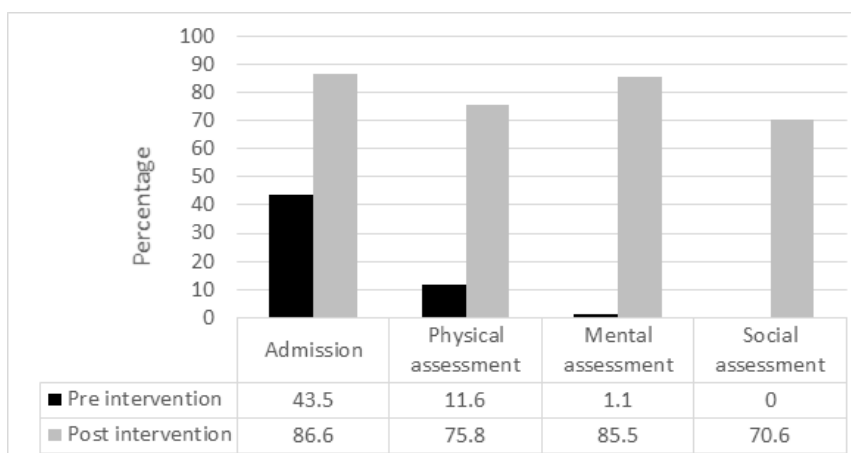


Figure 2: Bar diagram showing area wise distribution of mean percentage score of pre interventional practice and post interventional practice

In the area of admission the mean percentage score was increased to 86.6% from 43.5%. Physical assessment area has shown an improvement in mean percentage score from 11.6% to 75.5%. Mean percentage score of

mental assessment has increased from 1.1% to 85.5%. Mean percentage of the last area has shown an evident improvement in social assessment from 0% to 70.6%.

Table 2: Area wise distribution of Mean $\pm$ SD score of pre- interventional practice and post interventional practice
n=60

Area	Mean $\pm$ SD					
	Pre interventional practice	Post interventional practice				
		D1	D2	D3	D4	D5
Admission/ orientation	20.9 $\pm$ 2.07	29.9 $\pm$ 3.07	38.1 $\pm$ 3.84	39.1 $\pm$ 3.63	41.3 $\pm$ 2.79	41.6 $\pm$ 4.29
Physical assessment	7.2 $\pm$ 1.31	23.7 $\pm$ 11.6	36.7 $\pm$ 3.09	38.6 $\pm$ 4.90	39.8 $\pm$ 3.01	47.0 $\pm$ 3.94
Mental assessment	0.4 $\pm$ 0.51	18.5 $\pm$ 5.83	24.2 $\pm$ 3.58	23.7 $\pm$ 3.33	29.6 $\pm$ 1.71	30.8 $\pm$ 1.31
Social assessment	0.00 $\pm$ 0.00	13.8 $\pm$ 2.25	14.9 $\pm$ 2.23	16.3 $\pm$ 1.15	18.5 $\pm$ 2.67	20.5 $\pm$ 3.53

$$F(5, 45) = 9.02; (p > 0.05)$$

A remarkable change is observed from Mean $\pm$ SD scores of admission area from 20.9 $\pm$ 2.07 in pre –interventional practice to 29.9 $\pm$ 3.07, Physical assessment from 7.2 $\pm$ 1.31 to 23.7 $\pm$ 11.6, Mental assessment from 0.4 0.51 to 18.5 $\pm$ 5.83 and social

assessment from 0.00 $\pm$ 0.00 to 13.8 2.25.Observed data explained that a significant change was identified among nurse in terms of performing bio-psychosocial assessment of patients by using a protocol.

Table 3: Overall evaluation of the effectiveness of bio-psychosocial assessment protocol

	Mean ± SD					Mean % score						F value
Pre inter- ventional practice	Post interventional practice					Pre inter- ventional practice	Post interventional practice					
	D1	D2	D3	D4	D5		D1	D2	D3	D4	D5	*179.66
28.5 ± 3.43	85.9 ± 20.5	113.9 ± 5.78	117.7 ± 7.02	129.2 ± 6.17	139.9 ± 10.95	16.2	49.0	65.0	67.2	73.8	79.9	

$$F_{(5, 45)} = 9.02; (p > 0.05)$$

* significant

Mean post interventional practice score is significantly higher than that of mean pre interventional score in all the five days.

Mean $\pm$ SD of pre –interventional practice was 28.5 $\pm$ 3.43. Mean $\pm$ SD of post –interventional

practice has clearly shown a improvement from day 1 to day 5 as indicated by the Mean $\pm$ SD of five days such as Day 1(85.9 $\pm$ 20.5), Day 2 (113.9 $\pm$ 5.78), Day 3(117.7 $\pm$ 7.02),Day 4(129.2 $\pm$ 6.17) and Day 5(139.9 $\pm$ 10.95).

Hence the research hypothesis is accepted and null hypothesis is rejected as evidenced by the statistical value $F_{(5, 45)} = 9.02$; ($p > 0.05$) .

Discussion

Section I: Evaluation of protocol in terms of practice scores

The findings of the present study depicted that poor pre test scores among 100% admissions. However in post test interventional practice most (80%) of the nurses have improved the practice of the bio-psychosocial assessment procedure in the area of admission and 20% of the subjects have shown a very good practice. It indicates a considerable gain in practice scores on the bio-psychosocial assessment procedure in the post test.

The findings of the study is supported by another study conducted among 50 staff nurses in a selected hospital at Mangalore in 2006 to assess the effectiveness of the protocol on the discharge programme of the mentally ill patients. Poor pretest practice was found in all the (100%) of the discharges and in post test very good practice was noticed in almost all the (80%) of the discharges¹¹

We found that the mean percentage score of the all the four areas of bio-psychosocial assessment in the post interventional practice assessment demonstrated a remarkable rise than the pre-interventional practice score as evidenced by admission area the mean percentage score was increased to 86.6% from 43.5%. Physical assessment area has shown an improvement in mean percentage score from 11.6% to 75.5%.

Section II: Evaluation of effectiveness of bio-psychosocial assessment protocol

Study also revealed that the mean of post interventional practice score on 5th day (139.9) was higher than the mean of pre- interventional practice score (16.2). The computed 'F' value for all the areas (admission / orientation = 88.519), (biological assessment = 75.68), (mental assessment = 146.47) and (social assessment = 136.93) was higher than the tabled value $F(5, 45) = 9.02$; ($p > 0.05$). This indicated the significant effectiveness of the bio-psychosocial assessment protocol in improving the practice of the staff nurse, which is consistent with the findings of another study conducted in Bangalore in 2016 to assess the effectiveness of the

protocol on the management of women in the 2nd and 3rd stage of labour. The findings revealed that the improvement Mean score of all level of knowledge of staff nurses between pre-test and post-test was 13.75% with 't' test value was 12.88, which was highly significant at $p < 0.05$. Hence, it is inferred that there is significant increase in the knowledge level of the staff nurses regarding maternal and neonatal outcome of induction of labour after used of Self Instructional Module.¹²

Section III: Acceptability of the protocol

We could find that there was a full acceptance of the protocol by a majority of the staff nurses. The staff nurses expressed that protocol is not effective in terms of time available and the present staff strength, which was well established by a study conducted in Mangalore which demonstrated that computed 't' value in all the areas are significantly higher than the tabled value $t_{(58)} = 2.000$, $p < 0.05$ which showed that the protocol was effective in improving the practice of staff nurses during the discharge of the mentally ill.

Conclusion

Guidelines of practice with rationale were given through the protocol which included step wise procedure during the admission of patients to the general wards helped the staff nurses to gain scientific knowledge and practice in the bio-psychosocial assessment procedure as evidenced by the introduction of the protocol among the staff nurses helped them to learn more about the bio-psychosocial assessment procedure which was evident, in post interventional practice assessment.

Ethical Clearance : Ethical clearance was taken from the Institutional Ethics Committee, Father Muller Medical College Hospital, Mangalore, India.

Funding- Self

Conflict of Interest: None declared.

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Prevalence of Congenital Hypothyroidism; in Rural Area of District Gautam Budha Nagar (U.P.)

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Abstract

Introduction:- Congenital hypothyroidism is a condition that affects the newborns and results from a partial or complete loss of thyroid function. Congenital hypothyroidism occurs when the thyroid gland fails to develop the thyroid hormone or do not function properly. In 80 to 85 percent of cases, the thyroid gland is absent, abnormally located, or severely reduced in size. In the remaining cases, a normal-sized or enlarged thyroid gland is present, but production of thyroid hormones is decreased or absent. If untreated, congenital hypothyroidism can lead to intellectual disability and abnormal growth. Iodine is an essential dietary element which is required for the synthesis of the thyroid hormones, thyroxine (T4) and tri-iodothyronine (T3). In endemic goiter areas, congenital hypothyroidism may occur due to iodine deficiency.

Aim:- To screen the Rural area's neonates for Congenital Hypothyroidism.

Results:- The prevalence of CH is 4/161 live birth observed in the rural area of Gautam Buddha Nagar District and it also observed that the mean level of TSH was higher in female compared to male neonates.

Conclusion:- Despite the overwhelming evidence of a high prevalence of CH in India, this imminently treatable cause for developmental delay and mental retardation continues to await a credible universal screening programme. To get the actual picture of CH in the study area is to need to screen more neonates, which helps to make the more precise evaluation of CH.

Keywords:- Thyroid stimulating hormone (TSH), Thyroxine, and congenital hypothyroidism (CH).

Introduction

Congenital hypothyroidism (CH) is the most common congenital endocrine disorder in neonates and also is one amongst the foremost common preventable causes of mental retardation. If the diagnose is confirmed, treatment is started within in a few weeks of life, the neurodevelopmental outcome is generally normal ^[1]. The clinical features of congenital hypothyroidism are typically delicate and many newborns remain undiagnosed at the time of birth ^[2]. This is often due to partly passage of maternal thyroid hormone secretion across the placenta providing a protective impact,

particularly on the fetal brain and masking the clinical signs ^[3]. Even the foremost common type of CH has some moderately functioning residual thyroid gland creating clinical diagnosis difficult ^[4]. Within a few weeks of birth as hypothyroxinemia progresses clinical signs and symptoms of hypothyroidism become a lot of obvious and put neonatal brain in danger of irreversible injury. So it is necessary to start treatment as shortly as potential when birth. For all of the above reasons, screening has become the most effective way to detect infants with CH in many parts of the world. Pilot screening programs for CH were developed in Quebec and Canada in 1974 and have currently been established in Western Europe, North America, Japan, Australia and parts of Eastern Europe, Asia, South America and Central America ^[5,6]. In North America, over 5 million newborns are screened

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and around 1400 neonates with CH are detected annually. The newborn screening program in India is still in its early stages because of poor infrastructure and economic suppression. In some of the countries like the UK, T4 is measured to rule out the CH and followed by TSH when T4 is low. Some projects measure TSH as the primary screen [7]. In the present study, we have embraced both analytes T4 (free) and TSH to screen the newborns. The worldwide incidence of maternal hypothyroidism in gestation is overt (0.3 to 0.5 %) or subclinical hypothyroidism (2 to 3%). The chronic autoimmune thyroiditis is the most common reason behind maternal hypothyroidism in iodine sufficient areas. In view of these facts we have not included these type of patients who are having maternal history of thyroid or on anti-thyroid treatment because due to permanent administration of medicine may additionally affect the fetus, other causes are previously treated graves, thyroid cancer, drug and external radiation-induced hypothyroidism and pituitary dysfunctions, associated Injurious to fetus and neonatal outcome include preterm birth, intrauterine growth restriction (IUGR), congenital anomalies, fetal distress in labor and fetal leads to parental deaths. However, these complications are avoided with adequate treatment of hypothyroidism ideally in early gestation. The affected fetus may experience neurodevelopment impairments, significantly if both the fetus and the mother are hypothyroid during the gestational period [8].

Material and Method

The multi-centric hospital-based study was conducted over a period of 2 years from 2014 to 2016. Total one hundred and sixty-one neonates screened for congenital hypothyroidism from the rural area of Gautam Buddha Nagar district. Out of the total 36 healthy neonate subjects used as a control and rest 125 neonates used as the study patients. Ethical approval was taken from the Institutional Ethical Committee. All mothers of neonates were healthy and none experienced complications within the pregnancy or delivery. The neonates delivered at the hospital in the stipulated time period were included. All neonates underwent free T4 and TSH measurements to screen for congenital hypothyroidism. 3ml blood was

collected by a trained staff nurse or pediatrician in a plain tube and centrifuged at 4500 RPM for 15 minutes. The TSH concentration $> 25 \mu\text{IU/ml}$ in the cord blood and TSH concentration $> 10 \mu\text{IU/ml}$ in the venous blood on initial screening sample were considered to have positive screening result. Any abnormal values were rechecked or repeated within 3 days. Patients were followed up till discharge and further follow up was done in those cases with congenital hypothyroidism.

Results:- Total 161 neonates screened for CH from the rural area of Gautam Buddha Nagar District in which 55.9% neonates were male and 44.10% female with the male to female ratio 1.26:1. The maternal age ranges from 20-45 years. All the cases were full term, no premature baby included in the present study.

The descriptive data are given as mean $\pm$ standard deviation. The total of 36 normal neonate subjects include in the control group shows in table no 1. In which 19 neonates were male and 17 were female. The mean $\pm$ SD of Free T4 and TSH levels in control group neonate subjects was $0.94 \pm 0.13 \text{ ng/dl}$ & $4.96 \pm 3.35 \text{ uIU/ml}$ respectively shows in table no 2.

The mean $\pm$ SD Free T4 and TSH levels in study neonate subjects was $1.13 \pm 0.29 \text{ ng/dl}$ & $5.94 \pm 4.62 \text{ uIU/ml}$ respectively shows in table no 2. The prevalence of CH among studied neonates was 5/161 or 4/161 live births. One congenital hypothyroidism detected neonate expired latter due to an unexpected cause of death. The highest value of TSH 32.3 uIU/ml was observed from the rural area's neonates. It was also observed the mean of TSH was higher in Female neonates compared to Male neonates. The comparison of TSH values among the study neonates depicted in the fig.no.2. The observed TSH mean $\pm$ standard deviation in male & female was 5.35 ± 4.33 & $6.72 \pm 4.92 \text{ uIU/ml}$ respectively.

Table no 1: Neonates included in control group subject.

Control Subjects	
Male	19
Female	17
Total	36

Table no 2: Circulatory Free T4 & TSH levels in neonates control & study neonates.

Parameters	Control Subjects	Study neonates (Patients)	Total (Control+ Study neonates patients)
	Mean $\pm$ SD	Mean $\pm$ SD	Male = 90 (55.90%) Female = 71 (44.10%)
Free T4 ng/dl	0.94 $\pm$ 0.13	1.13 $\pm$ 0.29	
TSH uIU/ml	4.96 $\pm$ 3.35	5.94 $\pm$ 4.62	
	n=36	n=125	161

p value < 0.05; Significant

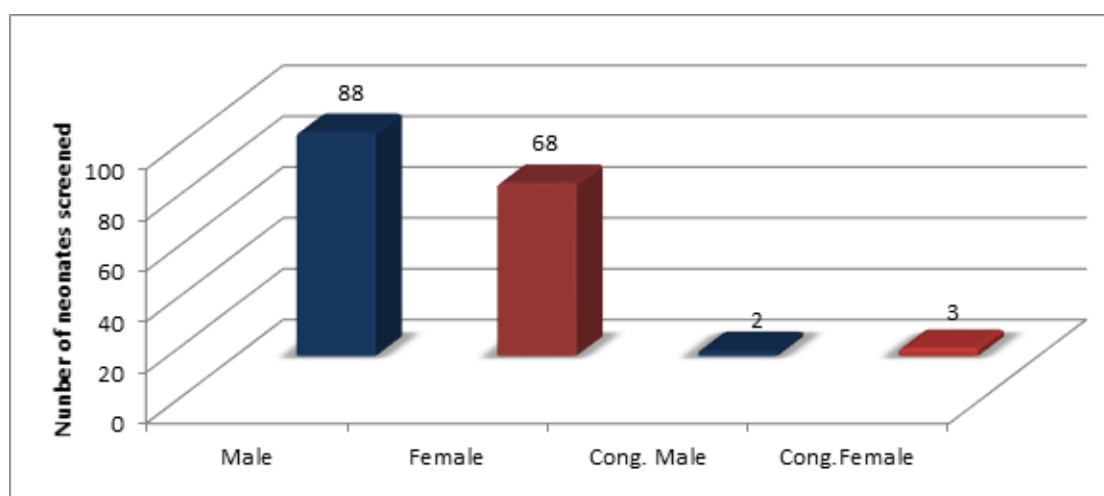


Fig no 1. Bar chart showing the prevalence of congenital hypothyroidism among the screened neonates.

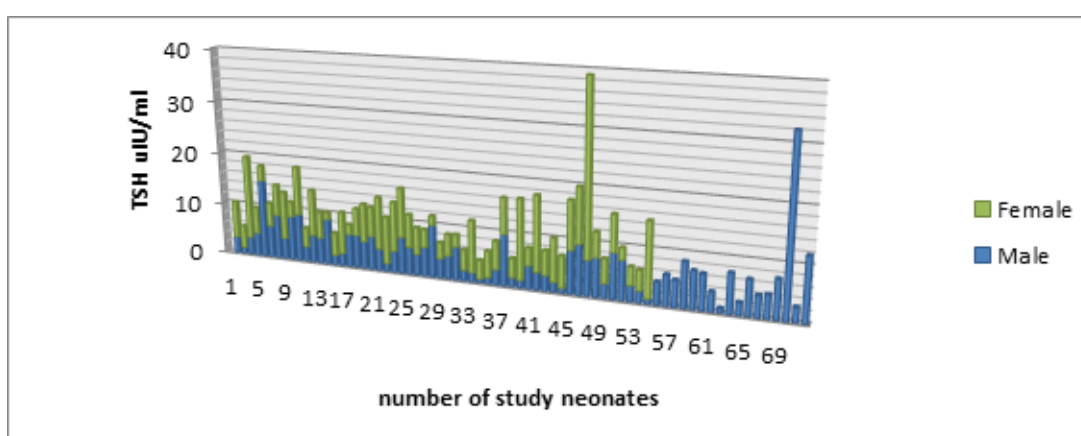


Fig. no 2. Bar chart showing the comparison of TSH values among the study neonates.

Discussion

Congenital hypothyroidism is also associated with lack of iodine nutrition during the gestational period

and may be induced the elevated TSH and low level of thyroxine in newborns. If CH diagnose initially and it's treatment started within a week, leads to the prevention of mental retardation in newborns. In India, an estimated

10,000 babies are born with congenital hypothyroidism every year^[9, 10]. Recently, countries like the Philippines and China to have commenced the screening because waiting for a symptomatic diagnosis of affected infants mean the baby will never be normal^[11,12]. The prevalence of CH in India varied from one study to another study. The CH is higher reported in Western Countries^[13, 14]. However, the exact prevalence of CH in India is not known; this is largely due to the fact that neonatal screening is still not Universal in India and is only sporadically implemented at local health systems. Universal Neonatal Screening is still under development in other developing countries across Asia and Africa. In the present study the prevalence of CH is higher observed, therefore stresses on the need for routine newborn screening for all neonates, before discharge.

Conclusion

“Prevention is better than cure” Congenital hypothyroidism (CH) is a major preventable cause of mental retardation. The worldwide incidence of CH 1 in 3000-4000 births and some studies indicating a higher incidence in India. Neonatal screening for Congenital Hypothyroidism widespread in developed countries at least past three decades. But In India it's nascent stage if the neonate doesn't screen for CH at the optimum time it leads to delay in speech and language development, and decreased attention and memory skills. Adequate follow-up strategies should come into place (important to distinguish transient and permanent CH); Newborn screening should be made compulsory in all centers for early detection and early treatment.

Ethical Clearance: - Ethical clearance was obtained from institutional Ethical Committee.

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Conflict of Interest:- Nil

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Beliefs, Preferences and Practices of End of Life Care among Elderly

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Abstract

According to the modern health care needs, it is important to explore the end of life beliefs, preferences and practices so that dignified death is assured which is the right of every human being. It is a way that the elderly share and communicate their wishes regarding end of life that helps the health care professionals to provide better end of life care. The objectives of the study were to assess the beliefs, preferences and practices about end of life care among the elderly as measured by self-administered structured questionnaires. An exploratory survey approach with non-probability convenient sampling was adopted for the study. The samples in the study were 384 elderly above 60 years of age residing in the adopted villages of MCON Manipal Academy of Higher Education, Manipal. The results of the study revealed that majority (52.1%) were females with a mean age of 67years (range 60-82 years), almost (79.2%) belonged to Hindu religion. Overall (88.8%) discussed the end of life wishes with their family and friends, (100%) wants to die at home, and majority (96.40%) are taken care of by their children. Most of them are not aware of living wills and never heard of durable power of attorney. Most of them (96.4%) expressed their desire to travel to places of religious pilgrimage and (85.7%) desires mantra to be chanted during death and dying process. Almost (63.5%) of the elderly wishes to get I.V pain medications during the end of life and apparently (52.3%) of the elderly do not want to plan their funeral but (70.1%) elderly expects that their spiritual rituals to be conducted during the end of life.

Conclusion : Understanding end of life beliefs, preferences and practices will help health care professionals take appropriate decisions in caring for the elderly in their end of life.

Keywords : Beliefs, Preferences, Practices, End of Life care, Elderly.

Introduction

Dying is at once a fact of life and a profound mystery. The need for knowing the importance of End of life (EOL) care has never been greater than in today's healthcare environment. Providing EOL care compassionately which is appropriate and in accordance with the wishes of the patient is an essential component

of nursing care. And also letting the family know about the wishes of the elderly could help them to make their decisions appropriately and as required.

Studies have found that respect for the patient's choice especially at the end of life is of core importance. However, patient's desire for care and intensive therapies at the end of life may clash with their social priorities¹. The objectives of the study were to assess the beliefs, preferences and practices about end of life care among the elderly as measured by self-administered structured questionnaires and the purpose of the study was to assess the beliefs, preferences and practices about end of life care among the elderly so that they share and communicate their wishes regarding end of life care and this may help the health care professionals to provide

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better end of life care.

Materials and Method

A survey approach was adopted for the study with a total of 384 elderly samples those who were able to read and write in either English or Kannada. Non probability convenient sampling technique was followed and the instruments such as demographic proforma and structured questionnaires with 38 items was used. Ethical aspects were taken into consideration and appropriate administrative permission and informed consent from the participants were taken for the study. The subjects under the study were from Arthady, Hirebettu and Marne villages. Data was collected from home to home survey.

Results

Majority of the elderly 141(36.7%) were within the age group of 60-64years and most 200 (52.1%) were females. Almost 304 (79.2%) belonged to Hindu religion and majority 276 (71.9%) had primary education. Mostly 193(50.3%) were housewife and 128 (33.3%) were agriculturist by occupation of which their family annual income was within Rs 30,000-40,000. Majority of the elderly 263 (28.6%) belonged to nuclear family and 347 (90.4%) were married with more than three children. Majority 236 (61.5%) of their health status were good and relatively, 156 (40.6%) have chronic illnesses out of which the most prevalent was hypertension 85 (54.4%), diabetes 56 (35.8%), heart diseases 10 (6.41%) and renal diseases 05 (3.2%).

It is observed that out of 384 elderly 14 (3.60%) strongly agree and 370 (96.40%) agree that they will be taken care by their children. Majority of the elderly 298 (77.6%) agree, 62 (16.1%) strongly agree that their spouse would take care of them. Most of the elderly 381 (99.2%) agree and 3(0.8%) strongly agree that other family members will take care of them. Almost 266 (69.3%) agree and 16(4.1%) disagree that their friends will take care of them. Majority 250 (65.1%) agree and 02 (0.5%) disagree that they will be taken care by their religious group members. Most of them 360 (93.8%) disagree, 20 (5.2%) agree, 02 (0.5%) strongly disagree, that no one will be there to take care of them.

Most of the elderly 360 (93.8%) disagree and 24 (6.2%) agree that their doctor will not believe that they are in pain. Most of them 344 (89.60%) agree, 39 (10.10%)

disagree that they will take medicines only when the pain is severe. Majority of the elderly 310 (80.7%) disagree, 73(19%) are neutral and 0.1 (0.3%) agree that they will become addicted to pain medicines. Almost 306 (79.7%) disagree, 49 (12.8%) strongly agree, 29 (7.5%) agree that they will not have money to buy medicines and most of the them 324 (84.40%) disagree, 48 (12.50%) agree that they will not tell anyone if they were in pain.

Majority of the elderly 326 (84.90%) agree, 22 (5.70%) strongly agree and 4 (1.00%) disagree that they should know about the medical experiments that is done on them. Most of them 348 (90.60%) agree and 36 (9.40%) are neutral that their medical records are kept private in the hospital. Majority of them 287 (74.70%) disagree, 92 (24.0%) are neutral, 05 (1.30%) agree that medical care provided by the health care professionals is very inhumane. Most of the elderly 338 (88.00%) disagree, 46 (12.00%) are neutral that the health care system will try to hide their mistakes from them.

Table 1: shows that majority of the elderly 213 (55.5%) would want to live as long as possible, even they had to be on life support or breathing machine or had to be fed through tube. Most of them 282 (73.4%) would want to live as long as possible, even if they are in severe pain. Maximum of the elderly 382 (99.5%) preferred being out of pain more than living as long as possible. Almost 382 (99.5%) would prefer being at home more than being in the hospital and majority 369 (96.1%) of the elderly want them to be taken care at home and 384 (100%) wants to die at home.

Table 2: represents that the majority of the elderly 327 (85.3%) is not aware of a living will and have never heard of durable power of attorney.

Most, 369 (96.1%) of the elderly spend their time in religious activities such as prayers, meditations, etc,. Majority 341 (88.8%) communicates their end of life wishes to their family and friends. Most of them 370 (96.4%) want to travel to places of religious pilgrimage, during the period of end of life and 329 (85.7%) desires mantras to be chanted during death and dying process. Majority 384 (100%) of the elderly would want their sufferings to be relieved at the end of life. Almost 244 (63.5%) of the elderly wishes to get I.V pain medications during the end of life and apparently 201 (52.3%) of the elderly do not want to plan their funeral but 269 (70.1%) wants their family members to follow spiritual rituals

for them during the end of life. Data revealed that there was no correlation between beliefs and preferences and beliefs and practices as evident by the correlation coefficients of 0.174, 0.185.

Table 1: Frequency and percentage distribution of preferences about end of life care among elderly.

Items	n=384			
	Yes		No	
	f	%	f	%
1. I would want to live as long as possible even they had to be on life support or breathing machine.	213	55.5	171	44.5
2. I would want to live as long as possible, even if they had to be fed through tube.	267	69.5	117	30.5
3. I would want to live as long as possible, even if they are in severe pain.	282	73.4	102	26.6
4. Being comfortable would be more important to me than living as long as possible.	382	99.5	2	0.5
5. Being out of pain would be more important to me than living as long as possible.	382	99.5	2	0.5
6. Being at home would be more important to me than being in the hospital.	382	99.5	2	0.5
7. I would be taken care at home but still want to be in the hospital.	15	3.9	369	96.1
8. If I could choose where to die, I would most want to die at				
A. Home	384	100	---	---
B. Hospital	0	0	---	---

Table 2: Frequency and percentage distribution regarding legal practices about end of life care among elderly.

Items	n=384			
	Yes		No	
	f	%	f	%
1. Have heard of a living will.	57	14.8	327	85.2
2. Have a living will?	31	8.1	353	91.9
3. Have heard of a durable power of attorney	2	0.5	382	99.5
4. Have a durable power of attorney	Nil	Nil	384	100

Discussion

The findings of the present study shows that out of 384 elderly 14 (3.60%) strongly agree and 370 (96.40%) agree that they will be taken care by their children. Majority of the elderly 298 (77.6%) agree, 62 (16.1%) strongly agree that their spouse would take care of them. Most of the elderly 381 (99.2%) agree and 3 (0.8%) strongly agree that other family members will take care of them. The findings of the current study is comparable with a study conducted by A. Tagaya, et.al, in Japan in 2008 on social support and end of life issues for small town Japanese elderly. In this study a total of 1956 men and women responded to a questionnaire including a scale of social support they receive in their home. They major findings showed that an increase level of perceived social support is not a predictor of decreased death anxiety, for which those who reported greater support tend to use more human relationships and fewer religious beliefs.²

The findings of the study reveals that majority of the elderly 213 (55.5%) would want to live as long as possible, even they had to be on life support or breathing machine or had to be fed through tube. Most of them 282 (73.4%) would want to live as long as possible, even if they are in severe pain. Maximum of the elderly 382 (99.5%) preferred being out of pain more than living as long as possible. Almost 382 (99.5%) would prefer being at home more than being in the hospital. Majority 369 (96.1%) of the elderly want them to be taken care at home and 384 (100%) wants to die at home. The current study finding is supported by the following research conducted by B. Lorna-Rose, (2010) on ensuring patient choices about dignity and place of death are respected at the end of life found that the proportion of people dying at home was less and inequalities in terms of hospital and home deaths were still present. Older people were not dying in their preferred place of care and as a result their psychosocial needs are not being met.³ Majority of the elderly 327 (85.3%) are not aware of living will and have never heard of durable Power of attorney. Therefore, they are at risk of receiving high-intensity care that is inconsistent with their preferences.⁴

Conclusion

The end of life process consists of various transitions such as physical, spiritual, emotional, and financial. The exacerbation in the transition of health care systems is related to the challenges in social support system, unshared clinical information, and lack of continuity among care givers.⁵ Communicating with the elderly and making them aware regarding the facilities and decisions that they could choose during the end of life will enhance their decisiveness.

Conflict of Interest: Nil

Ethical Clearance: Intuitional Research committee clearance was obtained.

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Suicide Death from Paraquat Auto-Inoculation: A Case Report

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Abstract

We examine a case involving a 34-year-old man who died of complications following the self-inoculation of Paraquat for suicidal purposes. During the crime scene investigation were seized all the paraphernalia were analyzed and were positive for Paraquat. At the autopsy were found an area of hemorrhagic infiltration on the inside face of the abdominal wall, in correspondence of the right peri-umbilical region, following the self-inoculation of the Paraquat performed. The aspects of greatest interest of the particular case under examination have been analyzed. In particular, we have taken into consideration the biochemical and toxicological aspects of Paraquat and the medico-legal problems related to the inoculation of the compound.

Keywords: *suicide, autopsy, forensic toxicology.*

Introduction

Although poisoning or drug intake are the most common suicidal conducts in Italy, Paraquat poisoning is relatively rare in our country compared to others (especially in Asia)^{1,2,3,4,5}. From the case here reported emerged that, even small quantities of the compound taken for suicidal purposes, may have a rapid fatal course, with the progressive onset of renal failure and pulmonary fibrosis. The relative impact of medical-pharmacological treatment following these events is not clear; however, given the importance of an early diagnosis of the picture, it is possible to insert more often this particular harmful practice in the differential diagnostic reasoning in the presence of pulmonary, gastrointestinal and renal signs and symptoms, so as to be able to undertake elimination therapy, as soon as possible. In this paper, we examined a case involving a 34-year-old male subject who died of complications following the self-inoculation of Paraquat for suicidal purposes. Once the aspects of greatest interest of the particular case under examination have

been analyzed, we have systematically considered the biochemical and toxicological aspects of this substance, with specific attention to the medical-legal problems connected to it.

Case Report

The case examines the death of SA, a male subject aged 34 at the time of the facts, who, after access to the Emergency Department reported the self-inoculation of an herbicide not better specified in the abdomen, in the right peri-umbilical region; it should be added that the anamnesis was positive for a previously diagnosed schizophrenia, and that the subject was in pharmacological treatment at the local Center of Mental Hygiene. The subject's conditions, at the entrance to the emergency room, appeared characterized by a relative clinical stability, with a normal range in routine blood tests and in the vital parameters. However, due to suicidal behavior, the health care workers considered prudent to keep the patient under observation, arranging for admission to the Department of Surgery. Toxicological analysis on the syringe used for self-inoculation were positive for Paraquat. The subsequent course was characterized by a relative clinical stability, although on the 4th day it was observed a progressive alteration of the renal function parameters (in particular hyper-azotemia and hyper-creatininemia), evolved in a frank Acute Renal Failure

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picture, together with hyperglycemia. Therefore, the health care workers arranged a necessary hemodialysis session. Meanwhile, in addition to the specialist advice of a psychiatrist due to the schizophrenic framework shown by the patient, the Poison Center's opinion was also required, which provided specific indications about the therapy. The next day (the fifth day of hospitalization) the clinical picture was aggravated by the appearance of a severe hypoxia and desaturation, so that the Resuscitation Consultant considered advisable to arrange the moving of the patient to the Intensive Care Unit; here the chest radiographic examination showed signs of severe interstitiopathy, and the blood gas test provided data to support hypoxemia and ventilatory deficit; therefore, the patient was subjected to Oro-Tracheal Intubation in order to connect him to the Mechanical Ventilator. On the following days, the conditions remained stable in their gravity: in addition to a persistent hypoxia, the blood glucose, azotemia, creatinine, transaminase and gamma GT values remained high, making up for a picture of multi-organ suffering. Despite the help of the mechanical ventilator and of the oro-tracheal intubation, bilateral pleural effusion and pulmonary parenchymal alterations radiologically documented, also occurred. Finally, on the 22nd day of hospitalization there was a definitive aggravation of clinical picture with the appearance of hypotension and massive desaturation, despite the help of the automatic respirator and circulation deficit and despite the attempt of inotropic drugs administration to support hemodynamic (sympathomimetic amines); in the early hours of the following day, after the appearance of severe involuntary bradycardia evolving in asystole, despite the resuscitation maneuvers, the death of S. A. occurred.

Autopsy Findings

The autopsy subsequently performed found:

- an area of hemorrhagic infiltration on the inside face of the abdominal wall, in correspondence of the right peri-umbilical region, following the self-inoculation of the Paraquat performed by S. A.
- a very marked picture of congestion and multiple-visceral edema, with greater expression at the encephalic and pulmonary levels;
- aspects of pulmonary parenchyma congestion, with large areas of inflammation as well as a marked fibrotic pattern of the bronchial tree.

These data, although relatively non-specific, thus allowed to identify the cause of death of S. A. in an acute cardio-circulatory and respiratory failure, as terminal epiphenomena of a Multi-Organ Failure Syndrome secondary to acute intoxication by exogenous substances, in particular Paraquat.

Hystopathological Findings

Upon histological examination of the samples collected in the autopsy site, the most interesting findings were as follows:

- Edema and Encephalic congestion;
- Acute pulmonary emphysema;
- Massive congestion of every examined parenchyma.

Discussion

Paraquat dichloride (1,1'-dimethyl-4,4'-bipyridinium dichloride) is a contact herbicide widely used in this chemical form in agriculture; it is the most important compound of the dipyridyl herbicide family⁶. In most of Paraquat-based herbicides available on the market, it is associated with other herbicides (such as Diquat); usually, for this type of formulations (in which the percentage of Paraquat never exceeds 2.5%), the harmful effects are limited to nausea and / or vomiting, which may or may not be associated with alterations in the main functional parameters of respiratory mechanics, however without lethal effects⁷. The clinical effects of this substance are usually related to the ingested dose: in the majority of cases with an (oral) dose intake equal to 20-40 mg of Paraquat / kg, the death occurs within 2 or 3 weeks from the ingestion, while for larger doses (> 40 mg / kg) the death occurs 1 to 7 days after exposure^{8,9}. Although accidental deaths from Paraquat exposure by inhalation or transdermal absorption are reported^{10,11}, the oral intake (either accidental or deliberate) is the most commonly involved; this substance is not significantly absorbed, in fact, in the absence of continuous skin solutions¹². Studies related to cases of Paraquat poisoning have shown that this substance has a toxic action developing with some delay compared to the intake ; the lesion, in fact, manifests itself during the following days (as mentioned, the times vary mainly according to the ingested dose) with dramatic changes at pulmonary level, with the appearance of pathological changes associated with dyspnoic symptomatology, until to produce a ARDS framework due to the destruction of alveolar epithelial

cells¹³; the main pathophysiological mechanism is the liberation of free radicals with oxidative damage of the pulmonary tissue. While pulmonary edema and pulmonary damage may be acute, within a few hours from a quantitatively severe exposure, late toxic damage can lead to a picture of pulmonary fibrosis, which is the most frequent cause of exitus¹⁴. The lung, therefore, is the typical target of the Paraquat: here the chemical products resulting from the reactions of oxygen are in fact available, which, reacting with Paraquat, produce free radicals.

Lung damage follows a two-phase pattern¹⁵: a) Pneumocytes concentrate the chemical compound thanks to the active membrane transport mechanism, with the destruction of the alveolar epithelium; b) Progressive inflammation and fibroblastic proliferation lead to widespread pulmonary fibrosis. In some cases, pneumothorax or pneumomediastinum may also derive from the progressive action of the inflammatory process, extending up to the esophagus¹⁶. The toxic action of Paraquat also occurs in the kidney: here, the necrosis of proximal tubule cells causes renal failure, but this clinical spectrum is sometimes reversible by forced hydration protocols^{17,18}. In addition, the direct effects of Paraquat on the ocular, cutaneous or on mucous membranes should not be forgotten, where it can lead to irritation or ulceration in case of direct contact^{19,20}. The treatment of Paraquat poisoning is based on measures aimed to modify both the kinetics and the toxic dynamics²¹. Toxicokinetic can be modified by reducing its absorption, removing the poison from the plasma, inhibiting its penetration into the cells of the alveolar epithelium and integrating a pharmacological therapy in order to reduce the onset of pulmonary fibrosis, improving gaseous exchanges. Among the treatment modalities used to increase its renal elimination or removal from the circulation (forced diuresis, peritoneal dialysis, hemodialysis, continuous arterio-venous hemofiltration, hemoperfusion), haemoperfusion is considered the most effective procedure in order to remove the herbicide from the blood circulation²². The percentage of the therapeutic success of this method is directly proportional to the timeliness of its application; nevertheless, the studies conducted showed that the extraction efficacy (measured based on the dose of paraquat removed from the circulation) is however limited in relation to the absorbed dose²³. A critical role is assumed, in cases of ingestion for suicidal purposes, by the methods of early

diagnosis of Paraquat intoxication: blood or urinary levels (usually tested by mass spectrophotometry) of this substance can confirm its presence in toxic quantities in the blood, also providing a survival index especially when dosed in the first 24 hours after the event^{24,25}. In this regard, a urinary value of Paraquat metabolites <1.0 g / mL suggests an increased risk of mortality. In order to prolong this range of prognostic predictability, some nomograms have also been developed, for example about the role of electrolytes and/or pancreatic enzymes alteration on prognosis^{26,27,28,29}. It should be remembered how, a few months before the facts under review, in particular in January 2010, the European Commission, with the EC regulation n. 15/2010, decided to ban the use of Paraquat substance as a pesticide and to include it in the list of chemical substances listed in parts 1 and 2 of the Annex I of the EC Regulation n.689 / 2008, among those substances subject to export notification requirement and among those submitted to the PIC notification^{30,31}. The case brought to the attention showed some aspects of uncertainty, above all from the point of view of the temporal trend of the clinical picture: in fact, the patient's condition at the entrance to the emergency room appeared stable, with normal hematochemical parameters. Nonetheless, the Healthcareers prudently contacted the Poison Control Center and retained the patient, arranging for admission to the Department of Surgery, also due to the particular site of the poison auto-inoculation (abdominal region, right paraumbilical site) with possible involvement of the peritoneal serosa and relative risk of acute abdomen. The particularity of the auto-inoculation site carries out, in the exposed case, a very important role also from a medico-legal point of view; in fact, as at the time of clinical diagnosis, also in the subsequent medical-legal process, it brought to light further elements of difficulty in the analysis of the causes and the pathophysiological mechanisms related to the patient's death. During the 5th day of hospitalization there were signs of initial acute renal failure, with hyperazotemia and hypercreatininemia, involving after a day also the respiratory system, with increasing hypoxia and desaturation, for which the patient was transferred to Intensive care. Here, from the chest radiograph, a picture of severe interstitiopathy emerged, and a hemogasanalytic examination confirmed hypoxemia and ventilatory deficit, for which it was subjected to oro-tracheal intubation and connection to the Mechanical Ventilator. Recalling what it has been said previously about Paraquat and its toxic action that can be expressed

in varying but unpredictable times (from a few days to 2 - 3 weeks), we can understand as, also in the case in question, after a period of relative stability of the general patient's clinical conditions, both a respiratory and renal failure progressively worsened the condition, and ultimately led the patient to death.

Conflict of Interest: The authors have no conflicts of interest to declare.

Ethical Clearance: Informed consent was obtained from legal guardian for uses of the case materials for research purposes and publication findings.

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Pattern of Mortality in Sudden Natural Death in North Delhi: A Prospective Autopsy Study

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Abstract

Objectives: In every population, the pattern of sudden natural deaths is often associated with the epidemiologic profile of certain common killer diseases. The common belief has been that infectious/communicable diseases are the most common reasons of mortality. However, changing lifestyle, increasing literacy level and advanced healthcare facilities in India have impacted immensely on the causes of death. We, therefore, planned to determine the etiology and epidemiologic characteristics of sudden death at Hindurao hospital at North Delhi. The high incidence of sudden, unexpected death in the heart of the capital city is still an enigma and hence we decided to analyse the cases of sudden death in the last two years at our hospital. This study was conducted to illustrate etiopathology, risk factors and triggers of sudden death with the aim to provide new insight in epidemiological aspects of sudden death. This should help in care of patients, and prevention of sudden death.

Method: A prospective study of 124 cases of sudden death was conducted at a tertiary care hospital at North Delhi. After evaluating detailed history from the family members, autopsy has been performed to find out cause of sudden death.

Results: The main etiology of sudden death is cardiovascular disease. Highest numbers of sudden death are in old age group. Male patients succumbed to sudden death more which may be related to multiple comorbidities in them. Sudden deaths were more encountered during winters and in morning hours. There are some autopsy negative cases, which are unexplained sudden death.

Conclusions: Cardiovascular, respiratory disorders and central nervous system were the major causes of sudden natural death. Seasonal variation of sudden death especially from respiratory causes may be attributed to rise in pollution and poor air quality during winter season in Delhi.

Keywords: Autopsy, Sudden death, sudden cardiac death.

Introduction

WHO defines sudden death as: "Death is said to be sudden or unexpected when a person not known to have been suffering from any dangerous disease, injury or poisoning is found dead or dies within 24 hours after the onset of terminal illness"^{1,2}. One of the earliest

descriptions of a sudden death event was reported in Froissart's Chronicles in the 14th century by Leonardo de Vinci.³ Incidence of coronary artery disease has increased in Indians during the past three to four decades. It has emerged as the single largest disease accounting for nearly one third of all deaths in India. Medico legal autopsy is done in such cases primarily to establish cause of death. Psychological and physical traumatic events, low or high body mass, arterial hypertension, old age, diabetes mellitus, smoking, and stress have been demonstrated in some studies performed in different countries as precipitants of sudden death⁵. Among all deaths, sudden death has accounted for 15- 20%. Sudden

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death has accounted for 50 to 80% of all coronary deaths⁵. Sudden cardiac deaths are accounted for >60% of all sudden deaths⁶.

Method

This study was conducted prospectively at a tertiary care hospital in north Delhi over a period of 2 years (starting from 30.12.2016- 30.11.2018). During this period 124 cases of sudden death were studied.

Detailed history of the case was taken from the family members. All autopsies were conducted at department of Forensic medicine at a tertiary care hospital at north Delhi. In all cases post mortem examination was performed and all fresh viscera have been sent to the pathology department. After gross pathological examination of fresh viscera, proper cutting and fixation has been performed with 10% Formalin. After 2 days of fixation detailed examination and proper sectioning from representative sites has been done. Tissue processing was done in automated tissue processor. H and E stain was performed for microscopic examination.

Results

The aim of this study is to classify underlying causes of sudden death, to find out risk factors, associated diseases and triggers of sudden death. The data of the pathological findings, epidemiological parameters and clinical history of all 124 cases were collected, tabulated and analysed.

Table no 1- Causes of sudden death

Causes	No of cases	Percentage (%)
Cardiac cause	84	67.7
respiratory	22	17.7
Central nervous system (Hemorrhagic infarct)	9	7
Gastrointestinal	5	4
Autopsy negative	4	3

The leading cause of sudden death was found to be cardiac in 67 % and followed by respiratory and CNS hemorrhagic infarcts (table no 1). Duodenal perforation accounted for 4% of all sudden deaths. Out of 124

patients only 4 were females. Sudden death was more common in 40-60 years of age group. However cardiac sudden deaths were more prevalent in 50-70 years of age group (table no 2,3).

Table no 2- Sex distribution of sudden death

Number	Male	Female
124	120	4

Table no 3- Age wise distribution of sudden death

Age group (in years)	Number of cases	Percentage (%)
10-20	3	2.0
21-30	10	8.0
31-40	20	16.12
41-50	29	23.38
51-60	34	27.41
61-70	21	16.93
71-80	9	7.25

Seasonal variation of sudden deaths was observed and winters accounted for 38.7 % of all sudden deaths. Seasonal variation of death may be attributed to the fall in environmental temperature along with pollution and smog which is prevalent in this season in north Delhi (table no 4).

Table no 4 - Season wise distribution of sudden death

Season	Number of cases	Percentage (%)
Summer (March-June)	30	24.19
Rainy (July-Sept)	24	19.35
Autumn (Oct- Nov)	22	17.74
Winters (Dec- Feb)	48	38.70

Incidence of sudden deaths was little more in morning hours (6am-12 noon). However no reasons could be ascertained for this variation (table no 5).

Table no 5- Diurnal distribution of sudden death

time	Number of cases	Percentage (%)
12 AM -6 AM	15	12.09
6 AM -12 PM	41	33.06
12 PM-6 PM	35	28.22
6 PM-12 AM	33	26.61

Discussion

In the present study our aim is to find out underlying causes of sudden death and risk factors associated with it. This study revealed that most of the cases were in the middle age group of 40-60 years of age. This fact is quite disturbing as this is the most productive age group of an individual in which he is the main support of the family. It may be related to the lifestyle changes, stress, dietary food habits of taking junk foods and rise in the air pollution. All the four cases of duodenal perforation leading to sudden death were in the age group of 40-60 years which shows the impact of food intake, smoking and stressful lifestyle. As per the literature Maximum numbers of Sudden deaths due to cardiac causes are in the age group of 40 to 64 years⁷.

Only 4 cases of female sudden deaths were encountered. This gender disparity may be related with the cardioprotective effect of estrogen in premenopausal women as opposed to the testosterone which is known to influence increment in the cardio vascular risk⁸. As per the study done by owada et al the male to female ratio of sudden death was 5.5⁹. However in our study the ratio was much higher. As this study was autopsy based so there might be a bias in this ratio.

The seasonal variation of sudden death was found to be significant in our study as 38.7 % of all sudden deaths were noted in the winters. Out of the 48 cases of sudden death in winters 28 were cardiac, 15 were respiratory, 3 were CNS hemorrhage and 2 with negative autopsy. If we see the year wise trend of respiratory cases then out of 22 cases of respiratory deaths 15 (68%) were in winters that might have an association with the poor air quality and pollution in north Delhi during this season. A study on the annual and seasonal variations of Air Quality Index over a period of 9 years (1996-2004) based on daily averaged concentration data of criteria air pollutants has been conducted for Delhi¹⁰.

Pollution level is gradually increasing in Delhi every year. On a scale of 0 – 500, an AQI value between 200 and 300 is considered to be ‘poor’, while a value between 300 and 400 is considered to be ‘very poor’. Anything beyond 400 is considered ‘severe’. Delhi usually encounters ‘severe’ air quality in November-December. In the winter of 2017, Delhi encountered a week-long spell of smog following which the AQI hit a peak of 486 on November 9. While in 2008 the average AQI in Delhi was 450. However a causal association of air quality index with sudden death is a matter of further investigation and has not been established yet.

Conclusion

Cardiovascular, respiratory disorders and central nervous system were the major causes of sudden natural death. Seasonal variation of sudden death especially from respiratory causes may be attributed to rise in pollution and poor air quality during winter season in Delhi. Middle age group people are more prone for sudden death which may be related with multiple risk factors like stress, food habits, hypertension, smoking and environmental factors.

Conflict of Interest- None

Source of Funding- None

Ethical Clearance- Not required

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Profile of Accused in Alleged Cases of Sexual Assault in Children – A Prospective Study

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Abstract

Sex-related offenses are universal incidents, which are captivating in every stage of the society. Child sexual assault is a state of maltreatment meted out to a person below the age of eighteen and is matter of concern. The present study was carried out at Department of Forensic Medicine and Toxicology of B.J.G.M.C and S.G.H. Pune, during November 2015 to September 2017. We have found that in 93.63 % of cases accused was known to the victim. Majority of accused were boyfriends followed by neighbor. The minimum age of accused was 11 years and maximum age was 55 years.

Keywords:- Child sexual assault, accused, age of accused.

Introduction

Sex-related offenses are universal incident, which are captivating in every stage of the society¹. The World Health Organization (WHO) ² defines it as: “Any sexual act, attempt to obtain a sexual gratification, unwanted sexual comments/ advances and acts to traffic or otherwise directed against a person’s sexuality, using coercion, threats of harm, or physical force, by any person regardless of relationship to the victim in any setting, including but not limited to home and work.” Child sexual assault is a state of maltreatment meted out to a person below the age of eighteen and is a predominant phenomenon globally³. Child sexual assault is a form of child abuse in which an adult or older adolescent who is in a relationship of responsibility, trust or power, uses a child for sexual stimulation⁴. It has been observed that in majority of cases, children are perpetrated by

someone known to the child or in a position of trust and responsibility⁵. The present study was conducted to seek profile of accused in cases of alleged sexual assault in children.

Material and Method

The present study was carried out at Department of Forensic Medicine and Toxicology of tertiary care centre during November 2015 to September 2017 after obtaining written and informed consent from the consentor and as per instructions given by ethical committee. Information regarding accused in relation to alleged sexual assault cases was sought in total 534 cases. A standard proforma was filled after obtaining the information from victim and investigating officer, which included all the relevant details such as history of incidence, age of accused, date and time of incidence, relation with the victim of sexual assault and place of incidence.

Result

Out of 534 cases studied, it was found that in majority of cases (93.63 %) accused was known to the victim. In only 6.37 % cases the act was committed by strangers (Table 01). The known accused were father, stepfather, husband, boyfriend, in laws, maternal and paternal relatives, victim’s friend and family friends, neighbor,

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rector of the hostel, teachers, driver and watchman etc. Majority of accused were boyfriends in 42.2 % cases, followed by neighbors (12.6 %) and maternal relatives (11.2 %) (Table- 02 and Fig- 01). With respect to age majority of the accused were found to be from age group 21 to 30 years (61.80 %) followed by age group 11 to 20 years (17.80 %) while the least incidence was noted amongst age group of 51 to 60 years. In 34 cases the age of the accused was not known. The minimum age of accused involved was 11 years and maximum age was 55 years. The present study reveals that, rented rooms is the commonest place of assault in majority of the cases (26.40 %), followed by the accused's home (21.72 %) (Table- 03 and Fig. - 02).

Table 01-Distribution of cases according to Pattern of accuseds

Sr No	Type of accused	Number of cases (n=534)
1	Known	500
2	Stranger	34

Table 02-Distribution of cases according to Pattern of accuseds

Accused	No of cases (n=500)	Percent
Father	18	3.6
Stepfather	06	1.2
Husband	24	4.8
Boyfriend	211	42.2
In laws	09	1.8
Maternal relatives	56	11.2
Paternal relatives	29	5.8
Neighbor	63	12.6
Friend	32	6.4
Family friend	23	4.6
Others (rector, teacher, watchman, driver)	28	5.6

Table 03-Distribution of cases according to Age of accused

Sr No	Age in years	No of accuseds	Percent (n=534)
1	0- 10 years	00	00
2	11- 20 years	95	17.80
3	21- 30 years	330	61.80
4	31- 40 years	73	13.67
5	41- 50 years	13	2.43
6	51 -60 years	03	0.56
7	Not known	34	6.37

Table 04 - Distribution of cases according to Place of Assault

Place	No of victims	Percent (n=534)
Victim's home	112	20.97
Accused's home	116	21.72
Rented room(hotel)	141	26.40
Open place	52	9.73
Vehicle	19	3.56
School & hostel	24	4.50
Unknown place	18	3.38
Other (off frnd, off relative)	52	9.73

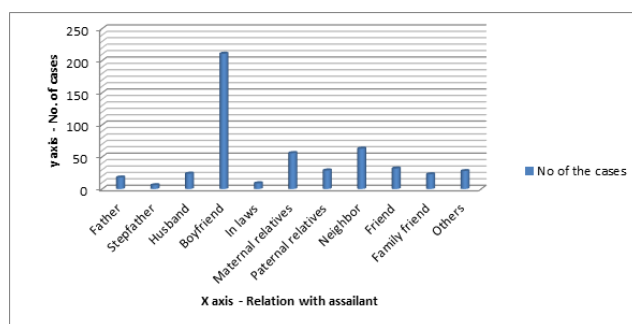


Fig 1

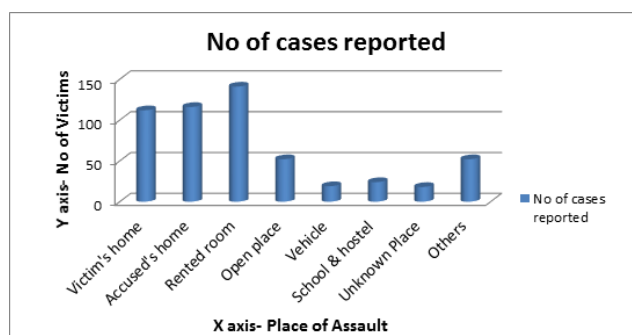


Fig. - 2

Discussion

In present study, significant relationship was found between the victims and accused. In 93.63 % cases, accused was known to the victim. This is in accordance with the observation of studies by other researchers.⁶⁻¹¹

However, the observation in present study is in contrast to studies by Okonkwo JEN et al¹² (34.8 %), Riggs N. et al¹³ (39 %) and DuMont J. et al¹⁴ (49.2 %), where strangers were the commonest accused in such cases.

We believe that, the reason for more involvement of known accused in our study can be attributed to the fact that, the known person can easily cheat the victims by emotions, faith and false assurance as compared to that of strangers. Thus the myth “Strangers usually commit sexual violence” is disproved in our study.

In present study, the known accused were father, stepfather, husband, boyfriend, in laws, maternal and paternal relatives, victim's friend, family friends, and neighbors, rector of the hostel, teachers, driver and watchman. In majority of the cases, boyfriend was the accused of sexual assault (39.51 %). This observation is in agreement with study by Vadysighe A.N. et al¹⁸ (36 %) and Tamuli R.P. et al¹ (29.06 %). However this observation is in contrast to the statistics of National data of India¹⁵, which shows that in majority of the cases,

accused were neighbors.

We believe that, the reason for most common accused being boyfriend in our study can be attributed to the fact that, the opposite sex affection, curiosity about relations at child age result into beginning of the love affair. The sexual desire and false commitment by boyfriend result in eloping with the accused, leaving home secretly and living with them for many days. The parents in such case could not accept what their child has done and refuse the relationship. Also false assurance by boyfriend mandates both the victim and the parents to register the complaint.

In present study, majority of the accused are between age 21 to 30 years (61.80 %) followed by age between 11 to 20 years (17.80 %). In 3 cases ages of the accused are more than 50 years. This observation is quite consistent with the study by Shinge S.S. et al⁶ where majority of the accused were from age group 21 to 30 years (58.5 %) followed by those from age group 31 to 40 years (19.51 %) and age group 11 to 20 years (12.20%).

The youngest age of accused in our study was 11 years and elder one was 55 years. This observation is quite in line with study by Shinge S.S. et al⁶ (youngest 15 years and eldest was 54 years). However, the observations in our study are in contrast with study by Sagar M.S. et al¹⁶, where 64 % cases were from 16 to 25 years age group and study by Sarkar S.C. et al¹⁷ where 39 % accused were from 21 years to 25 years age group. The findings in our study attribute to the fact that, sexually active males of younger age are most commonly involved in the act of sexual assault.

The study reveals that, the rented rooms were the commonest place of assault in majority of the cases (26.40 %), followed by the assailant's home (21.72 %). This is in agreement with study by Tamuli R.P. et al¹ (19.89 %). However, it contradicts the observations by other researchers^{8,9,18,19,20,21,22}.

The reason for rented rooms being most common place for sexual assault can be attributed to the fact that, the victim elope with the assailant and start living separately at distant place.

Conclusion

Child sexual violence is a catastrophe, a serious human right violation and a significant problem of current era. The present study suggests that the principal threat is not from the strangers but is from the known persons

and friends. The risk of harm is greater if the abuser is a relative. Considering the most common age group affected, it seems that there is dire need to concentrate on teen age population in terms of sex education and implementation of preventive guidelines for the same.

Conflict of Interest: Nil

Source of Funding: self

Ethical Clearance: Approval from institutional ethics committee was taken.

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A Study to Assess the Knowledge on Factors Influencing Childhood Obesity among School Children in Selected School, Kanchipuram District, Tamilnadu

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Abstract

Childhood obesity is a major public health crisis nationally and internationally. Hence, effective intervention strategies are being used to prevent and control obesity in children is necessary⁸. The study was conducted to assess the knowledge on factors influencing childhood obesity among school children in selected schools at Kanchipuram. District, Tamil Nadu. The objectives of the study were to assess the Knowledge on factors influencing childhood obesity and to associate the Knowledge on factors influencing childhood obesity among school children with selected demographic variables. By using descriptive research design and by using simple random sampling the total of 60 samples were selected. The study finding revealed that the frequency distribution in the study shows that majority 3(5%) were having adequate knowledge, 37(62%) of them having moderate knowledge and 20(33%) of them having inadequate knowledge on childhood obesity. Regarding association there is significant association of factors influencing childhood obesity among school children with selected demographic variables like type of family, monthly family income, dietary habit, height in cms and there is no significant association between factors influencing childhood obesity with demographic variables like age, number of sibling to children, education status and weight in kg.

Keywords: *Knowledge, factors, children, childhood obesity.*

Introduction

Obesity now consider as a killer life style disease is an important cause of percent able death world-wide⁴. According to WHO 1.2 billion people world are efficiency a overweight. Epidemic proportion of India in the 21th century with morbidity affecting 5% of the country population. Childhood obesity effect every organ systematic the body. The risk included diabetic, high blood pressure, and high cholesterol. Fact that 70% risk for heath disease⁵.

Childhood obesity is a major public health crisis nationally and internationally.. Hence, effective intervention strategies are being used to prevent and control obesity in children. The purpose of this study is to address various factors influencing childhood obesity, a variety of interventions and governmental actions addressing obesity and the challenges ahead for

managing this epidemic.⁸

Statement of the Problem

A study to assess knowledge on factors influencing childhood obesity among school children in selected school at kanchipuram district, Tamilnadu, India

Objectives

- To assess the Knowledge on factors influencing childhood obesity among school children.
- To associate the Knowledge on factors influencing childhood obesity among school children with selected demographic variables.

Research Methodology

- Research approach: Quantitative non-experimental
–Evaluative approach

- Research Design: Non-Experimental- Descriptive research design
- Population: The Accessible Population of the present study is School children from 6thstd to 12thstd at selected schools at Kanchipuram District.
- The Sample size of 60 school children will be selected
- Research setting: The study will be collected in the Selected Schools at Kanchipuram District, Tamilnadu.
- Sampling Technique: Simple random sampling

Results

Section -A: Distribution of demographic variables of the factors influencing childhood obesity among school children in selected school.

Age of children (Years) in which majority (45%) were belongs to the age between 13-15 years, (35%) of them between 10-12 years and (20%) of them between 16-18 years.

Number sibling to children in which majority of (45%) were belongs to two number of children (33.3%) belongs to only one children and (22%) belongs to more two number of children,

Type of family in which majority (63.3%) were belongs to nuclear family, (37%) were them joint family.

Education status of children in which majority (43.3%) were belongs 8th-10thstd school children , (40%) of them 6th-8thstd school children, (17%) of 11th-12thstd school children.

Monthly income of the parents in which majority (38.3%) were belongs more than Rs.10,000 and , (35%) of them below Rs.5000 , (27%) of them Rs.5,000 – Rs.10,000 .

Dietary habit in which majority (83.3%) were belongs to non-vegetarian dietary pattern and (17%) of them vegetarian dietary pattern.

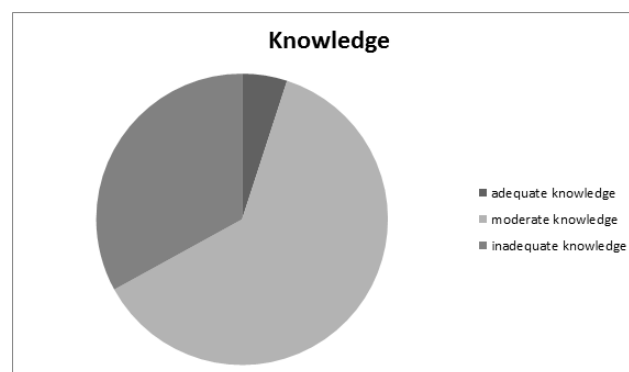
Height in cms in which majority (72%) were belongs to children above 100 cms (28.3%) of them children below 100 cms .

Weight in kg in which majority (50.3%) were

belongs to children having 31-40 kg,(25%) were children having 41-50 kg, (22%) of them children having 51-60 kg.

Section -B : Distribution of Knowledge on the factors influencing childhood obesity among school children in selected school.

The study finding revealed that the frequency distribution in the study shows that majority 3(5%) were having adequate knowledge, 37(62%) of them having moderate knowledge and 20(33%) of them having inadequate knowledge on childhood obesity.



Section -C : Association of Knowledge on the factors influencing childhood obesity with selected demographic variables:

Regarding association there is significant association of factors influencing childhood obesity among school children with selected demographic variables like type of family, monthly family income, dietary habit, height in cms and there is no significant association between factors influencing childhood obesity with demographic variables like age, number of sibling to children, education status and weight in kg

Summary: Community's lack of accessibility and affordability of healthy food can affect the nutrition of these children. Their lack of physical activity may be because of lack of facilities like safe side walks, bike paths, and safe parks. Much health- related problems are associated with obesity in children. Childhood obesity also leads to health risks in adulthood. Health problems related to obesity are not only physical but psychological and social as well.

Hence the study aims to address factors influencing childhood obesity, so that necessary action will be taken to prevent and treat childhood obesity

Source of Funding: Self

Ethical Consideration: Chettinad Academy of Research & Education- Institution Human Ethics Committee

Conflict of Interest: Nil

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Study of Correlation between Age and Closure of Cranial Sutures – A Post-Mortem Observational Study

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Abstract

Introduction – There is tremendous need for Indian data regarding the age of closure of cranial sutures. So, current study was undertaken at S.S.G. Hospital, Vadodara for a period of 1 year.

Material & Method - All cases of known age coming for the postmortem examination in which the victim is between 21-40 years of age were taken for the study. Both ectocranial and endocranial state were taken into consideration.

Results - In female subjects, significant correlation was found in sagittal, coronal and lambdoid suture closure in both ectocranially and endocranially in 21-30 age group (Table 2). In 31-40 age group significant correlation was found in coronal suture right and left side ectocranially.

Statistical Analysis - Spearman rank correlation coefficients, Levene's test for equality of variances, Student's t test for equality of means, STATAIC-13 software was used.

Conclusion – Many of the findings of current study were correlated with earlier studies, while others were found contradictory. Further detailed study with larger sample size is required.

Key-words – Age-estimation, Cranial sutures

Introduction

Age estimation forms the integral part of identification of the individual. In cases where we receive badly decomposed and skeletonized dead-bodies Identification forms the main examination point from the post-mortem examination. One of the main criteria in such cases would be to estimate the age from the state of fusion of sutures. The studies and data that are available in India are old and mostly from foreign studies. So, there is a dire need to conduct methodical research in the field of age estimations. So, the current study was undertaken at P.M. room of S.S.G. Hospital, Vadodara

to study the correlation between age and state of fusion of sutures in 21-40 years age group. Out of total cases coming from post-mortem examination total 150 cases were selected based on inclusion, exclusion criteria.

Material & Method

The study was conducted on cases coming for medico-legal postmortem examination to the Department of Forensic medicine, Govt. Medical College and SSG Hospital, Baroda during a period of April 2016 to December 2016.

Inclusion Criteria: All cases of known age coming for the postmortem examination in which the victim is between 21-40 years of age.

Exclusion criteria: Unknown, unclaimed bodies where exact age cannot be confirmed.

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Cases showing deformed or diseased or fractured skull, which may hamper the study of suture closure.

Method

This Cross-Sectional autopsy-based study was conducted in the Department of Forensic Medicine, S.S.G. Hospital & Medical College Baroda after taking the permission from the Institutional Ethics Committee. 150 cases of postmortem examination in which the victims are between 21-40 years of age were taken into the consideration for this study. Informed consent was taken from the relatives of the deceased before taking various body measurements.

Skull sutures were examined during the process of medico legal autopsies. After putting coronal incision over the head, scalp was reflected in anterior and posterior half to expose the skull completely to examine the coronal, sagittal and lambdoid sutures applying *Acsadi-Nemeskeri Scale (ANS)*¹ ectocranially. For endocranial examination same score system was applied after removing the calvaria taking due care to include complete coronal and sagittal suture. Lambdoid suture was studied in-situ. The calvarium was cleaned of soft tissues on both sides and was dried, which made the sutures more prominent. The obliteration of the sutures was ascertained endocranially as well as ectocranially. In both cases degree of closure was scored in 16 parts of the main cranial sutures as has been done by Acsadi-Nemeskeri method. The coronal suture was studied in three parts on right side and left side each; sagittal suture in four parts and lambdoid suture in three parts each on right and left side. Ectocranially the different sections

were distinguished by differences in the character of the suture. Endocranially the sutures do not show these differences in character. Consequently, the endocranial sutures were simply divided in sections of equal length.

Scale for closure: Acsadi-Nemeskeri complex method

0 = Open. There is still little space left between edges of adjoining bones.

1 = Incipient closure. Clearly visible as a continuous often zigzagging line.

2 = Closure in process. Line thinner, less zigzags, interrupted by complete closure

3 = Advanced closure. Only pits indicate where the suture is located

4 = Closed. Even location cannot be recognized.

Statistical Methods:

To estimate the possible relation between suture closure and age at death, appropriate statistical tools were used (Spearman rank correlation coefficients, Levene's test for equality of variances, Student's t test for equality of means, STATAIC-13 software). $p < 0.05$ was considered as significant.

Results

Out of total 170 cases selected as per inclusion, exclusion criteria. 70 were female and 100 cases

Table 1 – Comparison between Ectocranial & endocranial sutures

Age	No.	Ectocranial					Endocranial				
		S_Ecto	CR_Ecto	CL_Ecto	LR_Ecto	LL_Ecto	S_Endo	CR_Endo	CL_Endo	LR_Endo	LL_Endo
21-30	43	.842**	.788**	.790**	.887**	.887**	.770**	.822**	.822**	.823**	.803**
		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
31-40	42	.525**	.591**	.528**	.493**	.536**	.496**	.459**	.434**	.543**	.501**
		.000	.000	.000	.001	.000	.001	.002	.004	.000	.001

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Ectocranial sutures were compared with endocranial sutures through sagittal, right and left coronal and lambdoid (Table 1). To estimate the possible relation between suture closure and age at death, Spearman rank correlation coefficients (2 tailed) were calculated.

Because of the considerably skewed age distribution of the sample, Pearson correlation coefficients are less appropriate. Significant correlation was found in earlier age group till 40 years of age.

Table 2 – In Females, Comparison between Ectocranial & endocranial sutures

Age Groups	No.	Ectocranial					Endocranial				
		S_Ecto	CR_Ecto	CL_Ecto	LR_Ecto	LL_Ecto	S_Endo	CR_Endo	CL_Endo	LR_Endo	LL_Endo
21-30	13	.811**	.752**	.752**	.791**	.791**	.632*	.815**	.815**	.741**	.741**
		.001	.003	.003	.001	.001	.021	.001	.001	.004	.004
31-40	22	.484*	.593**	.589**	.471*	.430*	.338	.318	.276	.518*	.520*
		.023	.004	.004	.027	.046	.123	.150	.214	.014	.013

** . Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

In female subjects significant correlation was found in sagittal, coronal and lambdoid suture closure in both ectocranially and endocranially in 21-30 age group (Table 2). In 31-40 age group significant correlation was found in coronal suture right and left side ectocranially.

Table 3 – In Males, Comparison between Ectocranial & endocranial sutures

Age Groups	No.	S_Ecto	CR_Ecto	CL_Ecto	LR_Ecto	LL_Ecto	S_Endo	CR_Endo	CL_Endo	LR_Endo	LL_Endo
21-30	30	.881**	.798**	.794**	.917**	.917**	.836**	.848**	.848**	.881**	.833**
		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
31-40	20	.644**	.641**	.488*	.545*	.664**	.661**	.583**	.581**	.573**	.474*
		.002	.002	.029	.013	.001	.002	.007	.007	.008	.035

** . Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

In male subjects ectocranial and endocranial suture closure were found to be correlated up to 40 years (Table 3).

Discussion

In later years of life all the teeth have erupted, practically all the epiphyses have united with the

diaphysis, the height and weight are of no significance to determine the age.

Gustafson has done the work in which he has given the idea to determine the age on the basis of changes that occur in teeth. Literature is full of certain changes such as lipping of the bones, graying of the hair, appearance of arcus senilis in the cornea, opacity in lens, atherosclerotic changes in the arteries, wrinkling of the skin especially

of the face. They are too vague to be considered for determination of age in Medico-legal work.

Obliteration of skull sutures in late age, practically when all the teeth have erupted and epiphysis have fused i.e. after 21 years of age, gives a fairly accurate idea but here also we find that the determination of age can only be in decades, based on sole criterion of suture obliteration.

Sagittal suture

In our present study we have found that the sagittal suture, endocranially, starts fusing at the end of 21-30 years and completion is perfected at the age of 51-60 years, and this observation confirms with that reported by Shetty U(2009)², Modi K(2015)³, Todd & Lyon (1924)⁴, while it is in contrast to the observation reported by Zanzrukiya et al⁵, who indicated endocranial commencement of sagittal suture at a much later age at about 40 years.

Ectocranially sagittal suture closure was never complete. Youngest age at which sagittal suture union was seen in 35 years ectocranially and 32 years endocranially.

Coronal Suture

While in the present study endocranial fusion of coronal suture was observed as early as 21-30 years and completion by the late age other workers like Maish W et al⁶ reported in males the minimal age of fusion in endocranium were 40 years for both sagittal suture (SS) and coronal suture (CS). Their study does not indicate whether it was ectocranial or endocranial or it was commencement or termination. In coronal suture youngest age at which complete union was seen at 50 years ectocranially and 35 years endocranially.

Lambdoid Suture

Lambdoid suture endocranially, starts fusing at the age of 21-30 years in our study which shows that it is a year earlier than that reported by Shetty U (2009)², Modi K (2015)³, Todd and Lyon (1924)⁴, while completion in our study is 51-60 years. Earliest age at which complete union of lambdoid suture was seen at 39 years ectocranially and 32 years endocranially.

Our Indian data compare well with those of the male whites (Todd & Lyon 1925)⁷. Negro skulls however

show an earlier date of commencement and closure.

Form the present study (see graphs and tables) it is clearly evident that endocranial union is a far better parameter for age determination than is the ectocranial union as also has been established by A. Hardlicka⁸, Meindl RS⁹, Kumar V¹⁰.

Statement of Conflict of Interest – NONE

Statement of Informed consent – Informed consent of relatives taken

Statement of Human and animal ethics – No ethical issues involved.

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12. LR- Lambdoid Right side, LL - Lambdoid left side, Ecto – Ectocranial, Endo-Endocranial

Video Assisted Teaching Program on Knowledge and Preventive Practices of Catheter Related Blood Stream Infections among Health Care Professionals: A Hospital-based Prospective Study

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Abstract

Objective : The objective of the study was to evaluate the effectiveness of video assisted teaching programme, in terms of improvement in knowledge and practices to prevent catheter related blood stream infections.

Method: The study adopted pre-experimental study design in the intensive care units of a selected tertiary referral hospital of Karnataka, India. The study included mainly the infection control practices followed by the health care personnel for the selected events related to catheter related blood stream infection prevention and knowledge of health care personnel regarding preventive practices of catheter related blood stream infection. The pre-test observations of practices related to prevention of catheter related blood stream infections was done using observational checklists and the knowledge assessment was done using structured knowledge questionnaire among health care personnel in the intensive care units and a video assisted teaching intervention was given, after seven days of intervention the post-test data was taken for the practices and knowledge.

Results: The results show that there was a significant difference in the pre-test and post-test knowledge scores, practices of nurses while administration of medications through central line and central line dressing procedure ($p < 0.05$).

Conclusion: The present study showed that video assisted teaching on hospital infection control measures regarding catheter related blood stream infections was effective in supporting participants to increase their knowledge levels and preventive practices of catheter related blood stream infections and thereby reduce infection in the hospital.

Keywords: Knowledge, Infection Control, Health Personnel, Intensive care units

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Introduction

Catheter Related Blood Stream Infections (CRBSIs) are the most common cause of health care associated blood stream infections. According to Centers for Disease Control and Prevention (CDC), there was 12 to 25% of mortality among patients who acquire catheter related blood stream infections, also have lengthy hospital stays and increase in their treatment costs. The burdens of

CRBSIs in the United States (US) were nearly 80,000 yearly. These infections also would increase the cost of stay in the hospital¹.

A study was conducted with a purpose to provide a countrywide estimate of number of Health Care Associated Infections (HAIs) and to assess the mortality in US hospitals, the estimated number of HAIs in US hospitals were approximately 1.7million. The mortality related with HAIs in US hospitals were 98,987 and among these 30,665 is related to CRBSI². A prospective observational clinical study was conducted on Health Care Associated Infections (HAIs) in northern India, to determine the risk factors and epidemiology from a tertiary care hospital, among 679 patients. Routine investigation of various HAIs infections such as, Catheter Associated Urinary Tract Infections (CAUTI), Catheter Related Blood Stream Infection (CRBSI) and Ventilator Associated Pneumonia (VAP) was done. The result shows that number of incidence of CRBSI was 86 (13.50%) among patients admitted in ICUs with central line catheters³.

A study conducted in the critical care units of Alexandria University Hospital, Egypt among 100 health care workers, 40 physicians and 60 nurses regarding knowledge and practices on prevention of CRBSI reveals that health care workers have poor adherence with the standard procedures of central venous catheter care so they should be periodically assessed for the knowledge and practices regarding guidelines for prevention of CRBSI⁴. A study conducted to improve the nurse's knowledge to reduce CRBSIs in a haemodialysis unit of Walden University, Oman focused on implementing the CDC guidelines in order to improve the knowledge on evidence based guidelines regarding central venous catheters revealed a significant improvement in nurses' knowledge following the educational intervention⁵.

The healthcare professionals working at the intensive care units need to have good knowledge on the preventive strategies of CRBSIs so as to adhere to such practices. The present study was carried out to assess the knowledge and preventive practices of health care personnel as well as to improve the knowledge to prevent CRBSIs among patients admitted in intensive care units, through a video assisted teaching intervention to reduce the incidence of CRBSIs.

Materials and Method

Study Site, Design and Data Collection

This is a hospital based prospective study where in which the researcher adopted a pre-experimental study design (pre-test – intervention – post-test) carried out at the intensive care units of a selected tertiary referral hospital of Karnataka, India. After the ethical approval the pre-test observations of practices related to prevention of CRBSIs including practices of doctors while doing central line insertion (30events), practices of nurses while administering medications through central line (90events) and practices of nurses while doing central line dressing (50events) were observed using observational checklists and a structured knowledge questionnaire was used for the knowledge assessment among 72 health care personnel including physicians and nurses in the intensive care units and the questionnaire consisted of 30 multiple choice questions. Video assisted teaching intervention was given which dealt with the introduction on CRBSI, guidelines for central line insertion, guidelines for administration of medications through central line, and guidelines for central line dressing. After a gap of 7 days of video intervention the post-test data was taken for the practices of doctors while doing central line insertion (30events), practices of nurses while administering medications through central line (90events) and practices of nurses while doing central line dressing (50events). Knowledge was assessed to elicit the effectiveness of the teaching programme in terms of improvement in knowledge and practice scores.

The knowledge questionnaire consisted of 30 multiple choice items with one correct answer for each. Each correct answer carries one mark and the wrong answer carried zero marks. All the items had four alternative responses. The highest possible score was 30 and minimum score was zero. The knowledge score was classified arbitrarily as excellent knowledge (27-30), good knowledge (21-26), average knowledge (15-20), and poor knowledge (0-14).

The observation checklist was developed after a thorough review of literature, evidence based practices and experts' opinion. The critical items in the observation check list carries five marks and other item carries one mark and if any practices in the checklist are not followed, zero was marked. . The observation

check list on central line insertion consisted of 12 items. The highest possible score was 48 and minimum score was zero. The observation checklist on administration of medications through central line consisted of seven items the highest possible score was 27 and minimum score was zero. The observation checklist on central line dressing procedure consisted of seven items, the highest possible score was 31 and minimum score was zero. The study adopted event sampling for the observation of practices and purposive sampling for selecting the samples for administering knowledge questionnaire.

Ethical committee clearance was obtained from Institutional Ethical Committee, (IEC871/2016) and written informed consent from each study participants have been taken. Also the study has been registered prospectively under Clinical Trial Registry of India (CTRI), (REF/2017/01/013096).

Data Analysis

Data were analysed using SPSS version 16.0. The data analysis was done by using descriptive and inferential statistics. Descriptive statistics is used for analysing sample characteristics (frequency, percentage, mean and standard deviation). Inferential statistics (Paired t test and Wilcoxon's sign rank test) was used to test the effectiveness of the intervention.

Findings

Demographic characteristics

Out of 72 participants, majority of them were females 60 (83.3%), with mean age of 26.31 ± 3.82 years. Years of experience ranged from 1-5 years for 59 (81.9%) of the participants and 13 (18.1%) had more than five years of experience. Only 18 (25%) of the participants had the awareness of Evidence Based Guidelines on CRBSI preventive practices.

Knowledge among health care professionals

In the pretest, 16 (22.2%) had poor knowledge, 36 (50%) had average knowledge, and 20 (27.8%) had good knowledge. The post-test data shows that 2 (2.8%) had average knowledge, 35 (48.6%) had good knowledge and 35 (48.6%) had excellent knowledge on preventive practices of CRBSI. The mean of pre-test knowledge scores on preventive practices of CRBSI was 18.17 ± 3.98 . The maximum score attained was 26 and minimum was 10. The mean of post-test knowledge

scores on preventive practices of CRBSI was 26.17 ± 2.15 . The maximum score attained was 29 and minimum was 20. Paired t test was computed to see the effectiveness of the video assisted teaching programme, which shows that there was a significant difference in the mean pre-test and post-test knowledge scores after the teaching programme on CRBSI ($p < 0.01$) which was significant.

Description of practices of central line insertion among doctors

Out of 30 observations, the minimum score obtained in the pre-test was 8, the maximum score was 29, and the median of the pre-test scores of the practices of nurses assisting during central line insertion was 13 with an Inter Quartile Range of 8-19. The minimum score obtained in the post-test was 14, the maximum score was 29, and the median of the post-test scores of practices of nurses assisting during central line insertion was 19 with an Inter Quartile Range of 14-24. Wilcoxon Sign Rank Test was used to see the effectiveness of the video teaching programme on central line insertion practices, and the data shows that there was no significant difference in pre-test-and post-test practice scores on central line insertion after the video assisted teaching program ($p > 0.05$) so it was concluded that video assisted teaching programme was not effective in improving the practice scores of central line insertion by doctors because they already had a good practice towards the preventive practice measures while doing central line insertion as there is no clinical significance observed in the findings.

Description of practices of administration of medications through central line

Out of 90 observations, the minimum score obtained in the pre-test was two, the maximum score was 22, and the mean practice score was 8.28 ± 4.5 . In the post-test, minimum score obtained was two, and the maximum score was 27, and the mean practice score is 18.96 ± 5.3 . Paired t test was used to see the effectiveness of the video teaching programme on practices of nurses while administering medications through central line, and the data shows that there was a significant difference in the pre-test and post-test practice scores on administration of medication through central line after the video assisted teaching programme ($p < 0.05$). Therefore, the null hypothesis was rejected and the research hypotheses was accepted, hence it concludes that the video assisted teaching program was effective in improving practices

of nurses while administering medications through a central line. The Frequency (f) and percentage (%) of the practices of nurses while administering medications through central line is provided in Table 1.

Description of practices of central line dressing procedure

Out of 50 observations, the minimum score obtained in the pre-test was 11, the maximum score was 31, and the median of the pre-test scores of the practices of nurses while doing central line dressing was 16 with an Inter Quartile Range of 7-12. The minimum score obtained in the post-test was 16, the maximum score was 31, and the median of the post-test scores of practices of nurses while doing central line dressing was 26 with an Inter Quartile Range of 17-22. Wilcoxon Sign Rank Test was used to see the effectiveness of the video teaching programme on practices of nurses while doing central line dressing. The data shows that there was a significant difference in the pre-test and post-test practice scores of central line dressing after the teaching program ($p < 0.05$), hence it concludes that the video assisted teaching program was effective in improving practices of nurses while doing central line dressing. The Frequency (f) and percentage (%) of the practices of nurses while doing central line dressing is detailed in Table 2.

Discussion

The present study shows that out of 72 participants, in the pre-test 16 (22.2%) had poor knowledge, 36 (50%) had average knowledge and 20 (27.8%) had good knowledge and none of them had excellent knowledge. The findings were supported by a study conducted to improve the nurse's knowledge to reduce catheter related blood stream infection in a haemodialysis unit. The pre-test mean score was 52.17 ± 9.36 , also 46% of participants had inadequate knowledge, 54% had moderate level of knowledge and none of the participants had excellent knowledge⁵.

The present study findings show that the mean pre-test knowledge scores on preventive practices of CRBSI was 18.17 with a standard deviation of 3.982 and the mean post-test knowledge scores on preventive practices of CRBSI was 26.17 with a standard deviation of 2.156. The results show that there was a significant increase in post-test knowledge scores ($p < 0.05$). The findings

were supported by a pre-experimental study conducted in Kathmandu Medical College Teaching Hospital among 40 nurses. The mean knowledge score was 14.75 with a standard deviation of 2.37 in the pre-test. After educational intervention, the score was 16.80 with a standard deviation of 5.51. The result shows that there was a significant increase in post-test knowledge scores ($p = 0.039$)⁶.

In the present study, out of 30 pre-test observations of central line insertion procedure by the doctors, 90% of them had performed hand hygiene, 93.3% wore the cap, 96.7% wore the mask, 100% wore sterile gown & gloves. The result shows that, during the insertion of CVCs, most of the physicians had followed the preventive practice measures. These findings were supported by the study conducted to assess the HCWs knowledge and practices regarding the prevention of CRBSI. The result shows that during the insertion of CVCs, most physicians (87.5%) performed hand hygiene. Regarding sterile barrier precautions, 80% of physicians wore the cap, 85% wore masks, 90% wore the gown, and 80% wore sterile gloves. It shows that most of the physicians had followed the preventive practice measures while doing central line insertion⁴.

Conclusion

In conclusion, the Center for Disease Control and Prevention strongly recommends that reporting and monitoring for infection control practices and surveillance on infection in the ICUs is a critical factor in CRBSI prevention. It also emphasizes about education and training among health care professionals regarding how to assess and implement infection control measures and periodic evaluation of the knowledge among them. The present study showed that video assisted teaching on hospital infection control measures regarding CRBSI was effective in supporting participants to increase their knowledge levels and practices of preventive aspects of CRBSI and thereby reduce infection in the hospital.

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Conflict of Interest: No conflicts of interest.

Table 1: Frequency (f) and percentage (%) of the practices of nurses while administering medications through central line (n=90)

Preventive Practices	Pre-test				Post-test			
	Yes		No		Yes		No	
	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)
Performs hand hygiene	25	27.8	65	72.2	50	55.6	40	44.4
Uses clean or sterile gloves before touching the catheter	11	12.2	79	87.8	82	91.1	8	8.9
Follows strict aseptic technique	54	60.0	36	40.0	89	98.9	1	1.1
Scrub the cap or hub for at least 15-30 seconds	4	4.4	86	95.6	51	56.7	39	43.3
Identifies the appropriate lumen for administering the medicine	90	100	0	0	90	100	0	0
Disposes of all syringes, needles according to the hospital policy	90	100	0	0	90	100	0	0
Performs hand hygiene	19	21.1	71	78.9	34	37.8	56	62.2

Table 2: Frequency (f) and percentage (%) of the practices of nurses while doing central line dressing (n=50)

Preventive practices	Pre-test				Post-test			
	Yes		No		Yes		No	
	(f)	(%)	(f)	(%)	(f)	(%)	(f)	(%)
Performs hand hygiene	11	22.0	39	78.0	34	68.0	16	32.0
Puts on a pair of clean gloves.	48	96.0	2	4.0	50	100	0	0
Peels off the old dressing gently	50	100	0	0	50	100	0	0
Puts on a new pair of sterile gloves	11	22.0	39	78.0	37	74.0	13	26.0
Applies antiseptic to the site using >0.5% Chlorhexidine preparation with alcohol	33	66.0	17	34.0	50	100	0	0
Covers with either sterile gauze or sterile, transparent, semipermeable dressing	48	96.0	2	4.0	50	100	0	0
Performs hand hygiene	15	30.0	35	70.0	26	52.0	24	48.0

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Study on Profile of Acute Poisoning in a Rural Tertiary Care Hospital in Telangana

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Abstract

Poisoning has become an increasing cause of concern over the past decade, not only a major medical issue in India but also a significant global health problem. Nearly 3 million people consume poison each year resulting in 220000 deaths annually, majority with the intention of suicide. A Retrospective, hospital record based study was conducted in a rural medical college hospital including 100 cases of acute poisoning. Snake bite cases were excluded. Agricultural poison specifically organ phosphorus poisoning is the most predominant one observed in our study, with a total of 61 percent cases reported to the hospital. Majority of the poisonings were in the age group of 21-40 years. Gender based in-equivalence observed among males and females with a ratio of 3:1. A significant percentage of suicides were found with an estimate of 95%. Around 39% cases treated with a specific antidote and the remaining 61% had other modalities of treatment. The early initiation of gastric lavage, specific antidote and appropriate supportive management achieved a better outcome. The mortality of poisoning is 1% in the current study. The lower mortality rate observed due to large number of cases about 25% are referred to higher centers. Highest number of suicides was observed among farmers due to losses in agriculture, financial hardship and domestic issues. Psychologically depressed farmers committed suicide by consuming nearest available poison, organo-phosphorous compounds. Psychiatry counseling, agriculture support and financial help should be given to them at community level to bring down the mortality. Hospitals should develop adequate diagnostic facilities, equipment support and skilled supportive staff to combat poisoning deaths.

Keywords: Acute Poisoning, clinical profile.

Introduction

Poison is a substance that causes injury to the body and endangers the life of an individual by its systemic or local effects or both. Acute poisoning produced by a single dose or several small doses, taken in short intervals and onset of symptoms are abrupt (resulting in abrupt onset of symptoms). The history of poison and poisoning dates back to several thousand years. The early history of poison consumption was described in ancient Indian

literature. Egyptian, Babylonian and Greek records in 3000 B.C and Atharva Veda in 1500 B.C also describe poison. Susrutha in 350 B.C described about symptoms and antidote of poison. The Greeks used some plant toxins as poison for execution. Socrates in 470-399 BC was executed by the administration of hemlock. ⁽¹⁾

Paracelsus the herald of modern toxicology (1493-1541) said "All things are poisons, and nothing is without poison, the dosage alone makes it so a thing is not a poison." Any substance irrespective of its quality or quantity when given with an intention to endanger, injury or kill a person can be called poison. ⁽¹⁾

Acute poisoning and intoxication is a challenging problem and carries high mortality rates. Poisoning cases are increasing day by day due to various socioeconomic and cultural problems in the world.

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Vast numbers of new poisoning substances are introduced into the market because of the development of chemistry and industrialization. Suicidal poisoning deaths are predominant worldwide, usually associated with psychological disorders and emotional instability. Academic failure and getting discarded by loved ones are major reasons in youngsters, economic hardship and marriage disharmony are usual causes in middle age and endogenous depression or loss of spouse is predominant cause in old age individuals.

Poisoning causes highest mortality and morbidity worldwide. According to WHO about 3million people consume poison around the world, out of which 220000 deaths occur annually, about 50,000 deaths occur in India every year.⁽³⁾ The mortality of poisoning varies from country to country depending on the kind of poisons encountered, the extent of awareness about the poisoning, availability of treatment facilities and availability of qualified medical personnel. In developing countries the rate of mortality is as low as 1-2% whereas in India it is about 15-35%. Pattern of poisoning in a particular region depends on various factors like access to poisons, domestic issues, socioeconomic conditions of the individual, cultural and religious influences etc. Knowledge on pattern of poisoning in a particular area will help in early diagnosis and better treatment so that it helps to decrease the morbidity and mortality.

The objective of this study is to identify the range of substances used for poisoning in our area, to observe the clinical patterns of various poisons and its outcomes and to create awareness among the doctors of the institution regarding the most common poisoning cases reporting to this institution, which will help to bring down the mortality due to acute poisoning.

Materials and Method

The present study was a retrospective, cross-sectional and record based study conducted from 1st January 2016 to 30th October 2016 for a period of 10months in a rural Medical college hospital in Telangana. The study was conducted based on information available in the medical case sheets. The data was collected from the MRD of hospital from all inpatient case sheets both discharged and death due to acute poisoning. Brought dead, chronic poisoning cases and cases of snake other insect bites were not considered in this study.

The study included 100 cases of acute poisoning due to drugs, chemicals, insecticidal agents and some unknown poisons. Data regarding age, sex, marital status, occupation, locality, type of poison, time of intake, route of exposure, outcome of poisoning, any antidote administered and associated co-morbid conditions and manner of poisoning were collected from the hospital records and documented in the pre-structured pro-forma. Then the data were analyzed by descriptive statistical method by using STATA 11 software.

Results

Table-1: Manner of poisoning

Manner	No of cases
Accidental	5
Suicidal	95
Homicidal	0

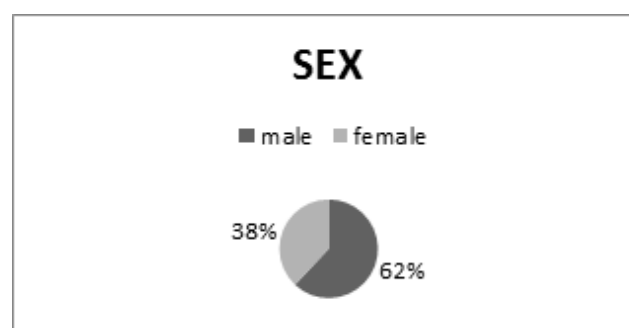


Figure-1: Poisoning in sex related.

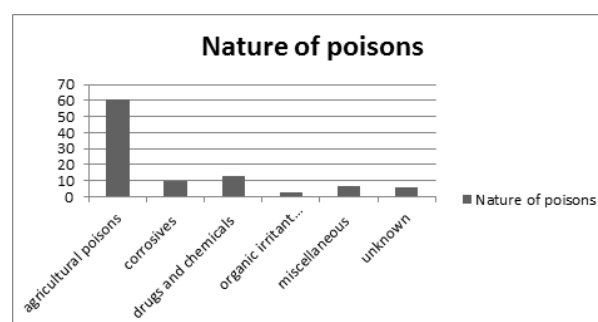


Figure-2: Nature of poisons.

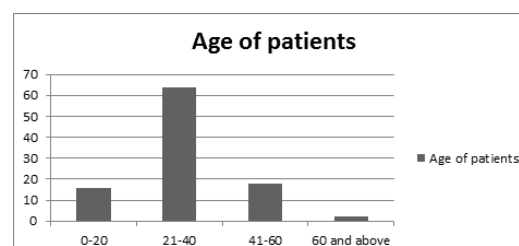


Figure-3: Poisoning in different age group.

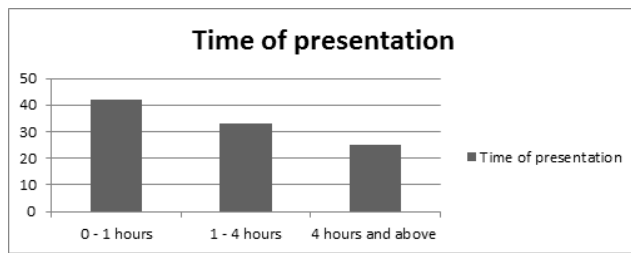


Figure-4: Time of presentation to the hospital after consuming poison.

Table-2: showing poisoning in un-married and married.

Un married	Married
36 %	64 %

Table-3: showing poisoning in Local area people and outsiders living in the study area.

Local area	Outsiders living in study area
90 %	10 %

Table-4: showing poisoning in relation to employment.

16 %	Students and un employed
28 %	House wives
8%	Other employment
48%	Farmers

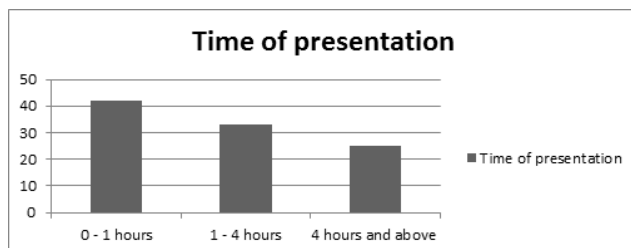


Figure-5: Poisoning with co-morbid illness.

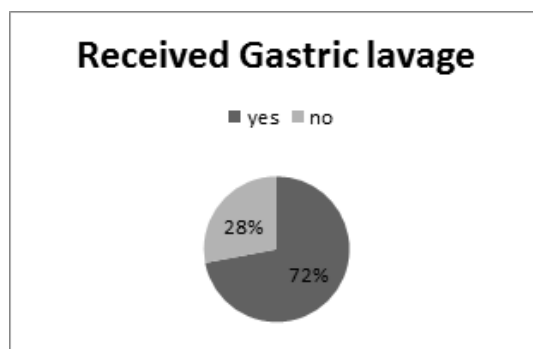


Figure-6: Percentage of cases treated with Gastric lavage.

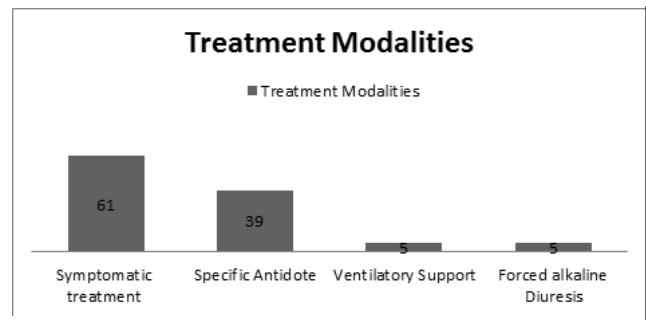


Figure-7: Various modalities of treatment given in poisoning.

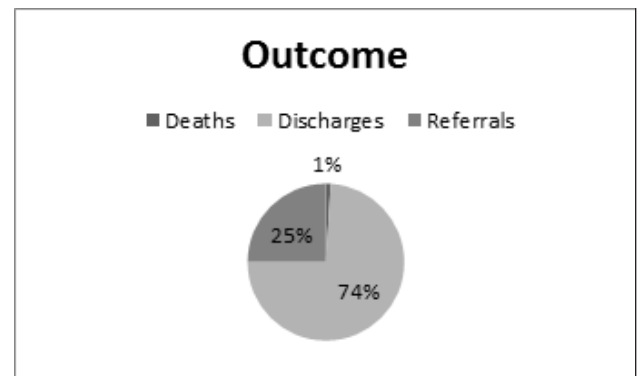


Figure-8: Showing out come in poisoning

Discussion

A retrospective study on poisoning profile was conducted in a rural medical college hospital in Telangana showing following results.

Study shows a majority of poisoning cases, about 95% are suicidal in nature and remaining 5% are accidental, similar results were noticed in a study conducted by K N Ramesh et, al.^{3,4}

Large percentage of cases of poisoning was observed in males than in females. Study revealed that 62% of males and 38% of females consumed poison, study conducted by Subash Vijaya Kumar and K N Ramesha also observed almost same results.^(2,3,4) All these studies reveal that males are contributing a major financial support to their families and usually they are under more pressure.

The route of poisoning was oral in all the cases. The most common substance implicated in poison exposure is organo phosphorous compounds.⁽³⁾

Highest number of poisoning cases, about 64% was observed in married group, whereas 36% observed in unmarried group.⁽³⁾ Financial worries, domestic issues and psychological instability are the main reasons in married group.

In relation to the employment, farmers are highest number about 48% and next house wives about 30%, small percentage observed in unemployment students and others. Most of the cases of poisoning were observed in local people about 90%, small percentage observed in non-locals those living in the study area.

Majority of the poisonings cases were in the age group of 21-40 years.⁽⁴⁾ Academic failure, unemployment, family disharmony and emotional instability, are the common driving forces for committing suicide in this age group. Similar findings were also observed in other studies.^(2, 4) Accidental poisoning was more commonly seen in less than 20 years of age due to lack of knowledge and awareness being the most common reason for accidental poisoning among youngsters. Suicidal poisons in elder age group are mostly due to health issues and loss of family member. Similar results were observed in other studies.^(2,3,4)

Regarding treatment of poison, we observed that in 39% of cases, a specific antidote was given, remaining 61% of the cases as such there was no antidote available hence treated symptomatically, in our study we also observed that in those cases where antidote was given early were recovered well without any untoward effect.^(5,6)

In 5% of the cases, ventilator support was given and in 5% of the cases forced alkaline diuresis was done. We observed that the number of cases reported late to the hospital developed complications and ventilator support was given and also observed that cases with ventilator support and treated with forced alkaline diuresis recovered well. In organo phosphorus poisoning cases, a better outcome was observed with early antidote administration and ventilator support.^(6,7)

Gastric lavage was done in 72% of the cases, the remaining 28% of cases no gastric lavage was done. Our study revealed that cases with early gastric lavage recovered well.^(6,8)

In our study co-morbid conditions like major psychosis, chronic alcoholism, hypertension, diabetes and epilepsy were associated with poisoning, we also observed that the complications are higher in poisoning with co-morbid conditions; most of the cases referred to higher centers are associated with comorbid conditions.

The nature of poisoning cases reported to our

hospital was divided into 5 categories. Agricultural poisons which include Organo phosphorus, Organo chlorine, herbicides and rodenticides; Corrosive poisons; acids and alkalis; organic irritant plant poisons, drugs and chemical poisons and other unknown poisons. Agricultural poisoning is the most predominant in our study area a total of 61% cases were agricultural poisons reported to our hospital. Among agricultural poisons highest percentage of cases are Organo phosphorous compounds about 63.93 % were observed.^(3,4,9)

When compared with a total number of poisoning cases Organo phosphorous poisoning is highest, about 39% cases were observed in our area. These high incidences were due to the reason that majority of the population in this area are agriculture farming based and agriculture is their major economic source. Crop failure and lack of minimum support price are main reasons; similar results were noticed in study done by K N Ramesh et, al.^(3,9)

In our study 42% of the patients arrived to the hospital within the first hour, 33% of the patients reached to the hospital within 4 hours whereas 25% of the cases came to the hospital after 4 hours, we observed that those who reached the hospital within first 4 hours had better outcomes. In remaining 25% of the cases, they developed complications and were referred to the higher centers. The time of consumption vs the time of reporting makes a major difference, when it comes to the outcome of treatment.^(5,9)

74% of poisoning cases were recovered very well and discharged. Hospital has developed specific protocol for treating poisoning cases; a specific antidote was also available to many common poisons. Most of the doctors are well trained in dealing with poisoning cases, we observed that nursing staff also equally competent to handle poisoning cases. With good teamwork, better outcome were achieved.

The mortality of poisoning is only 1% and 25% of cases are referred to higher centers to deal with complications arising out of poisoning. The less number of mortality was observed in our study because of high referrals.

Conclusion

In our study the commonest poisoning agent was Organo phosphorus. The occurrence was high

among married males in the age group of 21-40 years. Maximum numbers of suicidal cases were reported among farmers. Early gastric lavage and specific antidote therapy reduces the mortality in organo phosphorous poisoning cases. The lowest death rate was observed in our study, whereas referrals are in large number. The following recommendations are useful when dealing with poisoning cases.

Psychiatric counseling centers must be available right from primary health care level. Poisoning awareness and basic first aid knowledge should be imparted to the community.

Equipment like ventilator support and dialysis units should be made available in large scale at every hospital.

The government should strengthen the financial support, subsidies, insurance in case of crop failure to the farmers. Strict regulations on sales of poisons should be imposed.

Poisoning control centers should establish in every state, doctors can interact with these centers in case of any difficulty in identification, diagnosis and treatment of poisons. These centers will also help in preparing a better protocol in management of poisoning cases.

Source of Fund: Self.

Conflict of Interest: Nil

Ethical Clearance: Yes.

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Original Research Article

Pattern of Sudden Natural Deaths in Adults: An Autopsy based Study

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Abstract

Background- Very often in sudden natural death (SND), due to rapidity of onset of symptoms and suddenness of death, the attending physician could not certify the death with confidence, even though he is familiar with medical history of patient. Such deaths must undergo Medico-legal autopsy to determine the exact cause of death and to rule out any foul play. The data regarding the incidence and cause of SND will be helpful for planning health programs at community level. The objective of the present study is the same.

Material and Method- The medico-legal autopsy record, police inquest papers, other relevant laboratory investigation of SNDs over the two year study period were verified and considered in the present study.

Observation- 10.08 % deaths were due to sudden natural deaths (SND) with male to female ratio 4.1:1. Most of the SNDs were in 4th (31.54%) and 5th (26.42%) decade of life. Cardiac causes (50.94%) were most predominant followed by respiratory causes (26.15 %). Over all coronary artery disease (CAD) was the commonest cause of SNDs.

Key words- Sudden natural death, Medico-legal autopsy, Coronary artery disease.

Introduction

A natural death is defined by the Oxford English Dictionary as the following:

“Happening in the course of nature, as a result of age or disease, as opposed to one brought about by accident, violence, poison, etc.” And The World Health Organization defines sudden death as a death, which occurs within twenty four hours after the onset of symptoms. From the view point of Forensic Medicine, sudden natural death (SND) is mainly defined as a rapid, unexpected and natural death. Such deaths occurred in all age group, but when it occurs in apparently healthy

younger age group it arouse suspicion. Due to rapidity of onset of symptoms and sudden death, the attending physician could not certify the death with confidence, even though he is familiar with medical history of patient. For the insurance purpose autopsy report is require in such death.

The Government of India has made a provision in the Registration of Births and Deaths Act, 1969 for certification by the registered medical practitioner who has attended the deceased during his last illness. In some cases of SNDs, death may occur in the house, in the work place and if not observed by anyone arouse the suspicion. Hence, such deaths must undergo Medico-legal autopsy to determine the exact cause of death and to rule out any foul play.

Various autopsy based studies showed that, SNDs account for approximately 10% of all autopsies. So investigation in such sudden natural death will provide

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the valuable information in regard to cause of death, which will be helpful in planning of medical services and health programs on community level. Such studies are also helpful in development of standardized autopsy protocol with special precaution to the most common cause of SND.

Material & Method

A medico-legal autopsy record based study was carried out in the department of forensic medicine, Institute of Medical Sciences, Banaras Hindu University, Varanasi (U.P.) from June 2009 to June 2011. All the cases were retrospectively reviewed and those deemed to have died a sudden and / or unexpected death due to natural caused were identified. Full autopsies were performed in all cases.

All reports were analyzed with respect to age at the time of death, sex and cause of death. The system involved was documented for all cases, except for sepsis which had multisystem involvement and grouped separately. Deaths from sepsis were those with gross multisystem infection and /or microbiologically confirmed.

Inclusion criteria:-

Undiagnosed death occurring within 24 hours of admission to hospital.

The attending doctors were unable to determine the cause of death.

Brought dead cases brought for autopsy and cause of death remained undiagnosed.

With gross pathological finding confirmed by histopathology.

Exclusion criteria:-

All autopsies of age group less than 18 years

Cases with obscure cause of death

Result & Discussion

A total of 3682 medico legal autopsies were performed over the study period and 371 (10.08%) deaths were sudden natural deaths (SND). This finding is somewhat similar with the finding of Sanjay Gupta et al (7.64%)¹, Anand Mugadlimath et al (9%)², Naresh P. Zanjad (8.92%)³. This finding is inconsistent with that reported by A. Meina Singh et al (2.66%)⁴, Ivar

Nordrum et al (27.8%)⁵, Azmak A.D. (28.98%)⁶, this difference may be due to difference in geographical area and life style.

Age wise distribution of SND showed maximum number of cases belonged to 4th and 5th decade of life (57.96%), with those at extreme of age i.e. >70 (2.16%) being least represented (Table no.1). Similar findings were observed by Sanjay Gupta¹ (44.46%), Naresh P.Zanjad et al³ (52.6%), Sanjay Gupta¹ (44.46%), & Kumar et al⁷ (53.2%). This trend is not consistent with the study conducted by Escoffery C.T. and Shirley S.E.⁸ in (Jamaica) West Indies, which showed that cases in 6th and 7th decade of life comprised most SND. This difference may be due to more healthy activity and genetic difference in that population.

Gender wide distribution of cause of sudden natural death in all system showed male predominance with male cases 299 (80.59%) and female cases 72 (19.41%) (M:F = 4.1:1). This finding is consistent with the study of Anand Mugadlimath et al (males 81%, female 19%)², Nordrum I. et al (males 79.67%, females 20.32%)⁵, Azmak A.D (males 83.4%, females 16.6%)⁶, Sarkoija T. et al (males 82%, females 18%)⁹, Thomas A.C. et al (males 73.9%, females 26%)¹⁰ and Ambade V. N. (males 79.27%, females 20.73%)¹¹. The possible explanations for male predominance is that male are more exposed to outdoor work so more physical and psychological stress is faced by them, likewise males are involved more in unhealthy addiction.

Single most important system responsible for sudden natural death is cardiovascular system (50.94 %) followed by respiratory system (26.15 %), central nervous system (11.05 %), gastrointestinal system (5.93 %). Multiple organ infections as the cause of death were reported in 15 (4.04 %) cases, with male in 11 cases and female in 4 cases. Genitourinary system was involved in only 1.89% cases with predominance in male (Table no.2). Similar findings were found in previous studies^{1, 2, 3, 5, 9, 10, 12}. This trend is not consistent with the study conducted by Escoffery C.T. and Shirley S.E.⁸ where CNS was predominantly involved.

Over all coronary artery disease (CAD) was the commonest cause of sudden natural death with male predominance. This finding is consistent with other similar studies^{1, 2, 3, 5, 9, 10, 12} conducted in both developing and developed countries. This may be due

to lack of regular health check-up, sedentary life style and increased work stress in male population which predisposes to coronary artery disease. Contrary to this finding, study conducted in Jamaica (West Indies) by T. Escoffery observed that cerebrovascular accident was the most common cause of SND⁸. Cardiomyopathy was the next most common cause in CVS.

Second common cause of SND was pulmonary tuberculosis (11.86 %). Pulmonary tuberculosis and

pneumonia formed the chief causes of SND in respiratory system. This may be due to higher incidence of pulmonary tuberculosis in our country. Similar findings were observed in some studies^{2,3,13}. Among the CNS causes intracerebral haemorrhage with subarachnoid haemorrhage (SAH) (n-12) was the most common cause of SND followed by SAH alone (n-10). Among gastrointestinal causes of SND, intestinal perforation with peritonitis (n-7) was the most common followed by cirrhosis of liver (n-6) and pancreatitis (n-3).

Table no.1:- Age and Gender wise distribution of sudden natural deaths.

Age (yr)	Male (n-299)	Female (n-72)	Total	Percentage
19- 30	29	9	38	10.24%
31 - 40	55	10	65	17.52%
41 - 50	96	21	117	31.54%
51 - 60	77	21	98	26.42%
61 - 70	37	8	45	12.13%
>70	5	3	8	2.16%

Table no.2:- System wise distribution of sudden natural deaths (n-371)

System	Total	Percentage
Cardiovascular system (CVS)	189	50.94 %
Respiratory system (RS)	97	26.15 %
Gastrointestinal system	22	5.93 %
Central nervous system (CNS)	41	11.05 %
Genitourinary system (Pylonephritis/Glomerulonephritis)	7	1.89 %
Sepsis (Multiple Organ Involvement)	15	4.04 %

Table no.3: System & Gender wise distribution of Causes of Sudden Natural Death

System& Cause of Death	Male	Female	Total	% of all deaths (n-371)
Cardiovascular System	153	36	189	50.94%
CAD without MI*	85	18	103	
CAD with MI	29	4	33	
Valvular diseases	17	0	17	
Cardiac tamponade	4	1	5	

Cont... Table no.3: System & Gender wise distribution of Causes of Sudden Natural Death

Cardiomyopathy	18	13	31	
Respiratory System	79	18	97	26.15%
Pulmonary Tuberculosis	34	10	44	
Pneumonia	22	6	28	
COPD	14	2	16	
Pyothorax	7	0	7	
Pulmonary Embolism	2	0	2	
Gastrointestinal System	18	4	22	5.93%
Ruptured esophageal varices	2	0	2	
Cirrhosis of liver	5	1	6	
Hepatitis	1	1	2	
Intestinal perforation + Peritonitis	5	2	7	
Intestinal intussusception	1	0	1	
Liver abscess	1	0	1	
Pancreatitis	3	0	3	
Central Nervous System	34	7	41	11.05%
Meningitis	5	1	6	
Intracerebral abscess	6	2	8	
Subarachnoid hemorrhage	8	2	10	
Intracerebral hemorrhage	5	0	5	
Intracerebral + SAH	10	2	12	

CAD: Coronary Artery Disease, MI: Myocardial Infarction, COPD: Chronic Obstructive Pulmonary Disease, SAH- Subarachnoid haemorrhage.

Conclusion

This study showed that, the incidence of sudden natural death (SND) is 10.08% with marked male preponderance. Sudden natural deaths due to coronary artery disease were most common cause in this region. People in 4th and 5th decade of life are commonly affected. Before declaring death as a SND, one must rule out other unnatural causes of sudden death. Reliable history from close relative, detail clinical history and previously available health record must be obtained, if available. It is better to do detail histo-pathological study and toxicological analysis in SND cases to avoid any future false allegation on autopsy surgeon.

Ethical Clearance: Ethical clearance was not

necessary as it was a retrospective study which included only collection of data

Conflict of Interest: None declared

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A Study on Factors Influencing Road Traffic Accidents Including Survival Period of Victims, Mortality Pattern and Preventive Measures for Road Traffic Accidents

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Abstract

The term accident has been defined as an occurrence in a sequence of events which usually produces unintended injury, death or property damage. Today, accidents are among the leading causes of death. The present study was conducted in the Department of Forensic Medicine at RNT Medical College, Udaipur. The major head injuries were seen in 154 (77.6%) cases. The skull fractures were seen in 87 cases (56.4%). Subdural haematomas were the most frequent intracranial haematomas seen in 24 cases (15.5%). Cervical spine injuries were seen in 3 (1.5%) cases. In present study chest injuries were seen in 88 (44%) cases. Abdominal injuries were seen in 78 (39%) cases. The study was conducted to prevent road traffic accident. The time required for transport of victims to hospitals was between 1.5 to 3.5 hours. 38.5% deaths occurred within half an hour of the accident whereas about three quarter (77.1%) died within 12 hours.

Keywords: Road traffic accident, head injury, intracranial haematoma

Introduction

The term accident has been defined as an occurrence in a sequence of events which usually produces unintended injury, death or property damage.¹ Today, accidents are among the leading causes of death; in some cases the foremost cause. The number of minor as well as serious injuries, human suffering and economic loss due to disabilities caused by accidents is very difficult to estimate by any measurements. Thus while medical science has conquered the ravages of many diseases, accidents have become a new “epidemic” of public health importance calling for equal effort for control and prevention.²

Among all types of accidents - in home, in places of work (e.g. mines and industries), at play (e.g. sports and elsewhere); those caused by motor vehicles claim the largest toll of life and tend to be the most serious.

Throughout the world, the growth of transport system has been and continues to be a key element in economic development. In the developing world, current trends in population, industrialization and urbanization are putting heavy pressure on transport networks in general and on road systems in particular. Some of the unwanted side-effects of this growth in traffic such as congestion, noise, and many types of pollution are well documented and immediately obvious to the individual citizen; other causes of growing numbers of deaths and injuries from road traffic accidents are apparent only through aggregated statistics. Road traffic accident reveal a serious and growing problem, with absolute fatality and causality figures rising rapidly in majority of developing countries and with death rates; relative to either population or numbers of vehicles, considerably higher than the developed world.³

Accidents constitute complex phenomena of multiple causation. The etiological factors may be classified into two broad categories – human and environmental.²

Materials and Method

The present study was conducted in the Department

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of Forensic Medicine at RNT Medical College, Udaipur. The material for the present study were the autopsy subjects brought for postmortem examination. During the period of study (i.e. full one year), 200 cases of accidents deaths were considered for this study.

Observations

Table 1: Vehicles responsible for accidents (n=200)

Vehicles involved	No of cases	percentage
Two wheelers	115	57.5
Cars and jeeps	44	22
Medium transport	06	3
Heavy vehicles	31	15.5
Others	04	2
Unknown	00	00
Total	200	100

As shown in Table 2 two wheeler most commonly used by farmers and labourers. Two wheelers were the commonest offenders, being involved 115 cases (57.5%).

Table 2: Road accidents: site of injury (n=200)

Site of injury	All injuries	
	No of cases	%
Head and face	154	77
Neck	22	11
Thorax	147	73.5
Abdomen and pelvis	78	39
Upper limbs	112	56
Lower limbs	117	58.5
Number of injuries	630	
Injury per case	3.15	

The above table shows distribution of cases according to body parts involved. Multiple body parts were involved in each case.

Table 3: Type of injury (n=200)

Type of injury	No of cases	percentage
Abrasions	166	83
Contusions	106	53
Lacerations	167	83.5
Fractures and dislocations	186	93

As depicted in Table 3 all types of injuries were common fracture and dislocation were common seen in 186 cases (93%).

Table 4: Time required to reach hospital (n=200)

Time required to reach hospital	Pedestrians	Cyclist	Scooters	Occupant of car, jeep	Medium transport MTV	Occupant of trucks and buses HTV	Others	Total
≤ 15 min	12 (22.6%)	5 (100%)	3 (3.4%)	6 (26%)	1 (33.3%)	1 (6.25%)	0	28
15-30 min	4 (7.5%)	0	12 (13.6%)	2 (7.6%)	0	2 (12.5%)	0	20
30-45 min	24 (45.2%)	0	43 (48.8%)	13 (56.5%)	2 (66.6%)	4 (25.0%)	3 (25.0%)	89
45-60 min	3 (5.6%)	0	6 (6.8%)	1 (4.3%)	0	0	0	10
1-1.5 hr	3 (5.6%)	0	6 (6.8%)	1 (4.3%)	0	0	0	10
1.5 – 2 hr	4 (7.5%)	0	8 (9.09%)	1 (4.3%)	0	2 (12.5%)	2 (16.6%)	17
2 – 2.5 hr	1 (1.8%)	0	3 (3.4%)	0	0	1 (6.25%)	6 (50.0%)	11
2.5 – 3.0 hr	1 (1.8%)	0	4 (4.5%)	0	0	0	0	5
> 3 hr.	1 (1.8%)	0	3 (3.4%)	0	0	6 (37.5%)	1 (8.3%)	11
Spot deaths	0	0	0	0	0	0	0	0
Total cases	53	5	88	23	3	16	12	200

Table 5: Deaths at different time after road accidents (survival period) (n=200)

Survival period	Pedestrians	Cyclist	Scooters & motorcyclists	Occupant of car, jeep	Medium transport MTV	Occupant of trucks and buses HTV	Others	Total
0 – 0.5 hr	23 (43.3%)	3 (60.0%)	34 (38.6%)	6 (26.0%)	1 (33.3%)	3 (18.75%)	4 (33.3%)	74 (37.0%)
0.5 - 1 hr	10 (18.8%)	2 (40.0%)	13 (14.7%)	8 (34.7%)	0	0	0	33 (16.5%)
1 –6 hr	4 (7.5%)	0	11 (12.5%)	3 (13.04%)	0	5 (31.25%)	3 (25.0%)	26 (13.0%)
6 – 12 hr	3 (5.6%)	0	3 (3.4%)	2 (8.6%)	0	0	0	8 (4.0%)
12 – 24 hr	4 (7.5%)	0	2 (2.2%)	1 (4.34%)	1 (33.3%)	6 (37.5%)	2 (16.6%)	16 (8.0%)
24 – 48 hr	2 (3.7%)	0	7 (7.9%)	3 (13.04%)	0	2 (12.5%)	0	14 (7.0%)
48 – 72 hrs	2 (3.7%)	0	13 (14.7%)	0	0	0	3 (25.0%)	18 (9.0%)
3- 5 days	0	0	0	0	0	0	0	0
5 – 7 days	0	0	0	0	0	0	0	0
7 – 14 days	3 (5.6%)	0	4 (4.5%)	0	1 (33.3%)	0	0	10 (5.0%)
> 14 days	2 (3.7%)	0	0	0	0	0	0	2 (1.0%)
Total cases	53	5	88	23	3	16	12	200

Table 6 gives the number of cases who died at different intervals after injury. .

Table 6: Frequency of major regional injuries among different road users (n=200)

Regional Injury	Pedestrians	Cyclist	Scooterist & Motorcyclist	Occupant of car, jeep	Medium transport MTV	Occupant of trucks and buses HTV	Others
Head injury major	28 (52.8%)	3 (60%)	36 (40.9%)	8 (34.7%)	2 (66.6%)	6 (37.5%)	2 (16.6%)
Spinal Injuries	4 (7.5%)	0	8 (9.0%)	2 (8.6%)	1 (33.3%)	3 (18.75%)	0
Chest injuries major	7 (13.2%)	0	10 (11.3%)	2 (8.6%)	0	3 (18.75%)	1 (8.3%)
Abdominopelvic major	2 (3.7%)	0	4 (4.5%)	3 (13.0%)	0	0	2 (16.6%)
Upper limbs	7 (13.2%)	1 (20%)	16 (18.1%)	3 (13.0%)	0	2 (12.5%)	3 (25.0%)
Lower limbs	5 (9.4%)	1 (20%)	14 (15.9%)	5 (21.7%)	0	2 (12.5%)	4 (33.3%)
Total cases	53	5	88	23	3	16	12

Table 7: Major regional injuries in different road users (n=200)

Regional Injury	Total	Pedestrians	Cyclist	Scooters	Occupant of car, jeep	Medium transport MTV	Occupant of trucks and buses HTV	Others
Head injury	154 (77%)	93	04	25	12	17	3	00
a Fracture skull & face	87 (43.5%)	57 (61.2%)	0	10 (40%)	4 (33.3%)	14 (82.3%)	0	0
b Subdural haematoma subarachnoid haemorrhage extradural haematoma intracranial bleed	24 (12.0%)	12 (12.9%)	4 (80%)	2 (8%)	2 (16.6%)	3 (17.64%)	3 (100%)	0
c. Brain injury	20 (10%)	10 (10.7%)	0	8 (32)	2 (16.6%)	0	0	0
d. Herniation and brain compression	23 (11.5%)	14 (15.05%)	0	5 (20)	4 (33.3%)	0	0	0
Abdominal injury	78 (39.0%)	53	17	4	2	1	0	0
Liver	27 (13.5%)	17 (32%)	7 (41%)	2 (50%)	0	1 (100%)	0	0
Spleen	13 (6.5%)	8 (15.7%)	3 (21.4%)	1 (25%)	0	0	0	0
Kidney	18 (9.0%)	10 (18.8%)	5 (29.4%)	1 (25%)	2 (100%)	0	0	0
Bladder	9 (4.5%)	7 (13.2%)	2 (11.7%)	0	0	0	0	0
Gut	11 (5.5%)	11 (20.7%)	0	0	0	0	0	0
Chest injury:	88 (44%)	45 (81.1%)	4 (80%)	22 (25%)	5 (21.7%)	2 (66.6%)	8 (50%)	2 (16.6%)
Fracture ribs	74 (37%)	34 (61.8%)	5 (100%)	11 (12.5%)	11 (4.3%)	2 (66.6%)	0	3 (25%)
Fracture sternum	4 (2%)	1 (1.8%)	1 (20%)	2 (7.1%)	3 (13%)	2 (66.6%)	0	0
Lung	75 (37.5%)	45 (81.1%)	2 (40%)	23 (26.1%)	1 (4.3%)	1 (33.3%)	1 (6.25%)	0
Heart	9 (4.5%)	2 (3.6%)	1 (20%)	3 (3.4%)	1 (4.3%)	0	0	0
Diaphragm	4 (2%)	1 (1.8%)	1 (20%)	1 (1.1%)	0	0	0	0
Cervical spine injury	03 (1.5%)	2	0	0	0	0	0	1
Upper limbs	112 (56%)	45	26	18	5	10	8	8
fracture humerus	98 (49%)	40 (88.8%)	22 (84.6%)	15 (83.3%)	2 (40%)	10 (100%)	8 (100%)	8
fracture BBF	14 (7%)	5 (11.2%)	4 (15.3%)	3 (16.6%)	2 (40%)	0	0	0
Lower limbs	117	57	32	12	10	6	00	17
Fracture femur	(58.5%)	20 (35%)	12(37.5%)	5 (41.6%)	4 (40%)	5 (83.3%)	7	0
Fracture BBL	53 (26.5%)	10 (17.5%)	18 (56.2%)	6 (50%)	4 (40%)	1 (16.7%)	0	0
Fracture pelvic bones	44 (22%)	8 (14%)	02 (6.2%)	1 (8.3%)	2 (20%)	0	7 (100%)	0
Other cases	33 (16.5%)	20	0	3	0	0	0	10
Total cases	200	53	5	88	23	3	16	12

Discussion

Table 8: Comparison between present study and various authors vis-à-vis distributing injuries

Authors	No. of cases	Injuries per case	Body parts involved					
			Head & face (%)	Chest (%)	Abdominal (%)	Upper limb (%)	Lower limb (%)	Spine (%)
McCarrol et al. (1962) ⁴	200	2.9	61	49.5	41.5	19	53.5	7.5
Gissane (1963) ⁵	500	3.5	71.8	35.6	14.2	15.6	29.4	13.4
Sevitt (1968) ⁶	250	2.2	63	36	12	14	34	14
Chandra et al. (1979) ¹¹	1132	--	71.99	9	7.7	--	17.2	--
Srivastava and Gupta (1989) ⁷	462	--	36.36	16.82	8.8	--	37.01	--
Maheshwari and Mohan (1989) ⁸	807	--	31	5	2	14	50	2
Ghosh (1991) ⁹	90	1.98	62.22	42.2	35.55	12.22	21.11	6.67
Tirpude (1990) ¹⁰	80	2.01	67.5	47.5	26.5	11.2	25.0	5.0
Present study	200	3.15	77	73.5	39	56	58.5	11

All types of injuries are common in road accident victims. fractures, dislocations and lacerations were commonest seen in 93% and 88.5% of all cases respectively followed by abrasions in 93% and contusions in 54% cases (Table 3).

Time required to reach hospital:

Only 14% of the victims were rushed to hospital within 15 minutes of accident. Remaining one-fourth

(24%) victims reached hospital in first half an hour. 73.5% reached hospital in next one hour and 79% rushed to hospital in more than one and half hours (Table 5). This delay is due to lack of initiative in rushing victims to nearest hospitals. The area is very hilly and hard geographical conditions. So delay in transport of accident victims. Similar observations in time required to reach hospital and first aid at the spot of accidents were given by Maheshwari and Mohan (1989).⁸

Table 9: Comparison between present study with regard to survival period

Authors	Survival period							
	0-5 hrs (%)	2-6 hrs (%)	6-12 hrs (%)	12-24 hrs (%)	1-2 days (%)	3-5 days (%)	5-7 days (%)	7-14 days (%)
Sevitt (1968) ⁶	16	1.6	--	13.2	--	15.2	10	--
Sevitt (1973) ¹²	35.8	13.38	5.5	4.72	5.1	5.1	4.72	7.5
Chandra et al. (1979) ⁶	36	--	--	36	6.36	5.1	3.7	6.6
Srivastava & Gupta (1989) ⁷	51.53	--	13.2	--	--	20.5	--	--
Present study	37	13	4	9	7	Nil	Nil	5

Similar observations in time required to reach hospital and first aid at the spot of accidents were made by Maheshwari and Mohan (1989).⁸

Survival Period:

The 57 subjects who were dead at site of accident cannot be separated from 77 cases, who were dead on arrival in hospital within half an hour of injury. These 77 subjects were included in group who survived less than half an hour. Hence greatest proportion of deaths occurred within first half-hour when 38.5% of the victims had died.

Thus the severe brain injury and serious lacerations of liver and lung accounted for early deaths. Whereas in the first week, subdural haematoma and cerebral compressions were a common cause of deaths. In victims surviving more than 2 weeks, lower limb injuries and cerebral compressions accounted for death.

Major Regional Injuries:

Head Injury:

The major head injuries were seen in 154 (77.6%) cases. The skull fractures were seen in 87 cases (56.4%). Subdural haematomas were the most frequent intracranial haematomas seen in 24 cases (15.5%). Contusions and laceration brain was seen in 20 (12.9%) cases. Herniation of brain was seen in 23 (14.9%) (Table 6 and 7).

Chandra *et al.* (1979)¹¹ also observed similar trends. Head injury was seen in 71.99% cases, fractures of skull in 57.5% cases and subarachnoid haemorrhage and subdural haemorrhage in 47.79% and 37.45% cases respectively. Contusions and lacerations of brain was seen in 35.15% cases. Similar trends was noted by other workers like Sevitt (1973)¹², Ghosh (1991)⁹ and Tirpude *et al.* (1998).¹⁰

Cervical Spine Injuries:

Cervical spine injuries were seen in 3 (1.5%) cases. They were common in pedestrians (Table 6 and 7).

Tirpude *et al.* (1998)¹⁰ noted spinal injuries in 7.4% cases, Sevitt (1968)⁶ in 8% cases and Chandra *et al.* (1979)¹¹ in 2% cases.

Chest Injuries:

In present study chest injuries were seen in 88 (44%) cases. Fractures of ribs were seen in 74 (37%) cases followed by lacerations and contusions of lung seen in 75 (37.5%) cases, fracture of sternum in 4 (2%) cases. Fracture of ribs was seen in 66.6% occupants of medium

vehicles and 47.2% occupants of cars and jeeps, 66% occupants of medium vehicles and 47.8% occupants of cars and jeeps showed laceration of lungs. The majority of serious injuries to chest occurred from forced compression of sudden deceleration (Table 6 and 7).

Sevitt (1968)⁶ observed chest injuries in 36.4% cases. The fracture ribs was seen in 29.6% cases. Laceration and contusion lung in 14.4% cases. Rupture of diaphragm in 5.2% cases and heart in 1.2% cases respectively.

Similar concurrent finding of chest injuries were seen by Chandra *et al.* (1979).¹¹

Abdominal Injuries:

Abdominal injuries were seen in 78 (39%) cases. The lesions were major ruptures of liver in 27 (13.5%) cases, spleen in 13 (6.5%) cases, gut in 9 (4.5%) cases, kidney in 18 (9%) cases and bladder in 9 (4.5%) cases.

Sevitt (1968)⁶ observed major abdominal injuries in 11.6% cases. Laceration of liver was seen in 7.2% cases, spleen in 4.8% cases and kidney in 1.6% cases.

Chandra *et al.* (1979)¹¹ observed laceration of liver in 17.2% cases, spleen in 5.6% cases and kidney in 4.6% cases. Similar trend was observed in abdominal injuries by Ghosh (1991).⁹

Upper Limb Injuries:

Upper limb fractures were seen in 112 (56%) cases. Fracture both bones forearm was seen in 14 (7%) cases and humerus in 98 (49%) cases. Chandra *et al.* (1979)¹¹ observed upper limb fracture in 9.4% cases and Tirpude *et al.* (1998)¹⁰ observed in 11.25% cases.

Lower Limb Fractures:

Lower limb fractures including pelvic fractures were seen in 117 (58.5%) of cases. Fracture both bones leg was seen in 44 (22%) cases, fracture femur and hip bones in 53 (26.5%) cases and 20 (10%) cases respectively.

The similar trend was noted by workers like Chandra *et al.* (1979)¹¹, Ghosh (1991)⁹ and Tirpude *et al.* (1998).¹⁰

The preventing and control measures

A. The Road:

Due care should be given in maintaining the existing roads by improving road surface, removing road side

obstacles and constructing guard rails, smoothening the sharp arises and painting the traffic signals as required which should be visible by the night time also.

B. The Vehicles

Vehicles designs should be such as to improve visibility for the driver and protect the occupants in even of crash.

C. The Road User:

The responsibility of a driver is of paramount value in controlling and preventing road accidents. it is the driver who can save not only his own life but lives of other road users. So maximum stress should be given on the training and education of the drivers.

D. Emergency Medical Care:

The care of the injured is of foremost importance:

There should be provision of the traffic aid posts at suitable distances on the high risk national and state highways with provisions of quick transport of the injured and necessary first-aid.

Conclusion

Road vehicles have no respect for anatomical boundaries or surgical specialties and two, three or more body regions were injured in accidents. Vital parts like head and chest affected in most of the road traffic accidents.

On average major injury per case was 3.15 and fatal injury per case was 1.21. Keeping in view the results of study, it is suggested that to decrease the mortality in accident victims, the quick transport of the victims to hospital should be available.

The four-wheeler driver should compulsorily use seat belts while driving that can prevent life endangering chest and abdominal trauma that has very high incidence of fatality.

Effective ambulance system should be introduced to transport the victims of road traffic accidents for early treatment.

Speed limit is an important factor to decrease the road traffic accident. All drivers should follow their lane

while driving that can decrease the incidence of road traffic accidents. Titanium coated substance should be used to indicate the traffic signals on highways because they are also visible in dark time.

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Cross-Sectional Study on the Pattern of Skull Fractures & Intracranial Hemorrhages in Fatal Road Traffic Accidents in Chitradurga

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Abstract

Background: Deaths due to Road Traffic Accidents (RTAs) are increasing at an alarming rate & posing a major epidemiological and medico-legal problem. Victims in RTAs sustain various injuries, of which head injuries play a major role. Present study was conducted to know the pattern of skull fractures & intracranial hemorrhages in fatal RTAs. **Method:** Present cross-sectional study was carried out on the victims of fatal RTAs with head injuries, by conducting autopsy at mortuaries of Basaveshwara Medical College and District Hospitals, Chitradurga. **Results:** Most common single type of external injuries over face and head included abrasions in 66% and lacerations 64% cases. Dura mater was torn in 80% cases & 20% cases had intact dura mater. 72% cases presented with skull fracture and all the victims (100%) presented with intracranial haemorrhage and injury to brain parenchyma and 30% cases developed cerebral oedema. The most common type of brain injury noted was contusions in 52% cases. Fissured fracture was seen in 58% cases, followed by comminuted fracture in 14% & sutural in 6%. Subarachnoid hemorrhage was seen in 90% cases, of which 26% cases was in the age group of 31-40 years. **Conclusion:** This study made an effort to study the pattern of head injuries and intracranial haemorrhages leading to death in road traffic accidents. Appropriate preventive measures should be adopted to reduce head injury related deaths in road traffic accidents in the future.

Keywords: Fatal RTA, intracranial haemorrhage, skull fracture, head injury, autopsy

Introduction

Road Traffic Accident (RTA) is any vehicular accident occurring on the roadway (i.e. originating on, terminating on, or involving a vehicle partially on the roadway).¹ WHO defined the accident as, “an unexpected, unplanned occurrence that may involve injury.”² These accidental injuries and deaths are the prices we have to pay for the life on-wheels that our civilization indulges in. India accounts for about 10% of road accident fatalities worldwide. The magnitude

of the accident problem is difficult to define accurately because of the lack of precise figures. Head and neck are most common of all the regional injuries in forensic practice.³ Head injury is a morbid state where there are gross or subtle structural changes in scalp vault and or the content of the skull. A couple of important dicta to be remembered in relation to craniocerebral injury, which would prevent any unnecessary theorizing among doctors as well as lawyers because, ‘Any type of craniocerebral injury can be caused by any kind of blow.’ ‘No form of craniocerebral injury is too trivial to be ignored or so serious as to be despaired of’.⁴ Based on gross anatomical involvement of structures head injuries are classified into - scalp injuries, facial injuries, skull injuries, injury to meninges and injury to the brain.⁵

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Chitradurga being a district headquarters in Central Karnataka has seen growth in population and motor vehicles in a pattern similar to the rest of India. Chitradurga, a city with population of around 1.7 lakh, and being one of the major iron ore mining areas, is well connected by state and national highways. Chitradurga ranks third in road traffic accidents next only to Bangalore and Belgaum in Karnataka. Present study was undertaken to find out the patterns of skull fractures and intracranial haemorrhages among road traffic accident victims brought to Basaveshwara Medical College and Hospital Government Hospital and, Chitradurga.

Objective

To find the proportion of skull fractures and intracranial hemorrhages leading to death in fatal RTAs.

Methodology

This is a cross-sectional study conducted at mortuary of Basaveshwara Medical College and Government District hospital mortuary- Chitradurga. The average number of head injury cases autopsied in the mortuary of Basaveshwara Medical College and Hospital, Chitradurga for a period of six months in 2016 was considered as the baseline. 80% of these cases was considered as the sample size. The average worked out to be 58 cases and 80% of it was 46 cases.

Hence approximately nearest whole number of 50 was considered as the final sample size.

In the present study, a case of head injury as defined by the National Advisory Neurological Diseases and Stroke Council “is a morbid state resulting from gross or subtle structural changes in the scalp, skull, and/or the contents of the skull, which is produced by mechanical forces”.

Dead bodies of road traffic accidents brought to BMCH and Chitradurga District hospital mortuary where the cause of death was due to head injury were included for the study.

Autopsy included a detailed external examination for external injuries and a complete internal examination as per Lettule's technique.⁶ A pretested proforma was used to extract information by interrogating police personnel accompanying the deceased, as well as friends, relatives, neighbours and others who accompanied deceased. The data thus obtained was analysed with respect to socio-demographic patterns like age, sex, cranial fractures, and intracranial haemorrhages. Age of the deceased was estimated as to the nearest completed years. The age groups of victims were categorized in an interval of 10 years. The data so obtained was entered into a Microsoft Excel spreadsheet and analysed. All the categorical variables were presented as frequency and percentages.

Results

Table 1: Distribution of intracranial hemorrhages with respect to age

Age	Extra Dural Hemorrhage (EDH)	Sub Dural Haemorrhage (SDH)	Sub Arachnoid Haemorrhage (SAH)	Intra Cranial Haemorrhage (ICH)	Intra Ventricular Haemorrhage (IVH)
0-10	1	3	3	3	1
11-20	2	2	5	2	2
21-30	1	9	11	9	3
31-40	1	5	13	5	5
41-50	0	2	5	2	1
51-60	2	5	3	5	2
61-70	1	1	4	1	0
>70	0	0	1	0	0
Total	08	27	45	27	14

As shown in [Table 1] out of 8 cases of EDH, 2 cases each were seen in the age group of 11-20 years and between 51-60 years. One case each was seen in the extremes of age i.e., within 1-10 years and 61-70 years age group. Out of 27 cases of SDH, 9 cases were in the age group of 21-30 years. The SAH is seen in maximum

number of cases - 45 cases, of which majority (13 cases) was in the age group of 31-40 years. Intracerebral haemorrhage was seen in 27 cases of which major portion (9 cases) was seen in age group of 21-30 years. Intraventricular haemorrhage was commonly noticed among 31-40 years of age among the 14 cases.

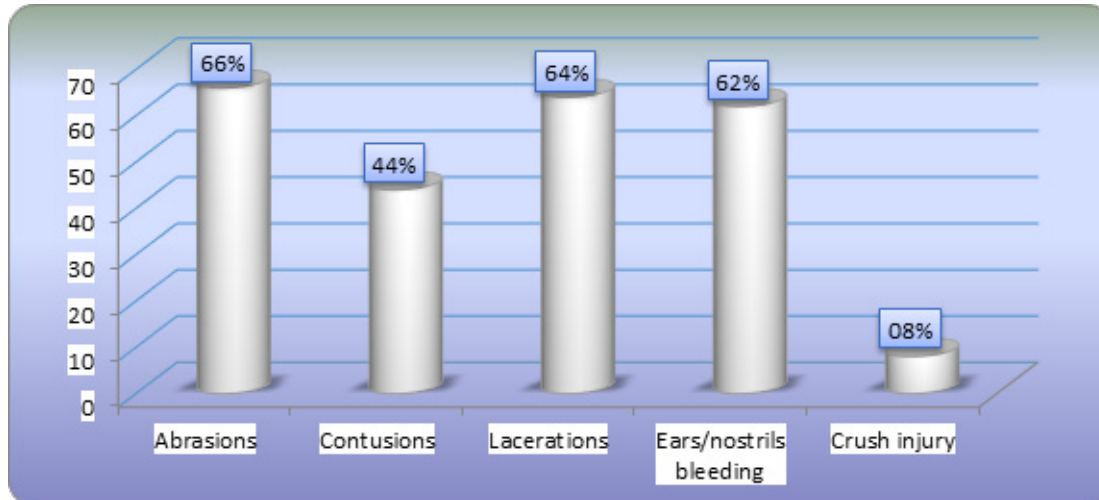


Figure 1: Showing distribution of external injuries over face and head

As evident from [Figure 1] most common single type of external injuries were abrasions seen in 66% cases and lacerations in 64% cases. 44% cases had contusions while 62% cases had bleeding from ears or nostrils. In 8% cases of crush injuries, combinations of all three injuries- lacerations, abrasions and contusions were noticed.

Table 2: Distribution based on meningeal condition:

Meninges	Frequency	Percentage
Torn	40	80
Intact	10	20
Total	50	100

As shown in [Table 2] dura mater was torn in 80% of the cases i.e., had open head injury; 20% cases had intact dura mater. And, 72% presented with skull fracture, all the victims (100%) presented with intracranial hemorrhage, and all victims (100%) showed injury to brain parenchyma and 30% victims had developed cerebral edema.

Table 3: Distribution based on findings of brain

Brain	Frequency	Percentage
Laceration	09	18
Contusion	26	52
Oedema	15	30
Total	50	100

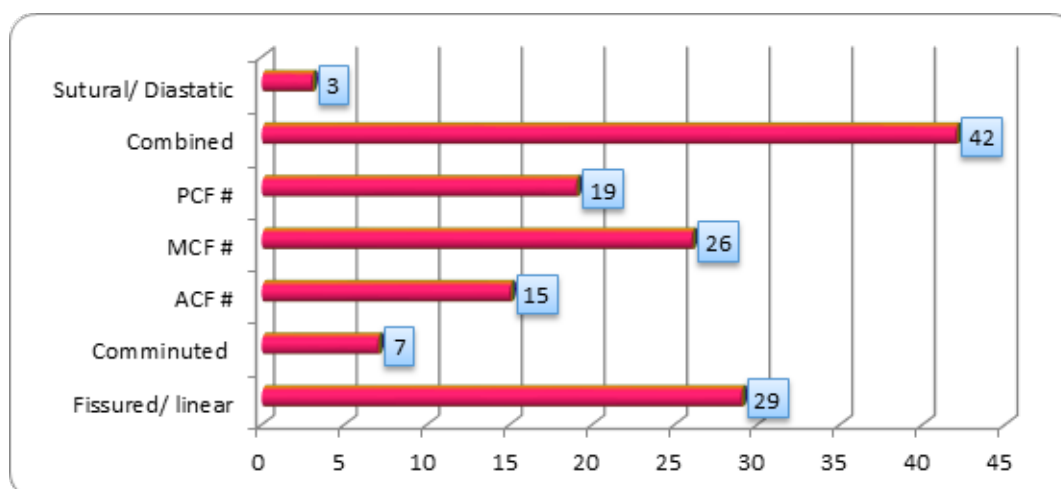
As evident from [Table 3] the most common type of brain injury noted was contusions accounting for 52% cases. Edema of the brain being next common (30% cases), followed by laceration in 18% cases.

Table 4: Association of intracranial hemorrhages with fracture

Intracranial Hemorrhage	No. of cases with fracture	No. of cases without fracture	Total
Extra Dural Hemorrhage (EDH)	08	00	08
Sub Dural Hemorrhage (SDH)	26	01	27
Sub Arachnoid Hemorrhage (SAH)	38	07	45
Intra Ventricular Hemorrhage (IVH)/ Intra Cerebral Hemorrhage (ICH)	12	02	14

As evident from [Table 4] EDH was noted in 8 cases, of which all of them are associated with skull fracture. The SDH was seen in 27 cases of which 26 were associated with skull fracture and 1 without skull

fracture. The SAH is seen in 45 cases out of which 38 were with skull fracture and 07 without skull fracture. Intracerebral/intra ventricular hemorrhages are seen in 14 cases of which 12 were associated with fracture of skull.

**Figure 2: Types of skull fracture**

As shown in [Figure 2], fissured fracture was seen in 29 victims(58%), comminuted fracture in 7(14%), sutural in 3(6%), Anterior Cranial Fossa (ACF) fracture in 15(30%), Middle Cranial Fossa (MCF) fracture in 26(52%), Posterior Cranial Fossa (PCF) fracture in 19(38%) and combined fracture is seen in 42(84%) cases. Diastatic fracture constituted 6% of the cases.

Discussion

Road traffic Accident (RTA) is the main cause for head injury and death worldwide and in India. The heavy traffic in metropolitan cities is the main cause for accidents and often results due to negligence and carelessness.

Head injury due to road traffic accidents result in gross or subtle structural changes within the content of skull and scalp and death. However many studies are available across the world and India to describe the pattern of head injury as results of road traffic accident. But such studies are scant in this part of the country. Hence this study was undertaken with the aim of studying the pattern of head injury& intracranial haemorrhages leading to death in Chitradurga city.

Distribution of intracranial hemorrhages with respect to age:

SAH was seen in 26% cases and majority of them were aged between 31 to 40 years. In support to these findings, maximum numbers of SAH was seen in same

age group in most of the studies. In studies conducted at Brisbane, Queensland;⁷ AIIMS, New Delhi,⁸ the intracranial hemorrhages were more common in the middle age which is similar to the findings of our study. Out of 8 cases of EDH, 2 cases each were aged between 11 to 20 years and 51 to 60 years. One case each was seen in the extremes of age i.e., within 1-10 years and 61-70 years age group. This is similar to a study conducted at the Chief Medical Examiner's Office, Baltimore,⁹ where 3 cases of EDH were seen in infants, which is contrary to popular belief that EDH is rare in infants due to the tough adherence of dura to the surrounding bones. The absence of EDH in age group > 70 years in our study could be due to less number of cases encountered in that age group.

Out of 27 cases of SDH, 9 cases were in the age group of 21-30 years. Intracerebral haemorrhage was seen in 54% cases of which major portion 18% was seen in age group of 21-30 years. Intraventricular haemorrhage was commonly noticed among 31-40 years of age.

Distribution of external injuries over face and head:

Most common type of external injuries on head and face were abrasions seen in 66%, laceration accounting to 64% of injuries and 44% had contusions, 62% cases had bleeding from ears or nostrils. The combination of all three injuries- lacerations, abrasions and contusions were noticed more frequently in this study.

Type of cranial and intracranial lesions:

Dura mater was torn in 80% of the cases in this study i.e., had open head injury; 20% of the cases had intact dura mater. On analysing the type of brain injury- the most common type noted was contusions accounting for 56% of the cases, oedema of the brain being next common (30%) type, followed by laceration in 18% cases.

In a similar study by Shobhana et al,¹⁰ contusion was seen in 35% of cases, 28% of cases showed oedema of brain, 22% of cases showed laceration; brain matter was expelled out in 11% of cases. 34% of the cases showed diffuse involvement of brain.

Intracranial haemorrhages:

In the present study, brain haemorrhages were classified as extradural haemorrhage, subdural

haemorrhage, subarachnoid haemorrhage, and intra cerebral/cerebellar haemorrhage. Subarachnoid haemorrhage was seen in 90% of the cases followed by subdural haemorrhage in 54% of the cases. Intra cerebral/cerebellar haemorrhage and intra ventricular haemorrhage was observed in 28% of the cases.

Subarachnoid haemorrhage was associated with subdural haemorrhage in more than half of the cases in our study. Subarachnoid haemorrhage was associated with intracerebral haemorrhage in 28% cases.

Extradural haemorrhage was appreciated in only 16% cases in this study. EDH was swept out in most of the cases due to fracture of the skull. Hence it was not appreciated at autopsy. All the 8 cases of extradural haemorrhage had fracture of the skull. Among the 54% of the cases with subdural haemorrhage, 52% had fracture of skull. Among the 90% cases of subarachnoid haemorrhage, 76% had fracture of the skull.

Among the 28% cases intra cerebral/cerebellar haemorrhage, 24% had fracture of the skull. Significant association was seen between subarachnoid and subdural haemorrhage in our study. According to various studies, SDH is the most common haemorrhage which differs from our study.^{11,12,13}

In the study by Shobhana et al¹⁰, 75% of cases showed meningeal haemorrhage in the form of SAH and SDH, 8% of cases showed SDH alone, 6% of cases showed combination of EDH, SDH and SAH, 5% cases showed SAH, 1% of cases showed EDH. Similar results were also obtained in studies conducted at Chief Medical Examiner Office, Baltimore⁹ (75% of skull fractures are associated with intracranial haemorrhage).

Types of skull fracture:

Fissure fracture of the skull was the commonest fracture seen in 58% of the victims in our study followed by MCF and PCF fractures. Combined fracture was seen in 84% of the victims. Fracture of skull was also observed in studies conducted at Brisbane, Queensland (48.3%)⁷ and PGIMS, Rohtak (51.6%).¹⁴

In a study conducted based on autopsy findings at AIIMS, New Delhi, skull fractures was present in 79.87% of the road traffic accident victims. The fissured fracture was the most common type, followed by depressed, comminuted and compound fractures. These findings are consistent with the findings in our study.⁸

In our study, on considering the skull base fracture, majority of cases had combined fractures in 84% of the victims. Fracture of MCF was present in 52% of the cases and PCF in 38% cases and then ACF in 30% cases. This study was in contrast to the study conducted in Northeast Delhi, which had shown the involvement of PCF in 40% of the cases followed by ACF involvement in 20% cases.¹⁵ In contrast a study conducted at Manipal, MCF was involved in 26% of cases, PCF in 17% of the cases and ACF in 15% of the cases.¹⁶

Higher occurrence of skull fracture can be due to recent increase in number of vehicles that too motor cycles, anatomy of skull and its movement in relation to the jerk, sudden brake and acute turns in accidents might be the cause of impact to head.

Conclusion

The study revealed the patterns of skull fractures and intracranial haemorrhages leading to death in fatal RTAs. Abrasions were more frequent type of external injuries noted followed by combination of other types of injuries like contusions and lacerations. This study has made an effort to study the pattern of head injuries and intracranial haemorrhages leading to death in road traffic accidents.

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Conflict of Interest – None declared.

Ethical Approval – The study was approved by Institutional Ethics Committee.

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Original Research Paper

An Autopsy based Study for Estimation of Stature from Anthropometry of Combined Length of Forearm and Hand in Female Population of Indore Region (M.P.)

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Abstract

Identifying unknown individuals is a key part of the forensic anthropology. Anthropologists assist in identifications primarily by constructing a biological profile. The most important applications of anthropology at field level include biological anthropology, epidemiology, clinical application and in metabolic research.^[1,2] The stature prediction occupies relatively a central position both in the anthropological research and in the identification necessitated by the medical jurisprudence or by the medico-legal experts. So it is important for medico-legal as well as humanitarian reasons. The present study will be conducted to find out possible correlation between stature of an individual & combined length of forearm & hand and derive regression formula to estimate the stature from anthropometry of combined length of forearm & hand. This cross-sectional study was carried out on 250 deceased Females of age 21 years and above brought for post mortem examination in mortuary of Forensic Medicine Department, M.G.M. Medical College and M.Y. Hospital, Indore (M.P.). The mean combined length of right and left forearm and hand in Females was **42.99 ± 1.70 cm** and **42.82 ± 1.70 cm** respectively, whereas mean stature was found to be **156.25 ± 5.29 cm** in Females.. In this study maximum stature in Females was found to be **167.3 cm**, while minimum stature was found to be **145.0 cm**. It can be concluded that the present study has provided regression equations for parameters that can be used for stature estimation in the population of Indore. These equations should not be used for other Indian population groups. Definite proportion exists between the stature and combined length of forearm and hand in all individuals

Keywords: Identification, anthropometry, stature, combined length of forearm and hand.

Introduction

Personal identification of an unknown individual is one of the main objectives of forensic investigations.

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Identification of dead body and proof of “**corpus delicti**” is essential and integral part of any criminal and civil justice delivery system throughout the world. The main part of corpus delicti (i.e. the body of the offence; the essence of crime) is the establishment of the identity of the dead body Identification of an individual is very important in criminal cases like assault, murder, rape, disputed paternity, impersonation etc. and in civil cases like marriage inheritance, disputed sex etc.^[3,4]

Reconstruction of body stature has been a subject of study since the beginning of nineteenth century

in the specialised areas of forensic anthropology which deals with the application of methods and techniques of analysing skeletal remains. **“Forensic anthropology, an applied discipline, is a branch of physical anthropology, which interacts with other disciplines pertaining to the understanding of crime and its investigations.”**^[5,6] In other words **“Forensic anthropology** is the application of the science of anthropology and its various subfields, including forensic archaeology and **forensic taphonomy** in a legal setting”.^[7]

Regression formulae and multiplication formulae (M.F.) formulated on population need to be revised at least ones in decade to have greater accuracy in the prediction of stature among the living population.⁸ limb bone length is known to be the best indication of stature because, the long bone have got a greater definite correlation to height of an individual.⁹ There is no universally acceptable formulae to express relationship in between stature and length of long bones of a individual. Estimation of stature of an individual in India by using formulae given by western workers involves an error of 5-8%. various factor like race, sex, side of body, climate, heredity and nutritional status are attributed to variation in the ratio of length of limb bones to that of stature.^{10,11} literature regarding regression equation from this part of the world is scant. However, the only available method for stature estimation in central Indian is multiplication factors derived for Madhya Pradesh thus, this study on subject from central India is undertaken. Our study will be useful for identification of a person by estimating stature when only a part of dead body is available.

It has become an important necessity in recent times due to natural disaster like earthquakes, tsunamis, cyclones, floods and man-made disasters like terror attacks, bomb blast, mass accidents wars, plane crashes etc. Apart from this the estimated stature narrows down the pool of potential matching Identities for an investigator in cases of missing persons reports.

Height like other phenotypic traits is determined by a combination of genetic, environmental as well as demographic factors.^[12] It has been emphasized that relationships of different body parameters vary from population to population due to differences in nutrition and levels of physical activity.^[13]

The lack of anthropometric data concerning the

local population of Indore was felt as the city is prone to disasters like the blast, mass accident. Hence the present study was aimed at & concentrated on the Indian population of Indore of known stature of which anthropometric measurements of combined length of forearm and hand were calculated & correlated with stature to find regression formulae. Study was carried out at Department of Forensic Medicine & Toxicology, M.G.M. Medical College and M.Y. Hospital, Indore (M.P.).

Material and Method

The present Cross Sectional study was carried out on a sample of 250 deceased Females in mortuary of Department of Forensic Medicine, Mahatma Gandhi Memorial Medical College and M.Y. hospital, Indore (M.P.). In the present study, convenient sampling procedure was done. Study subjects are all Female cases of postmortem examinations of age more than 21 years. Subjects with skeletal abnormalities, deformities, amputated lower limbs, mutilated and decomposed body were excluded. Written informed consent was taken prior to the research after giving detailed information to the relatives of the subjects regarding the study.

Firstly detailed history was taken both regarding the incident and complete clinical history including operative procedures. Detailed individual demographic data including the height, sex, age etc. were also recorded on the pre-structured pro-forma. Anthropometric measurements of the combined length of forearm and hand on the left and right side of each individual, Stature of each subject was also recorded. All the measurements were taken in daylight. The measurements were taken twice for accuracy. The measurements were taken using standard anthropometric instruments in centimeters to the nearest millimeters. Proper care has been taken to avoid any excessive compression of underlying tissues and to record the measurement precisely.

Stature is measured as the vertical distance between the vertex and the heel in mid sagittal plane, where the vertex is the highest point on the head when the head is held in Frankfurt Horizontal (FH) plane using Standard measuring tape.

The length of Forearm and hand was measured between tip of olecranon process of ulna and the tip of middle finger of hand of the subjects using sliding caliper as well as standard measuring tape. The measurements

were taken where the pronated and forearm were placed on flat, hard and horizontal surface with ex-tended and abducted fingers but without any abduction adduction, flexion or extension of wrist-joint so that the forearm was directly in longitudinal axis with the middle finger.

At first the researcher selected and analyzed the variables, then the base line data were represented using tables. Statistical analysis was carried out using IBM SPSS Statistics (IBM, current version 2015- statistical package for the social sciences) software package to calculate linear regression equations and compute multiplication factor. Every questionnaire had a code number to input into the SPSS software. Multiplication factors for hand dimensions were calculated by dividing the stature of an individual by combined length of forearm and hand for each subject in Females. The mean values & standard deviation (SD) of forearm and hand dimensions were calculated. Pearson's correlation coefficient was calculated to establish the correlation between the stature and combined length of forearm and hand dimensions. Paired sample t-test was performed to find the right and left side differences in combined length of forearm and hand dimensions among Females. The significance of results was tested using Student's t-test. p value was used for testing statistical hypothesis. p-value of less than 0.05 was considered as significant and less than 0.001 as highly significant.

Results

The present study was carried out on a sample of 250 deceased Females in mortuary of Department of Forensic Medicine, Mahatma Gandhi Memorial Medical College and M.Y. hospital, Indore (M.P.). Table 1 shows age wise distribution of the study subjects. In this study mean age of the study subjects was found to be **40.42 ± 14.85** years. Table 2 shows Maximum numbers of cases were in age group of 21 to 25 years (16.8%), while minimum numbers of cases were in age group 80 to 85 years and 85 to 90 years (0.0 %).

Table 3 shows mean stature in subjects was **156.25 ± 5.29**. In this study maximum height reported was **167.3cm** while, minimum height was **145 cm**. Table 4 shows the statistical analysis for combined length of forearm and hand in study subjects. The table shows that mean combined length of forearm and hand on right side (**42.99 ± 1.70 cm**) are more than mean combined length of forearm and hand on left side (**42.82 ± 1.70 cm**) in subjects. In this study maximum combined length

of forearm and hand was **45.7cm**, while minimum combined length of forearm and hand was **38.5 cm** on right side and the range was from **38.5 cm to 45.7 cm**, whereas maximum combined length of forearm and hand was **45.4 cm** and minimum combined length of forearm and hand was **38.2 cm** on left side and the range was from **38.2 cm to 45.4 cm**. In this study average combined length of forearm and hand was found to be **42.91±1.69cm**. Maximum average combined length of forearm and hand was **45.55cm** while minimum combined length of forearm and hand was **38.4cm**.

Table 5 shows the regression equation of combined length of forearm and hand with stature. The equation obtained is $66.80 + 2.082 \cdot \text{RCLF\&H}$, $67.34 + 2.077 \cdot \text{LCLF\&H}$ and $66.49 + 2.093 \cdot \text{AvCLF\&H}$, shows that by putting the value of RCLF&H, LCLF&H & Av. CLF&H in the equation stature can be measured.

Table 6 shows statistically significant, positive correlation was seen between all the parameters. In the present study a strong correlation was found between right and left combined length of forearm and hand (**r=0.987**). A significant correlation was found between combined length of forearm and hand and stature (**r=0.900**).

Discussion

The present study was carried out on a sample of 250 deceased Females in mortuary of Department of Forensic Medicine, Mahatma Gandhi Memorial Medical College and M.Y. hospital, Indore (M.P.). An attempt was made to correlate combined length of forearm and hand with stature and derive regression equations to calculate stature from combined length of forearm and hand. On the basis of this combined length of forearm and hand, stature was found to be positively correlated and the association was highly significant. The combined length of forearm and hand and stature correlation coefficient (r) in Females was 0.900. In the present study the mean stature of female subjects was found to be $156.25 \pm 5.29\text{cm}$, which was slightly lower than the findings of the other studies Illayperuma et al (2009)^[14] and Vaghefi et al (2014)^[15], while it was slightly higher than the study done by Choudhary et al (2014)^[16] and was nearly comparable with the study done by Kumar et al (2010)^[17] when compared to present study

The regression equation obtained is $66.80 + 2.082 \cdot \text{RCLF\&H}$, $67.34 + 2.077 \cdot \text{LCLF\&H}$ and $66.49 +$

2.093* AvCLF&H in our study. The regression equations derived in the present study showed a different pattern than earlier studies. The table clearly shows variations in the regression equations in different ethnic groups in India. So regression equations of the present study cannot be applied to other population groups

There is dimensional/proportional relationship between specific body segments and the whole body. Anatomically limbs exhibit consistent ratio relative to the total height of a person and these ratios are linked to the age, sex and race. So the principle of biological correlation of the body parts with each other is applied to estimate stature on an individual. While anthropometric measurements (stature and built) differ in different sex and ethnic groups due to demographic factors and are strongly influenced by genetic and environmental factors, suggesting the need for different normograms for each endogamous group. Furthermore, the need for the alternative formulae for the genders is also proved as the rate of skeletal maturity in both sexes vary during the course of development. The results of the present study can be used as baseline information for population based studies in central region of Madhya Pradesh, India, So that anthropologists, forensic and other medico-legal experts can estimate the stature of the individual of this part of India of either sex by the use of combined length of forearm and hand within the standard error of estimate. One must consider differences between populations to apply such formula to other populations.

These types of studies are of medico legal importance, as the first step in forensic analysis is establishing the identity of the person in question, where stature remains one of the primary characteristics of identification. So the findings of the present study will be useful for forensic experts and anthropologists. These studies also help to know the differences between different population groups.

Table-1: Distribution of anthropometric parameters for age in study subjects

VARIABLE	Age in years
	Female
MEAN	40.42
STD DEV	14.85
MAX	90
MIN	21
RANGE	21-90

Table 2: Age wise distribution of study subjects

S. No.	Age group (years)	No. of Cases	Percentage (%)
1.	21+ -25 years	42	16.8
2.	25+ -30 years	41	16.4
3.	30+ -35 years	41	16.4
4.	35+ -40 years	24	9.6
5.	40+ -45 years	25	10.0
6.	45+ -50 years	19	7.6
7.	50+ -55 years	18	7.2
8.	55+ -60 years	19	7.6
9.	60+ -65 years	8	3.2
10.	65+ -70 years	5	2.0
11.	70+ -75 years	2	0.8
12.	75+ -80 years	6	2.4
13.	80+ -85 years	0	0.0
14.	85+ -90 years	0	0.0

Table 3: Distribution of height among study subjects

Variables	Mean	STD DEV	Max	Min	Range
HT in cm	156.25	5.29	167.3	145.0	145.0-167.3

Table 4: Statistical analysis for combined length of forearm and hand in study subjects

Variables	RCLF&H in cm	LCLF&H in cm	Av. CLF&H in cm
MEAN	42.99	42.82	42.91
STD DEV	1.70	1.70	1.69
MAX	45.7	45.4	45.55
MIN	38.5	38.2	38.4
RANGE	38.5-45.7	38.2-45.4	38.4-45.55

Table 5: Association of different variables for combined length of forearm and hand with stature in study subjects

S. No.	Combined length forearm and hand with stature	Regression equation
1.	HT with RCLF&H	$66.80 + 2.082 * \text{RCLF\&H}$
2.	HT with LCLF&H	$67.34 + 2.077 * \text{LCLF\&H}$
3.	Avg. CLF&H with HT	$66.49 + 2.093 * \text{ACLF\&H}$

Table 6: Correlation between different variables in study subjects

Variables	Correlation Coefficient (r)	Correlation	Impression
Correlation between RCLF&H & LCLF&H	0.987	P=0.000*	Very strong, positive, statistically significant correlation
Correlation between Av.CLF&H & HT	0.900	P=0.000*	Very strong, positive, statistically significant correlation

HT- Height

RCLF&H– Right combined length of forearm and hand

LCLF&H– Left combined length of forearm and hand

Av.CLF&H – Average combined length of forearm and hand

Conflict of Interest – Nil

Source of Funding – Self

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Rise in Deaths Due to Fall from Height: A 3-Year Retrospective Study

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Abstract

Deaths due to fall from height are the second leading cause of injury-related deaths. The fatalities of the injuries depend not only on the height of fall but also on the landing position and impact surface. Additionally, diversity of the injuries and the complexity of the patterns involved in these injuries, emphasizes the need for study in this area. A retrospective autopsy study of deaths due to fall from heights was carried out at the Department of Forensic Medicine, KIMS Hospital, Bangalore from January 2014 to December 2016. Among the total 1911 cases autopsied during the study period, 90 cases (4.07%) were deaths due to fall from height. Maximum number of cases was in the second decade of their lives (36.6%) and was followed by cases in third decade (21.1 %). male to female ratio was 6.5:1. About 41.1% of the cases were construction workers, followed by 15.5% students. Fatal height of fall was within 0-20 feet (48.8%) followed by 21-40 feet (44.4%). Amongst the fatal fall, 63.3% of cases succumbed to injuries without treatment. It was observed that in 41.1% the impact was on hard surface followed by fall on tiles in 35.5%. Head injury was the leading cause of death in 51.1% of the cases. We concluded that fall from heights carry a significant morbidity and mortality and to decrease the incidence of these deaths, it is important to employ certain vital strategies. These include creating awareness amongst workers, increasing parental supervision of toddlers during their play at heights and psychological counseling for students.

Keywords: Height of fall, Impact, Pattern of Injuries, Cranio-cerebral damage.

Introduction

Increasing urbanization and civilization has led to an increase in construction of high rise buildings especially to gratify human needs. Additionally, factors like unsafe/uneven surfaces, poor lighting and slippery surfaces, diminished eyesight and problems with gait and balance among elderly contribute immensely to greater incidence of fall from heights.

Globally, fall from height are a substantial public jeopardy and are among the important leading causes of

serious and fatal injuries. It is the second leading cause of injury-related death worldwide. It is also a major cause of personal injuries disproportionately affecting the very young and the very old and causing a significant impact on victim's families and the society.

A fatal fall from height can result from accidents, suicides or homicides. In some cases, the manner of death becomes ambiguous. This is due to the fact that multiple injuries sustained due to fall pose a difficult task to autopsy surgeon to ascertain if the injuries were sustained due the fall or inflicted by other means before the fall. The severity of injury depends on many factors like the weight of the body and the manner in which the body impacts against the surface. Complexity of injuries increases with an increase in the height of the fall.

In this study, we retrospectively evaluated the

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demographic data, injury pattern of such cases and utilized this information for formulating the necessary preventive measures.

Materials and Method

A Retrospective study of deaths due to fall from height for a period of 3 years, from January 2014 to December 2016 was studied in the Department of Forensic Medicine, Kempegowda Institute of Medical Sciences, Bangalore. This study was conducted using a pre-tested structured proforma which fulfilled the inclusion and exclusion criteria, police inquest and perusal of hospital records.

Results

During this study period, total of 1911 cases were brought for post-mortem examination. Out of the 1911 cases, 90 (4.7%) cases were deaths due to fall from height.

Gender distribution - Of the 90 cases, 78 (86.6%) were male and 12(13.3%) were female fatalities. The males outnumbered the females in entirety and male to female ratio was 6.5:1. (Table-2)

Age distribution - The maximum number of victims 33 (36.6%) belonged to age group of 21-30 years followed by 19 (21.1%) belonging to 31 to 40 years age group. The least age was 1 year and uppermost age was 78 years. (Table-1)

Occupation/livelihood/education distribution - Predominance of deaths was seen among construction workers as seen in 37(41.1%) cases, followed by deaths among students as seen in 14(15.5%) cases, among factory workers as seen in 10(9%) cases and professionals as seen in 8(8.8%) cases. Least deaths were seen among toddlers as seen in 4(4.4%) cases and in senior citizens as seen in 3(3.3%) cases. (Table-3)

Status of treatment - Among the fatalities 57(63.3%) cases did not receive treatment and only 33(36.6%) cases received treatment. Among the ones who received treatment, the survival period of the injured was within 1-3 days in 28(84.8%) cases followed by 4-7 days in 4(12.1%) cases and in only 1 case survival was 7-14 days.

Height of fall - The height of descent among 44(48.8%) cases was 0-20 feet followed by 21-40 feet

among 40(44.4%) cases. The least of 61-80 feet and 81-100 feet was noticed in 1(1%) of cases. Evaluation of impacting surface of the body revealed that about 37(41.1%) cases fell on hard surface, followed by on tiles in 32(35.5%) cases and on cement surface in 9(10%) cases. (Table-4) & (Table-5)

Pattern and location of injuries - In about 74(82.2%) cases, external injuries were sustained in the cranial region. Internal categorization of injuries revealed that 69(76.6%) cases sustained intracerebral injury and 56(62.2%) cases sustained skull fractures.

In 66(73.3%) cases injuries were seen in thoracic region. Internally ribs fracture in 57(63.3%) cases and 41(45.5%) cases sustained lung injury. In 42(46.6%) cases, injuries were in abdomino-pelvic region. Internal categorization of injuries revealed that liver injury was highest among 25(27.7%) cases, followed by injury to kidney in 20(22.2%) cases. Long bones fracture was seen in 13(14.4%) cases and pelvis fracture in 10(11.1%) cases.

Opinion to the cause of death due to fall from height was head injury in 46(51.1%) cases followed by multiple injuries sustained in 43(47.7%) cases.

Table 1 – Age distribution

AGE DISTRIBUTION			
	2014	2015	2016
0-10	2	3	2
11-20	3	3	3
21-30	8	12	13
31-40	10	1	8
41-50	3	3	5
51-60	2	3	3
>60	0	1	2
TOTAL	28	26	36

Table 2 – Gender distribution

GENDER DISTRIBUTION		
	MALE	FEMALE
2014	22	6
2015	23	3
2016	33	3
TOTAL	78	12

Table 3 – Occupation

OCCUPATION			
	2014	2015	2016
Construction worker	11	10	16
Factory worker	3	3	4
Student	6	4	4
Agricultural worker	3	2	1
House wife	2	1	2
Professional	1	2	5
Toddler	1	1	2
Daily wage worker	1	2	0
Senior citizen	0	1	2
TOTAL	28	26	36

Table 4- Height of fall

HEIGHT OF FALL			
	2014	2015	2016
0-20	16	14	14
21-40	9	11	20
41-60	2	1	1
61-80	1	0	0
81-100	0	0	1
TOTAL	28	26	36

Table 5- Impact surface

IMPACT SURFACE			
	2014	2015	2016
Hard surface	12	8	17
Cement	4	2	3
Stone	1	2	0
Tiles	6	11	15
Mud	3	3	1
Sand	2	0	0
TOTAL	28	26	36

Discussion

Deaths due to fall from height is the second leading cause of injury-related deaths and are on rise. These findings are similar to other studies.^{1-4, 8}

Similar to studies done earlier,^{1-5, 7, 8} our study showed that maximum number of cases was in the age group of 21-30 years and 31-40 years. However, this finding was in contrast to one of the studies.⁶ Male predominance seen in our study was similar to few other studies¹⁻⁸. This could be due to the fact that the young age groups are more vulnerable to falls validating their stressful and ambiguous lifestyles. The high incidence in males could be due to two reasons – males being the breadwinner of the family are more exposed to stress, strain and occupational hazards and a greater amount of zeal is involved in handling the work at heights compared to females.

Similar to some studies^{1, 2, 8} majority of deaths occurred among construction workers. Lack of education, poor working skills, worker's qualities like careless attitude, misjudgment, and overconfidence in doing the unusual work, lack of safety measures employed could be the reasons causing fatal injuries. Chronic work pressure/burnout, poor sleep deprivation, work depression due to increased workloads, rigorous physical activities and working at heights for long intervals causing over exertion are few other predisposing factors for fatigue causing fatal injuries.

Among students, the reasons could be due to high amount of stress they are subjected to in their lives either due to personal affairs, poor academic performance, low self esteem and negative peers. The decreased incidence of falls among professionals can be due to secure employment and the awareness and the privileges of the rights to live. In toddlers, evolving developmental stage, innate curiosity of their surroundings, inadequate supervision, and improper safety measures employed could be the reason behind their death. In senior citizens, ageing leading to variations in physical, sensory and cognitive functions, prevailing health issues, loneliness, depression, family pressure, and general debility could be the reasons behind their deaths.

Among the impacting surfaces, the unyielding surfaces like hard surface and tiles offered resistance and energy during impact caused grave injuries. This was similar to one among studies.⁴ During impact, despite resistance being offered by the victims as a protective mechanism, head is still the most vulnerable organ to injury. This could be the reason behind head injury being the most common injury. This is followed by thoracic and abdomino-pelvic injury. These findings was similar

to one among studies.¹⁻⁸

Conclusion

Deaths due to fall from height is on the rise. Most of the deaths due to fall from heights could be averted by using protective equipments, personal fall arrest systems, on-site precautionary measures, short safety training courses for the workers, adequate rest among workers, to employ ergonomics to derive a holistic approach to deal with risks involved from fall from height. Psychological counseling for students and elders and safety measures and strict supervision among toddlers would be few other mechanisms to avert fall from heights. This approach could reduce the morbidity and mortality of deaths due to fall from heights and decrease the burden on the health care system.

Limitations

Our study has limitations associated with the community. Since it was a retrospective study, we relied only on the data reported and not all variables were documented. The variables that were documented were based on the reporting of the study cases.

Conflicts of Interest: None

Funding: None

Ethical Approval: Obtained

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A Comparative Study of Lip-prints on Bond Paper and Cloth

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Abstract

Article 6 of the Universal Declaration of Human Rights states that everyone has a right to identity as a person, and its importance cannot be overemphasized anywhere else than in the court of law. The wrinkles and grooves on labial mucosa called as sulci-labiorum forms a characteristic pattern and the study of these is referred to as cheiloscopy. These are unique to an individual just like the fingerprints hence, behold the potential for identification purpose and can be used to verify the presence of a person at the scene of crime. The aim of study was to compare the lip-prints taken on bond paper and cloth.

The study was done in north Haryana from 2010-11 on 100 subjects. Purposive sampling was done and subjects were asked to produce lip prints on cloth as well as on bond paper. The data obtained using these two base materials were analyzed for any difference in results using Fischer's exact test.

The difference in the result between the lip prints obtained using bond paper and cloth was found to be statistically non-significant. Hence, it can be concluded that lip prints present on the cloth of the accused as in crime scene can be compared with samples obtained on bond paper.

Keywords: Identification, Lip-prints

Introduction

Identity means determination of individuality of a person beyond doubt, based on physical characteristics unique to an individual¹. Article 6 of the Universal Declaration of Human Rights states that everyone has a right to identity as a person, and its importance cannot be overemphasized anywhere else than in the court of law².

The question of identification of a living person arises everyday in civil & criminal cases alike ranging from unlawful possession of property, insurance claims, prolongation of lapsed pension to absconding soldiers, criminals accused of assault, rape, sodomy or murder.

Although DNA & finger printing have been successful in personal identification, DNA matching is a technically complex procedure and requires high

quality laboratory facility which is not readily available everywhere in a developing country like ours. Finger prints on the other hand are prone to damage due to damage to hand as a result of wear & tear.

The wrinkles and grooves on labial mucosa, called as sulci-labiorum forms a characteristic pattern and the study of which is referred to as cheiloscopy. These are unique to an individual just like the fingerprints and hence, behold the potential for identification purpose.

Fischer was the first anthropologist to describe the furrows on the red part of the human lips. The use of lip prints were first recommended as early as in 1932 by Sir Edmond Locard, one of France's greatest criminologists. LeMoyne Snyder in his book Homicide Investigation, written as early as 1950, mentions the possible use of lip prints in the identification of individuals³. Lip-prints can be instrumental in identifying a person positively and used to verify the presence or absence of a person at the scene of crime⁴, especially in cases of heinous crimes against women.

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The current practice is to take lip-prints on paper or cellophane sheets⁵ whereas those found on crime scene are mainly on cloth and glass. Therefore, keeping this source of potential error in mind, this study was designed to adjudge the comparability of lip-prints obtained on cloth and bond paper.

Aim

The aim of the study was to compare the lip-prints taken on bond paper and cloth.

Material & Method

The study was done at a tertiary care centre in north Haryana from 2009 to 2011 on 100 subjects from various age groups.

Inclusion criteria: All consenting adult individuals with healthy lips.

Exclusion criteria: Subjects with deformity/injury & disease over lips were not included in the study.

Consent was taken from participants after explaining the purpose and procedure of the study.

Purposive sampling was done and subjects were asked to produce lip prints on cloth as well as on bond paper as follows:

1. The subjects were asked to clean his/her lips with water & dry them with tissue paper.
2. A dark coloured frosted lipstick was applied on the lips up to the vermillion border.
3. A bond papers was fixed on cardboard, bearing the serial number & date of sample collection written on top and another piece of white cotton cloth was fixed on cardboard bearing the same serial number & date of collection was given to each subject.
4. The subjects were asked to press his/her lips onto the papers by holding it between the lips, so as to leave a clear impression of their lips on the papers.

5. The samples thus obtained were compared by studying 20 patterns per sample (5 in each quadrant) and coding was done in accordance to Suzuki and Tsuchihashi classification⁶

The data obtained using these two base materials were analyzed for any difference in results using Fischer's exact test.



Photograph showing procedure of sample collection

Results

The following results were obtained among the total hundred cases that were studied.

Five samples were unreadable due to poor quality of lip-prints obtained and hence had to be discarded.

Amongst the remaining Ninety-five samples, Ninety-three showed a complete match. However, two samples did not show a complete match.

The data obtained was analysed statistically using Fischer's exact test and the difference in the results between the lip prints obtained on bond paper and cloth was found to be non-significant.

Table depicting comparison of print on bond paper vis a vis cloth (* Out of 100 samples taken 5 were discarded)

Lip Print	Bond Paper			
Cloth print		Quadrant Matched	Quadrant Unmatched	
	Matched	93	0	p-value 0.0004
	Unmatched	0	2	
	Total	93	2	95*

Discussion

Various studies have been conducted for determining feasibility & reliability of lip-prints as a tool of identification.

However, no similar study with regards to comparison of material used as base for sampling was available for comparison.

Conclusion

The statistical analysis of data obtained in this study shows that there is no significant difference in the lip print obtained on cloth as compared to those on bond paper. Hence, it can be safely concluded that lip prints present on the cloth of the accused at the crime scene can be compared with samples obtained on bond paper.

Conflict of Interest: No conflict of interest declared.

Source of Funding: Self

Ethical Clearance: Ethical clearance taken from institutional ethical committee.

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Appraising Perception and Knowledge of Medical Practitioners in Context with Ubiquitous Aspects of Consent

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Abstract

Aim: To evaluate Perception & Knowledge of consent in Medical practice in various circumstances amongst the Medical practitioners. **Objectives:** To assess, the qualification wise difference in Perception & knowledge regarding consent. To evaluate the Perception & knowledge of various aspects of consent like types of consent, consent in Medical and Surgical management, consent in treatment of minors etc. Reviewing current practice of obtaining consent and to study the orientation regarding the various prerequisites while notifying the consent. **Materials and Method:** Cross sectional Observational study. Collective sampling method was used. Sample size: 200 RMP working in medical college were included. An elaborate questionnaire was prepared to obtain all the information incorporated in the aim and objectives of the study. **Results:** The correct responses were calculated. All the variables in the study were analyzed statistically. It was found that the participants are having the enough perception and required knowledge regarding most of the aspects of consent but it was lacking in some of the aspects of consent. **Conclusion:** It can be conclude that Medical practitioners were having required perception and Knowledge regarding most of the aspects of consent but it was deficient in some of the aspects. It may be justified by non availability of CMEs & orientation programmes regarding information about consent and also diverse field of Participant doctors.

Keywords: Evaluate, types, aspects, required, orientation programmes.

Introduction

Every human being of adult years and of sound mind has the right to determine what shall be done with his body and a surgeon who performs an operation without the patient's consent commits an assault for which he is liable to damages¹.

Consent means voluntary agreement, compliance or permission. To be legally valid, it must be given after understanding, for what it is given and of risks involved². To examine, treat or operate upon a patient without consent is assault in law, even if it is beneficial and done in good faith except in emergency. The patient may

recover damages. If a doctor fails to give the required information to patient before asking for his consent to a particular operation or treatment, he may be charged for negligence. The expression of personal liberty under Art. 21 is of the widest amplitude and covers a wide variety of rights, including the right to live with human dignity and all that goes along with it, and any act which damages, injures, or interferes with the use of any limb or faculty of a person, either permanently or temporarily³. **Informed Consent:** Informed consent implies an understanding by the patient of (1) the nature of his condition, (2) the nature of the proposed treatment or procedure, (3) the alternative procedure (4) the risks and benefits involved in both the proposed and alternative procedure, (5) the potential risks of not receiving treatment, and (6) the relative chances of success or failure of both procedures, so that he may accept or reject the procedure. All disclosures must be in language the patient can understand⁴.

Before performing a medical procedure, a doctor must obtain her patient's consent. This obtains legally,

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professionally, and ethically safety. The “magic” of the patient’s consent is that it transforms the status of an act from illegitimate to legitimate⁵. Both morally and legally, the patient’s right to give or withhold consent flows from his right to respect for autonomy. Although the meaning of autonomy is debated it is not contentious to suggest that, at a minimum, autonomy requires the capacity to make a decision⁶. Right to choose and know about procedure is fundamental thing of patients’ autonomy. Informed consent is way of providing necessary information to the patients and helping them for decision making⁷. All the pros and cons of procedure must be explained to the patients in the language he or she can understand^{4,8}. Just taking signature of patient on consent form without proper explanation and understanding of him is violating entire process of informed consent^{3,4}. A healthcare professional (or other healthcare staff) who does not respect this principle may be liable both to legal action by the patient and to action by their professional body. Employing bodies may also be liable for the actions of their staff⁹. Just taking signature of patient on consent form without proper explanation and understanding of him is violating entire process of informed consent¹⁰. A child above 12 year of age can give valid consent for medical treatment but for surgical procedure age for consent is above 18 year¹¹.

The MCI guidelines are applicable to operations and do not cover other treatments. For other treatments, the following may be noted as general guidelines¹²:

1. For routine types of treatment, implied consent would suffice.
2. For detailed types of treatment, ideally express oral consent may be needed.
3. For complex types of treatment, written express consent is required.

Aim

To evaluate perception & knowledge of consent in Medical practice in various circumstances amongst the Medical practitioners.

Objectives

1. To assess qualification wise difference in Perception & knowledge regarding consent.
2. To evaluate the Perception & knowledge of

various aspects of consent like types of consent, consent in Medical and Surgical management, consent in treatment of minors, etc.

3. To review current practice of obtaining consent.
4. To study the orientation regarding the various prerequisites while notifying the consent.

The Materials and Method

Only registered medical practioners having valid MBBS/MD/MS/DM/Mch and CPS/University diploma holding medical practitioners and residents are included in the study. It was Cross sectional Observational study with Purposive sampling method. An elaborate questionnaire was prepared to obtain all the information incorporated in the aim and objectives of the study. Question having single answer is asked to the participants. Ethical clearance from institutional ethics committee was duly taken. The written informed consent of the participant for participation and future publication was taken. All the variables in the study are analyzed statistically using HPSS software.

Observations and Results

Table 1: Distribution of subjects according to qualifications

Qualifications	No of subjects	Percentage(%)
MBBS	126	63
MD	42	21
MS	32	16
Total	200	100

In this study out of 200 participants, 126 (63 %) were having MBBS degree, 42 (21%) were having MD degree and 32(16%) were having MS degree.

Table 2: Distribution of subjects according to designation

Designation	No of subjects	Percentage(%)
Faculty	64	32
Resident	136	68
Total	200	100.0

In this study out of 200 participants, 64 (21.5%) were Faculties and 136 (78.5%) were Residents.

Table 3: Distribution of subjects according to Perception & knowledge score

	Yes	%	No	%	NR	%
Voluntary agreement, compliance or permission is consent	191	95.5	2	1	7	3.5
Consent may be implied or expressed	170	85	25	12.5	5	2.5
To examine, treat or operate upon a patient without consent is assault in law	180	90	20	10	0	0
Consent of child below 12 years or mentally ill is valid	32	16	164	82	4	2
Can minor be treated/operated without consent of parent	23	11.5	175	87.5	2	1
In case of emergency medical management can be done without consent	170	85	26	13	4	2
Local guardian can give consent in absence of parents	187	93.5	13	6.5	0	0
In informed consent, the nature, alternative options are complications of proposed treatment are explained to patients	187	93.5	7	3.5	6	3
Informed written consent is must for surgical procedure	195	97.5	4	2	1	0.5
Patient has right to refuse medical management	182	91	17	8.5	1	0.5

Note: NR means not replied to question

In table no.3, To the question of, voluntary agreement, compliance or permission is consent, 191 (95.5%) participants has given 'yes' as correct answer, 2 (1%) given 'no' as incorrect answer.

To the question of, Consent may be implied or expressed 170 (85%) participants has given 'yes' as correct answer, 25(12.5%) given 'no' as incorrect answer.

To the question of, to examine, treat or operate upon a patient without consent is assault in law, 180 (90 %) participants has given 'yes' as correct answer, 20 (10%) given 'no' as incorrect answer.

To the question of, consent of child below 12 year or mentally ill person is valid. 32(16 %) participants has given 'yes' as in correct answer, 164 (82 %) given 'no' as correct answer.

To the question of, can minor be treated/operated without consent of parents, 23(11.5%) participants has given 'yes' as in correct answer, 175 (87.5%) given 'no' as correct answer.

To the question of, in case of emergency medical management can be done without 170(85%) participants has given 'yes' as correct answer, 26(13%) given 'no' as incorrect answer.

To the question of , local guardian can give consent in absence of parents 187(93.5%) participants has given 'yes' as correct answer, 13 (6.5 %) given 'no' as incorrect answer.

To the question of, in informed Consent, the nature, alternative options and complications of proposed treatment are explained to patient, 187 (93.5%) participants has given 'yes' as correct answer, 7 (3.5 %) given 'no' as incorrect answer.

To the question of, informed written consent is must for surgical procedure, 195(97.5%) participants has given 'yes' as correct answer, 4(2%) given 'no' as incorrect answer.

To the question of, patient has right to refuse medical management 182 (91%) participants has given 'yes' as correct answer, 17(8.5%) given 'no' as incorrect answer.

Table 4: Designation wise distribution of correct responses

Questions	MBBS		MD		MS		Total	χ ² -value	p-value
	F	%	F	%	F	%			
Q1	121	60.5	41	20.5	29	14.5	191	2.29	0.31,NS
Q2	108	54	35	17.5	27	13.5	170	0.15	0.92,NS
Q3	112	56	39	19.5	29	14.5	180	0.56	0.75,NS
Q4	104	52	35	17.5	25	12.5	164	0.40	0.81,NS
Q5	12	6	37	18.5	26	13	175	1.37	0.50,NS
Q6	111	55.5	34	17	25	12.5	170	2.67	0.26,NS
Q7	114	57	41	20.5	32	16	187	5.29	0.071,NS
Q8	117	58.5	39	19.5	31	15.5	187	0.71	0.70,NS
Q9	125	62.5	40	20	30	15	195	4.23	0.12,NS
Q10	113	56.5	37	18.5	30	15	180	0.68	0.71,NS

No significant designation wise difference is observed about perception and knowledge of consent

Discussion

Very few studies have been undertaken to assess the perception & knowledge of medical practitioners about consent applicable in medical practice. From the study it is observed that the Medical practitioners have given correct responses to most of the questions regarding knowledge about consent i.e. ranging from 82% to 97.5% in all instances. In rest of the instances responses were incorrect or not replied.

According literature available and KSN Reddy and O.V.Nandimath^{3,13} the most of the responses were correct. No law or state action can intervene to avoid or delay the discharge of the paramount obligation cast upon members of the medical profession. The obligation of a doctor is total, absolute, and paramount. Laws of procedure whether in statutes or otherwise that would interfere with the discharge of this obligation cannot be sustained and must, therefore, give way¹⁴. This principle is rejected in the present study. Present study's findings are reflected by "When the doctor himself is considering the possibility of a major operation, the doctor is able with his medical training, with his knowledge of the patient's medical history, and with his objective position to make a balanced judgment as to whether the operation should be performed or not. The duty of the doctor in these circumstances, subject to his overriding duty to have regard to the best interests of the patient, is to provide the patient with information which will

enable the patient to make a balanced judgment if the patient chooses to make a balanced judgment"¹⁵. The consent obtained, of course, after getting the relevant information will have its own parameter of operation to render protection to the medical practitioner. If the doctor goes beyond these parameters, he would be treating the patient at his risk, as it is deemed that there is no consent for such treatment at all. A doctor who went ahead in treating a patient, to protect the patient's own interest, was held liable as he was operating without consent¹⁶. This principle is complying with the present study. The very basic principles of medical practice date back to the Classical Period and the writings of Hippocrates¹⁷. The Hippocratic Oath focuses on the physician's duties to his teacher, and then to his patients: to treat them in the best way he can, neither to take advantage of them or do them any harm, to refrain from performing surgery, and to maintain confidentiality. There is no mention of any concept approaching that of consent, or disclosure. Some basic principles of Hippocratic Oath are matching with the outcome of the present study. Derivations in present study comply with the other several studies that have shown that written information in the language patients can understand has beneficial effects. Patient information sheet in vernacular language must be necessary before obtaining their informed consent^{18, 19}

Some patients stated that doctor must take decision on behalf of them and take all responsibility²⁰. Because of this mind set of people some time informed consent is

not serving its actual purpose. Many times information given to the patients is inadequate and many times it may be over loaded beyond their capacity to digest it. Beresford and colleagues argued that some patients want little or no information about therapeutic risks and that the standard of the disclosure of the reasonable patient should not be applied to them^{20, 21, 22}. These findings are also seen to be extracted in the present study

Conclusion

From the above study it can be concluded that: Medical practitioners are having enough perception and required Knowledge regarding most of the aspects of the consent. For some of the aspects of consent lack of perception regarding correct practice of obtaining consent in various circumstances was noted. No designation wise difference was observed in Perception and Knowledge of participants about consent. Lack of perception and knowledge may be justified by non availability of CMEs & orientation programmes regarding amendments for consent and also diverse field of Participants. Recommendation based on the study can be utilized to improve the quality of health care and Medical documentation. Regular CMEs, Workshops and publications are required so as to upkeep the Knowledge and awareness about consent. Autonomy is the main ethical consideration underlying informed consent. The patients' right to determine what investigations and treatment to undergo must be respected by all doctors. For consent to be informed patients rely on the information provided by their doctor. Honesty and truthfulness are required to make the process of consent valid.

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A Prospective Study of Pattern of Custodial Deaths of Autopsies Conducted at SMS Hospital Jaipur During 2017-18

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Abstract

Deaths occurring in police custody incite enormous amount of emotions from relatives of deceased and speculations from media and general public. A person in custody is entirely dependent on his custodians for his basic requirements; hence this type of death raises questions regarding living conditions, inhumane treatment and violation of fundamental rights of prisoners.

This prospective observational study was carried out during period April 2017 to March 2018 in Department of Forensic Medicine, at SMS Medical College, Jaipur, Rajasthan. 20 cases of alleged Deaths in custody during study period were observed on the subjects of socio-demographic profile of deceased, circumstances prior to deaths, treatment taken, postmortem findings and cause of deaths. The data so obtained was statistically analysed. This study observed that maximum cases were male (95%); age group above 61 years (30%); urban domicile (65%). Maximum cases were brought in month of February (25%) followed by January (20%). Most prisoners died in hospital during treatment (80%). Natural causes of death were commoner than unnatural causes. Histopathological observations were most common for carcinoma (25%) followed by myocardial infarction (20%).

Keywords:- custody, death, postmortem, prisoner, natural death, histopathology

Introduction

‘Custody’ is considered to begin from the moment a person is apprehended, arrested or otherwise deprived of his liberty by agents of state, or by agents of any other public or private entity or organization, including in particular correctional or medical institutions or security companies, operating within the jurisdiction of that state. It includes, notably, detention or imprisonment, or any other placement of a person in a public or private custodial setting that he or she is not permitted to leave at will. It ends when a person is free to leave and is no longer under the effective control of State agents, or of agents of public or private entity or organization, including in particular correctional or medical institutions, or security companies, operating within the jurisdiction of that

state^[1].

Deaths occurring in custody are questionable and the State has to provide answers regarding cause of death. The inquest is carried out by a Judicial Magistrate and any such death is directly investigated by Human Rights Commission of India for any evidence of violation of human rights in prison. As per article 21 of Indian constitution every citizen of India has right to live and to live with dignity. This right extends even to prisoners in custody and cannot be taken away by anybody except by procedure of law ^[2].

The Hon’ble supreme court of India has set guidelines for prisons regarding general conduct of staff with prisoners, food and nutrition, living conditions of the prisoners, separate cells for males and females to avoid sexual harassment and sexual offences^[3]. Hence, our constitution and legislature considers prisoners at par with general population except that their freedom has been restricted for a specified time.

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Though death is inevitable outcome of life; incidences of custodial death raise questions regarding conduct of jail staff towards prisoners. Hence, discovering the cause of custodial death and the circumstances in which prisoner died is of paramount importance to bring to books the offender who illegally caused death of prisoner, to give satisfactory answers regarding cause of death of deceased to next of his/her kin and to maintain harmony and feeling of fraternity in the society.

The common questions that arise in custodial death are that whether death was natural or unnatural, if natural was it avoidable. If it was an unnatural death, who were the perpetrators of this death. Another most common question that arises is that whether or not prisoner was given timely and adequate treatment; such that not giving proper and timely treatment resulted in his death. All of these questions can be answered only by conducting proper and meticulous postmortem examinations.

Material and Method

This was a prospective observational study carried out at Mortuary of SMS Hospital, Jaipur from April 2017-March 2018. All the cases of alleged custodial deaths that were brought to SMS Hospital for postmortem examination during study period were included. The available documents of deceased (available treatment records, police inquest report, the postmortem report, preserved viscera reports, and other available documents if any) were studied.

The observations so made were recorded in tabulated form and data extracted from them was evaluated.

Findings

A total of 20 cases of custodial deaths came to SMS Hospital during study period of which 19 (95%) were males and 1(5%) was female. The age distribution of prisoners who died in custody was as –none (0%) was 18- 20 years; 4 (20%) were between 21-30 years; 4 (20%) were 31-40 years, 3 (15%) were 41- 50 years, 3(15%) were between 51-60 years and 6(30%) were above 61 years age.

13(65%) were of urban domicile and 7(35%) were of rural domicile.

Of 20 custodial deaths 18(90%) were declared dead in hospital and 2 (10%) died before prisoner could be brought to hospital.

16 (80%) subjects were brought alive, 2(10%) were declared dead in emergency department and 2(10%) were brought dead to Mortuary of Hospital. Of the 16 prisoners who were brought alive and admitted to Hospital; 6(30%) died within 24 hours of admission, 4(20%) died within 24 to 48 hours of admission, 2(10%) died within 48-72 hours of admission, 2(10%) lived for 3 days to 10 days after admission to hospital and only 2(10) prisoners had hospital stay of more than 10 days.

On observing the months of year when cases of custodial deaths were received in hospital, we found that 4 cases (20%) were brought in January, 5(25%) in February, 1 (5%) in March, June, November and December; 2 (10%) in April and July; 3 cases in October. No cases were received in May, August and September.

Maximum cases (n=8) were brought to hospital during 12PM to 6 PM, minimum cases (n=2) were brought during late night hours i.e. 12 AM to 6 AM. 2 cases were brought dead to mortuary.

The police inquest report submitted by magistrate suggested cause of death as due to falling ill in 15(75%) cases, hanging in 2(10%) cases, assault in 1(5%) case, and as unknown cause in 2(10%) cases

During Postmortem, signs of injuries were present in 8 cases; of which- neck and chest were involved in 1 case each; neck and lower limb in one case; head and upper limbs in one case; upper and lower limbs in one case; clavicle bone in one case; lower limb in one case; head, shoulder, upper limb and lower limb in one case. The injuries were old in 3 cases, perimortem in 2 cases which were both cases of hanging; injuries produced during CPR in 1 case; multiple injuries of different durations were present in 2 cases.

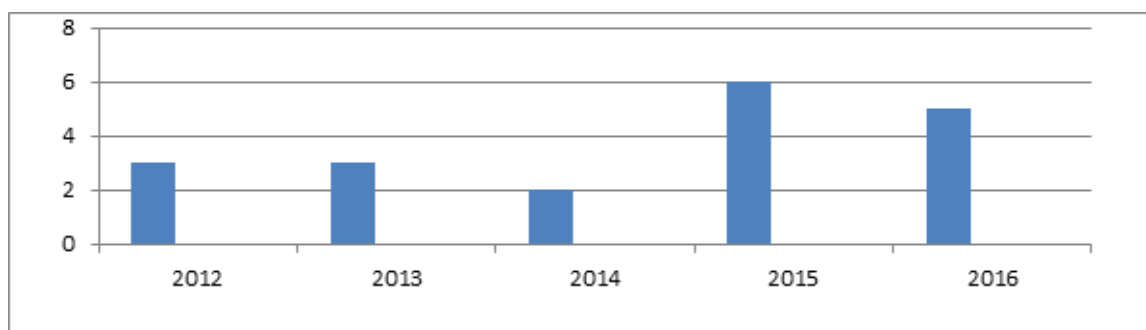
On histopathological analysis of viscera, pathological changes were found in 18 cases whereas viscera were normal in only 2 cases which were incidentally both cases of Hanging. Postmortem findings of only pathology not associated with any injury were found in 11 cases. Findings of both pathology and injury were found in 7 cases, and finding of both pathology and poisoning was found in 2 cases.

Postmortem findings of poisoning were found in 2 cases in which both were associated with pathological changes of congestion of viscera. The viscera report for chemical examination for common poisons showed

positive result for Aluminium Phosphide in one case and report was awaited in second case till end of study period.

On observing postmortem examination reports and histopathological examination of viscera; findings of Carcinoma were noted in 5(25%) cases, myocardial infarction in 4(20%) cases which were associated with ischemic heart disease, pleuritis, Chronic Obstructive Pulmonary disease and Liver Edema. Generalized Visceral congestion was noted in 15(75%) cases which

was associated with varied pathologies like Chronic Obstructive Pulmonary Disease; Myocardial Infarction; Liver edema; Sub Dural Hemorrhage; Pleuritis; Liver cirrhosis; Steatosis; Lungs pneumonia; Septicemia; Multiple organ failure; Carcinoma; Chronic venous congestion; Enlargement of spleen, liver and heart; poisoning and asphyxia. Signs of multiple organ failure, pathological findings in lungs, signs of liver cirrhosis and steatosis, Sub-dural hematoma were observed.



Conclusion

The present study was a prospective observational study of duration 1 year (April 2017 to March 2018) and included 20 cases of custodial deaths which came to SMS Hospital Jaipur. A preponderance of males (95%) was noted which was also noted in studies worldwide [4, 5,6,7,8,9,10,11]. However, in a cohort study for a period of 12 years, on young offenders of Victorian population, it was observed that female offenders were about 40 times more likely to die than the reference female population; while the risk of death in male offenders was only 9 times higher than in reference male population. In this study subjects were followed through even after their discharge from custody [12]. This indicates that rate of death inside custody of females is lesser than when they are discharged from prison.

A person in custody lives in entirely different set of conditions than outside world. This may even restore his health and well being thus prolong his life. In our study maximum cases (30%) belonged to greater than 61 years age group which corresponds to life expectancy of general public and also which likely explains highest rate of findings of carcinoma and Myocardial infarction in present study. Next most common age groups of custodial deaths were 21-30 years and 31-40 years with

20% cases in each group. However, different studies show different age group preponderance in custodial deaths. A study in central Maharashtra showed maximum cases (33.33%) from age group of 31- 40 years followed by 21-30 years age group [5]. Similar findings of younger age group being more common were noted in other Indian and international studies [13, 14]

In a 10 year study at California the modal age of custodial deaths at state supervised facilities was observed to change from 30-34 year in 1994 to 45- 49 years in 2003. But, the death rate was higher for 55-74 year old in custody compared to general population [15]. This observation needs probing into the general conditions of elderly prisoners and ways to make them more apt for geriatric prisoners.

In our study we found natural causes of death more common than the unnatural causes. This was also consistent with Police inquisition report in which 75% cases death was suspected to be by natural causes. However, in Rajasthan, during the period from 2012 to 2016, the incidence of number of cases registered of custodial deaths has seen an increasing trend, which is unfavorable trend [Figure 1] [16].

In our study Carcinoma was found to be the most common among causes of natural death. The

incidences of custodial deaths vary from time to time and also across different regions of the world. In a 65 years (1939-2004) retrospective exploratory analysis from Maryland, Cardiovascular disease was found to be the most frequent cause of death from the 1930s to the 1970s, with exception of 1940s, when syphilis and tuberculosis became most frequent. Asphyxia due to suicidal hangings was the predominant cause of death in the 1980s. Drug intoxication deaths were common in 1990s and 2000s. Sudden unexplained deaths involving violent behavior, the use of multiple restraints, and drug intoxication were identified after 1980s which coincided with increased cocaine abuse^[17].

Various studies have observed Pulmonary tuberculosis as most common cause of death followed by ischemic heart disease^[5]; cardiovascular diseases followed by carcinoma^[14] and pneumonia followed by Tuberculosis^[21]

Natural causes of deaths were found to be more common in other studies nationally and internationally^[5, 15]. However, some researchers have made contrary observations of unnatural violent causes being commoner^[14, 18].

In cases of suspected suicides- hanging and poisoning were suspected equal incidence in 2 cases each. Similar observations of hanging and poisoning being most common modes of suicides were made by other observers too^[19,12]. Some studies observed Poisoning was leading option for suicide^[5,13], and others observed Hanging to be most common^[8,9].

Similar to our study, most custodial deaths occurred in hospital in some studies^[20], but in jail in others^[5,14,15,18].

In our study majority (65%) of deceased prisoners were of urban domicile. This may be explained as the Jaipur is capital of Rajasthan state and all the prisoners were brought from jails of Jaipur region.

Most (70%) cases of custodial deaths occurred during November to February which is winter season in Jaipur. This may indicate need for proper facilities for prisoners to save from cold.

Limitations

Limitation of study may be due to short period (1 year) of study. Chemical examination reports of some of the deceased prisoners were not received till publishing

of this article so final causes of deaths could not be ascertained and are only speculated on basis of treatment records, postmortem findings and histopathological examination reports. An investigation of custodial death is multipronged and involves additional agencies like National Human Rights Commission. Scientific conclusion drawn may be inadequate. The manner of death whether being homicide, suicide or accidental could not be determined due to non-availability of full investigation report. This study is relevant as it takes into account the treatment records, postmortem examination, visceral examination for pathology and poisoning which are necessary to establish cause of death.

Recommendations

Maximum deaths occurred due to natural causes, with carcinoma being the leading killer. This highlights the need of stringent pre-arrest health checkup, periodical health checkup and screening of prisoner population for early signs of malignancy. The jail staff should be trained to recognize symptoms pertaining to malignancy and prisoners must be stated early treatment.

20% deaths were suspected suicides, hence psychological analysis of prisoner's mental condition must be done periodically and jail staff must be trained to identify signs of depression in prisoners.

Most of the deaths occurred within 48 hours of admission to hospital which indicates that prisoners were brought to hospital in critical condition. There must be better medical facilities available in jail. Maximum deaths were in winter season, this requires further detailed analysis regarding causes of such deaths so that any confounding factors relating to winter season may be identified and measures taken to improve conditions and environment of jails.

Deaths by hanging and poisoning call for questioning accessibility of poisons and ligature materials, and recognizing suicidal tendencies among prisoners. Design of jails should be such that prisoners do not get any accessible point for suspension. This study illustrates the diversified illnesses and injuries caused in jails and offer direction for understanding some of the needs and conditions of those in custody.

Conflict of Interest - Nil

Source of Funding - Self

Ethical Clearance- Approval from the Institutional Ethics Committee (IEC), SMS Medical College and Attached Hospitals, was taken.

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Feature of Ligature Mark and Fractures in Hanging and Ligature Strangulation Cases in Ajmer Region Population of India

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Abstract

Human race is one of the most intellectual living creatures among the whole living world. Human race has the potential to think and act, but unfortunately humans have also by desire searched the way to end their own by adopting various ways of mechanical asphyxia which is most commonly encountered in medico-legal practice. Hanging is one of the most common method of suicide in India and around the world, other types of hanging are, homicidal hanging judicial hanging, autoerotic hanging. A study was conducted in the Department of Forensic Medicine & Toxicology at JLN Medical College, Ajmer for a period of one year i.e. from January 2009 to December 2010. During this period a total number of 105 cases were observed; of which 100 were of hanging and 05 cases of ligature strangulation. In the investigation 100 hanging cases reported in Ajmer region were studied for injuries to bones and cartilage of neck. In the study, hyoid bone (13 %) and thyroid cartilage fracture (5%) were most commonly observed among male and female respectively, no case of larynx and trachea fracture was recorded.

Keywords: Hanging, ligature feature, neck fracture, hanging, ligature strangulation

Introduction

In humans, major mode of death is asphyxia and of which mechanical asphyxia is most commonly seen in medico-legal practice. Mechanical asphyxia created by constriction round the neck plays a major role in human death, hanging which was originated in Persia (now Iran) about 2500 years ago as a method of execution is very common. Hanging still remains the standard lawful method of execution in many countries, and in India is one of the most common method of suicide. The other types of hanging are, homicidal hanging judicial hanging, autoerotic hanging (Camps et al, 1976)¹. Hanging differs from strangulation in which the neck is constricted irrespective of any effect caused by the weight of the

body (Mant, 1984)⁵. The various structures damaged in hanging and strangulation include the soft tissue like skin, subcutaneous tissue, fascia, muscle, blood vessels and lymph node and the bony and cartilaginous tissues like the hyoid bone and larynx (Mant, 1984)². Ligature mark is a vital evidential piece to assess the cause of death, ligature mark depends on the nature and position of the ligature used, and the time of suspension of body after death. Ligature mark is found as pressure mark on the neck underneath the ligature. Initially it appears as a pale groove which on drying becomes yellowish brown parchment like (Mariam 2015)³. In the present study observation were recorded on the feature of ligature marks and fracture caused by hanging and ligature strangulation in cases recorded among the population of Ajmer region of Rajasthan State.

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Material and Method

Present study was done in the Department of Forensic Medicine & Toxicology at JLN Medical College, Ajmer for a period of one year i.e. from January 2009 to December 2010. During this period

a total number of 105 cases were observed for violent asphyxial death, of which 100 cases were of hanging, 05 cases were of ligature strangulation in which 03 cases were of homicidal ligature strangulation and 02 cases were of accidental ligature strangulation. In the present paper observation pertaining to 100 cases of hanging are presented and discussed. In cases of the body, brought with ligature material, the ligature material were studied for feature of ligature marks, fracture of bone or cartridge and its gender based frequency.

Results and Discussion

In the study done of 105 cases 100 cases were of hanging and 05 cases were of ligature strangulation. The distribution pattern of ligature features observed in all the cases showed that three colour texture were observed i.e., reddish brown, parchment and pale (table

1). The cases were classified as per gender, in hanging cases it was seen that in male parchment type feature was maximum (37 cases) followed by reddish brown (21 cases); whereas in females reddish brown feature (16 cases) was seen in maximum events followed by parchment (6 cases). In strangulation cases observed in female both reddish brown and parchment features were in equal frequency (2 cases).

The hyoid bone fracture was observed in 4 cases of male with no case in female; where as for thyroid cartilage fracture female cases were 3 with no male case. None of the case was observed for larynx and trachea fracture (Table 2). The frequency distribution pattern showed that there were 4 % and 3 % case of hyoid bone fracture in hanging cases among male and female respectively.

Table 1: Distribution ligature mark features in hanging and ligature strangulation cases

Features (Color, Textures)	Hanging			Strangulation		
	Male	Female	Total No.	Male	Female	Total No.
Reddish-brown	21	16	37	0	2	2
Parchment	37	6	43	0	2	2
Pale	8	2	10	0	0	0
Total	66	24	90	0	4	4

Table 2: Genderwise distribution of injuries to bones and cartilages of neck in cases of hanging and ligature strangulation

Type of Neck Compression	Hyoid Bone Fracture			Thyroid cartilage Fracture			Larynx and Trachea Fracture		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Hanging	4	-	4	-	3	3	0	0	0
Ligature strangulation	-	-	-	0	3	3	0	0	0

Discussion

Hanging cases has increased with the event of urbanization, study on the aspects like cause of death, ligature marks and fracture to neck region is imperative to understand the subject. Therefore, the present study conducted in the Department of Forensic Medicine & Toxicology at JLN Medical College, Ajmer on 105 cases recorded of hanging and ligature strangulation in

Ajmer district from January 2009 to December 2010 are discussed below.

The observation made on ligature marks showed that parchment type mark was most common in male as compared to female, 37 cases were recorded on male category as compared to 6 cases in female. Whereas for

reddish brown mark was high in male (21 cases) but was very common in female (16 cases). Presence of ligature mark is common in mechanical asphyxia, previous reports by Pal et al (2016)⁴ and Mariam (2015)³ suggest that these observation are important to understand the case and generate valuable information as a forensic expert.

The frequency of cartilaginous and bony anatomy of neck *viz* hyoid bone/ thyroid cartilage and LTA (Larynx & Trachea fracture) was not high but the damage indicated that in cases of hanging the damaged to the cartilage and bony structure of the neck are very less. In cases of hanging the hyoid bone gets fractured more commonly than the thyroid cartilage. In cases of ligature strangulation the fracture of thyroid cartilage was also found, but due to very less number of cases of ligature strangulation in the study no certainty of the findings can be derived.

Conclusion

In India suicidal hangings are common, very often homicidal hangings are simulated as suicidal hangings. In our study on Ajmer population, 105 asphyxial death were recorded for the study period. Out of 105, 100 cases were of hanging and 05 of ligature strangulation of which 03 of homicidal ligature strangulation and 02 accidental ligature strangulation. In the study, parchment type feature was maximum (37 cases) followed by reddish brown (21 cases) in males whereas reddish brown features were maximum in female. Hyoid bone (13 %) and thyroid cartilage fracture (5%) were most commonly

observed among male and female respectively, no case of larynx and trachea fracture was recorded.

Conflict of Interest: None

Source of Funding: None (to carry the research fund was spent by authors)

Ethical Clearance: This is my bonafied research work for award of MD Forensic Medicine Degree by Rajasthan University of Health Sciences, Jaipur in May 2011. My thesis has been evaluated and approved by panel of examiners

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An Original Research Article

An Observational Study of Radiological Age & Documented Age in 16-20 Years of Age Group in Jaipur

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Abstract

Age estimation is an important exercise undertaken in clinical forensic medicine for various civil & criminal purposes. Present community based Descriptive Observational Study was carried out in S.M.S. Medical College, Jaipur. In this study majority of cases lower end of radius were fused in both genders at 18-20 years of age. The lower end of ulna bone was found to be fused in 69.33% cases. The iliac crest was found fused in 29.34% study subjects. The centre for ischial tuberosity had appeared in 90% males and in 97.44% females between 16-18 years but the process of fusion had not been initiated in any subject below 18 years of age. Complete fusion of ischial tuberosity to the pelvic bone was seen in 40% males and in 19.44% females above 18 years of age. Non-correlation of skeletal age to recorded age as per birth certificates was seen in 36% males and 16% females. Higher discrepancy was observed in rural subjects, non-vegetarian eaters and sports persons. Their skeletal age was ahead of their recorded ages. In a developing country like India, paucity of reliable documentary evidences like birth certificate. Non availability of reliable local data for estimation of age is an incriminating factor for miscarriage of justice.

Keywords: Epiphyseal fusion, Ischial tuberosity, Ossification centre, Radiological age.

Introduction

Age estimation in the living is one of the most important tasks especially in developing countries like India where birth records are often not well maintained. There is a variation in the timing of appearance and fusion of the epiphyses of the bones. Ossification is seen earlier in the tropical countries and in females. The variation in the age of appearance and the union of ossification is mainly attributed to various factors like climate, heredity, race, nutrition, dietary habits, gender and socioeconomic status of population. Scientific estimation of age of an

individual whether living, dead or from human remains is a vexing problem for personnel in Forensic Medicine in both civil and criminal matters.

Estimation of age is an important task and a valuable tool to assist in many civil and criminal procedures such as identification, consent, criminal responsibility, clinical examination, validity of will, attainment of majority, kidnapping, rape, criminal abortion etc. Especially in developing countries like India where majority of population is not aware of the importance of registration of births or the record of registration may not be properly maintained. The parameters used for estimation of age are mainly physical examination, dental examination and radiological examination. Physical examinations are not sufficiently accurate due to the wide variations in biological maturation in different individuals.

Age estimation in cadavers, human remains and living individuals is generally needed to live the issues with significant legal and social modification

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for individuals as well as for the community.¹ Various workers have made attempts to divide the human life into a succession of discrete growth phases and to analyze them in terms of alteration in the tissues of the body especially in skeleton. The bones of human skeletons develop from separate ossification centers. From these centers ossification progresses till the bone is completely formed. These changes can be studied by means of X-Ray & these changes are age related. It is therefore possible to determine the approximate age of an individual by radiological examination of bones till ossification is complete.

Material & Method

This study was carried out at the Department of Forensic Medicine, SMS Medical College,.

Study design: Community based Descriptive Observational Study.

Study period: December' 2016 to November' 2017.

Study universe: Students and staff of Medical, nursing & other paramedical college in Jaipur

Inclusion criteria:

- Subjects belonged to Rajasthan by origin.
- Subjects having documentary evidence of age in the form of birth certificate issued by competent authority
- Age group: 16-20 years.
- Subjects who gave their consent.

Exclusion criteria:

- Subjects without proof of birth record.
- Subjects below 16 years and above 20 years.
- Subjects with Severe malnutrition.
- Subjects with Chronic illness.
- Subjects with Endocrinal disorders.
- Subjects with deformities of limbs and pelvis.

Method of collection of data:

After obtaining consent from the subjects satisfying

the inclusion criteria and obtaining valid informed written consent, the general physical examination were conducted to know the health status and rule out any deformities to select the subjects after applying exclusion criteria.

Materials:

- Printer black ink
- Data collecting instrument, X-ray film
- Lead marker, lead apron
- 8 x 10 inches rigid cassette
- Film hanger (8" x 10")
- Developer Solution
- View box
- Magnifying lens
- Weighing machine and height measuring scale
- Performa

Sampling method:

- Stratified Random Sampling based on age.
- Sample size – 150(75 Boys+75girls)

Sample Size: Sample size was calculated to be 64 subjects at 95% confidence level and 20% relative allowable error assuming the proportion males who had fusion of trochlea in 16-20 years to be 61% (as per seed article). But for study purpose, 150 subjects were taken to increase the authenticity of results.

Method

After selection of cases, the personal details were recorded and after taking informed written consent clinical and dental examination was carried out and details recorded in pre-proposed Performa. The subjects were then be subjected to Digital X-ray examination of pelvis, Wrist and Elbow joints. The Radiographs were then be studied for appearance and fusion of ossification centers and age determination were done on basis of the table of Galustan in Modi's textbook of Medical Jurisprudence. The documented age of the subject was also noted and the determined age was analyzed in relation to the documented age (as per birth certificates).

Statistical Analysis

The finally analyzed data was tabulated in Microsoft Excel Worksheet and statistically analyzed using appropriate statistical software to determine its significance at 95% confidence limits. The collected qualitative data were expressed in groups, diagrams, proportion and percentages and analyzed using SPSS version 16 software & analyzed using chi square test. $P < 0.05$ were considered significant.

Aim

To study the correlation between ages determination by radiological examination of appearance and fusion of epiphyseal centers of Elbow, Wrist and Pelvis in relation to birth certificates in subjects between 16-20 years of age.

Objectives

- (i) To assess the age determination from appearance

and fusion of epiphyseal centers of Elbow, Wrist and Pelvis in subjects between

16-20 years of age using digital X-rays in Jaipur region.

(ii) To assess and compare radiological age to the documented age as per the birth certificate.

(iii) Suggestions for authenticity of age estimation from ossification centers.

Observation

In our study the majority of cases (54%) were between 18-20 years of age as per their birth certificates. Males were more (55.55%) amongst 18-20 years subjects and females were more (56.52%) amongst 16-18 year subjects.. Majority of subjects from rural region were males (62.31%) and those from urban regions were mostly females (60.49%).

Table 1: Gender wise distribution of epiphyseal fusion of elbow joint (n=150)

Epiphysis	Male	Female	Total
Non-Fused	01 (1.33%)	00 (0%)	01 (0.67%)
Process of Fusion	02 (2.66%)	01 (1.33%)	03 (2%)
Fused	72 (96%)	74 (98.66%)	146 (97.33%)
Total	75 (50%)	75 (50%)	150 (100%)

Table 2: Gender wise distribution of epiphyseal fusion of lower end of radius (n=150)

Epiphysis	Male (Years)		Female (Years)		Total
	16-18	18-20	16-18	18-20	
Non-Fused	13 (43.33%)	00 (0%)	16 (41.02%)	00 (0%)	29 (19.33%)
Process of Fusion	13 (43.33%)	03 (6.66%)	19 (48.71%)	00 (0%)	35 (23.33%)
Fused	04 (13.33%)	42 (93.33%)	04 (10.25%)	36 (100%)	86 (57.33%)
Total	30 (40%)	45 (60%)	39 (52%)	36 (48%)	150 (100%)

Table 3: Gender wise distribution of epiphyseal fusion of lower end of ulna (n=150)

Epiphysis	Male (Years)		Female (Years)		Total
	16-18	18-20	16-18	18-20	
Non-Fused	14 (46.66%)	00 (0%)	14 (35.89%)	00 (0%)	28 (18.66%)
Process of Fusion	13 (43.33%)	02 (4.44%)	03 (7.69%)	00 (0%)	18 (12%)
Fused	03 (10%)	43 (95.55%)	22 (56.41%)	36 (100%)	104 (69.33%)
Total	30 (40%)	45 (60%)	39 (52%)	36 (48%)	150 (100%)

Table 4: Gender wise distribution of epiphyseal fusion of iliac crest (n=150)

Epiphysis	Male (Years)		Female (Years)		Total
	16-18	18-20	16-18	18-20	
Non-Fused	29 (96.66%)	09 (20%)	39 (100%)	04 (11.11%)	81 (54%)
Process of Fusion	01 (03.34%)	11 (24.45%)	00 (00%)	13 (36.11%)	25 (16.66%)
Fused	00 (00%)	25 (55.55%)	00 (00%)	19 (52.78%)	44 (29.34%)
Total	30 (40%)	45 (60%)	39 (52%)	36 (48%)	150 (100%)

Table 5: Gender wise distribution of epiphyseal fusion of ischial tuberosity (n=150)

Epiphysis	Male (Years)		Female (Years)		Total
	16-18	18-20	16-18	18-20	
Non-appearance	03 (10%)	00 (00%)	01 (02.56%)	00 (00%)	04 (02.66%)
Non-Fused	27 (90%)	21 (46.67%)	38 (97.44%)	14 (38.89%)	100 (66.67%)
Process of Fusion	00 (00%)	06 (13.33%)	00 (00%)	15 (41.67%)	21 (14%)
Fused	00 (00%)	18 (40%)	00 (00%)	07 (19.44%)	25 (16.67%)
Total	30 (40%)	45 (60%)	39 (52%)	36 (48%)	150 (100%)

Out of the total 150 cases, there were 69 cases in the 16-18 year age group and 81 cases in 18-20 year age group as per the available date of birth proofs. Amongst them 10 cases in the 16-18 years age group and 29 cases in the 18-20 years age group did not correlate to their recorded date of births.

Table 6: Gender wise distribution of correlation & non-correlation of fusion of Joint with demographic variable

Demographic	Correlation		Non-Correlation	
	Male	Female	Male	Female
Religion				
Hindu (n=121)	39 (32.23%)	51 (42.14%)	21 (17.35%)	10 (08.26%)
Muslim (n=29)	09 (31.04%)	12 (41.38%)	06 (20.69%)	02 (06.89%)
Residence				
Rural (n=69)	26 (37.68%)	22 (31.88%)	17 (24.63%)	04 (05.79%)
Urban (n=81)	22 (27.16%)	41 (50.61%)	10 (12.35%)	08 (09.88%)
Dietary Habits				
Vegetarian (n=104)	33 (31.73%)	48 (46.15%)	15 (14.42%)	08 (07.69%)
Non-Vegetarian (n=46)	15 (32.61%)	15 (32.61%)	12 (26.09%)	04 (08.69%)
Sports & Exercise Participation				
Yes (n=87)	42 (48.27%)	18 (20.69%)	24 (27.59%)	03 (03.45%)
No (n=63)	06 (09.52%)	45 (71.42%)	03 (04.76%)	09 (14.28%)

Discussion

Region of present study was an urban center but the students pursuing education from the institution come from different parts of Rajasthan on merit basis, contributing to a large proportion of rural population in the study subjects. Amongst the males included in the study more were from rural regions (57.33%) and Females belonging to urban region were in a higher proportion (65.33%) as compared to those belonging to rural regions. This distribution is understandable according to the female education rate in the state of Rajasthan, where even in recent times, female feticide, child marriage and prohibiting girls from achieving higher education are rampant in the society. Further

elaboration of results of radiological observations in study population for various demographic characteristics is done subsequently.

Bardale Rajesh (2011)² stated that the factors affecting appearing of ossification centers and fusion of epiphysis are climate, dietary habits, geographical variation, hereditary factors, and associations with diseases, growth and development. In the present study the fusion process of the secondary ossification centers was considered in three stages viz. non fused, in process of fusion and completely fused (with or without the line of fusion). In the present study, the elbow joint was not fused in only one male subject (0.67%). It was in the process of fusion in two male and one female study

subjects (2%). It had completely fused in rest 97.33% cases of both genders. These results are similar to those of **Sangma WBC, et al (2007)**³ who also observed complete fusion of elbow joint in 100% cases at the age of 16 years. Our results are also quite similar to those of **Bhise SS and Nandkar SD (2011)**⁴ who reported the complete fusion of elbow joint at 16-17 years in males and at 15-16 years in females. The slight variation seen in males was due to the regional variation in study population. **Galstaun G (1937)**⁵ from his study on Bengali subjects opined that complete union at the elbow joint occurred at 16 years, which is almost similar with the results of this study. **Basu SK and Basu S (1938)**⁶ recorded the latest time of fusion at the elbow as 17 years. These results show completion of ossification of Elbow joints at a slightly higher age as compared to our study which is probably due to regional variation in the two studies. **Aggarwal ML and Pathak IC (1957)**⁸ stated that in Punjabi girls, complete union occurred at the elbow at 16 years, which is almost similar with this study. **Chhokar V, et al (1992)**⁹ in their study of 200 female subjects of New Delhi found that complete fusion occurred at 14-16 years which is also in agreement to the observations of the present study. **Borovansky L and Hnevkovsky O (1929)**¹⁰ stated that the distal ends of radius and ulna fused with their shafts at about 19 years. This again is later than that observed in the present study and similar to the findings of **Nandy A (2010)**¹¹. **Chhokar V, et al (1992)**⁹ proposed that the distal ends of the radius and ulna fused with the shafts at 17-18 years, which lies quite within the range observed in the present study.

Hollinshead WH (1969)¹² documented that the iliac crest and the ischial tuberosity fused to the main mass by the age of 20-21 years. This is slightly dissimilar from the present study where these secondary ossification centers were found fused in about 50% cases. **Sankhyan S, et al. (1993)**¹³ also found that the iliac crest fused with the mass, ilium at the age of 21.5 years, which is also dissimilar to our finding.

After radiological examination of the elbow joint, wrist joint and pelvis; radiological age was assigned to each individual as per the proposed protocol. As per standard study of **Galastun G (1937)**⁵ on Bengalis, the radiological ages were grouped into 14-16, 16-18, 17-19, 18-20 and > 20 years for males; and, into 14-16, 16-17, 17-19, 18-20, 19-20 and > 20 years for females.

Out of rest 81 cases of 18-20 years age group, 52

cases had correlation of date of birth & radiological age, which was similar to results of **Dasgupta et al (1974)**³, **Galstaun G (1937)**⁵, **Banerjee KK and Aggarwal BB (1998)**⁷ and **Aggarwal ML and Pathak IC (1957)**⁸. Female subjects showed a higher correlation between recorded and Radiological ages in the present study (84%) as compared to males (64%). The results could not be compared to any other study as no such exactly similar study could be found in literature.

Conclusion

Age estimation is an important exercise undertaken in clinical forensic medicine for various civil & criminal purposes.

The epiphyses around the elbow joint were completely fused in 97.33% study subjects by the age of 16 years in both males and females.

Complete fusion of lower end of Radius and Ulna were observed at 18 years of recorded age in the present study in both genders.

The epiphyseal union of iliac crest was completed by the age of 20 years in both genders. The commencement of the epiphyseal union of iliac crest and ischial tuberosity was not observed before 18 years of age in this study.

Non-correlation of skeletal age to recorded age as per birth certificates was seen in 36% males and 16% females. Higher discrepancy was observed in rural subjects, non-vegetarian eaters and sports persons. Their skeletal age was ahead of their recorded ages. Due variations in development of children, improved nutrition, physical changes, social pattern, changes in hormonal development, such studies must be done from time to time.

Conflict of Interest: Nil.

Source of Funding: Nil.

Ethical Clearance: Clearance was obtained from research and review board of S.M.S. Medical College and Hospital, Jaipur.

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Cybersecurity Threats and Solutions in the Current E-Healthcare Environment: A Situational Analysis

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Abstract

The need for cybersecurity measures in the field of healthcare is becoming more prescient given both the increased sophistication of cyber criminal activity and the increased prevalence of low-security mobile devices¹. Also, hospitals have been slower to increase cybersecurity, but has become an increasing target due to the increased security of the financial industry². The implementation of the Health Information Portability and Accountability Act (HIPAA) has made patient records more portable and accessible, and created more opportunities for breaches¹. The Health Information Technology for Economic and Clinical Health Act (HITECH) promoting greater implementation of electronic systems for coordination and records. The medical field is also becoming increasingly dependent on connectivity, and people are wary of the threats to automated and robotic safety procedures. The threat of high dependence on technology for medical practices presents risks in and of itself, such as cases where it disrupts communication between healthcare professionals, or fails to account for user failures that could be prevented with better feedback before implementation. Healthcare providers are in a difficult position, trying to balance the need for quick, responsive systems for users, and need for cybersecurity measures that can slow down the computer system. In the following pages, Lewin's field mapping approach will facilitate an analysis of the current largest cybersecurity threats and current research on the best methods of thwarting these vulnerabilities.

Key words:- cybersecurity, e-health care, threats and solutions.

Introduction

According to a top industry consultant, U.S. healthcare systems are attacked tens of thousands of times per year and are projected to lose around \$305 billion from cyber attacks over the next five years. One of the reasons for this significant loss is the use of hacking and malware programs to ask for ransom in exchange for personal data that was stolen. In 2016, over 800,000 records were stolen in four cyber attacks. Ransom is also demanded for access to the computer system itself,

which hackers can dismantle knowing the high cost of downtime to healthcare organizations². The problem is that the opportunity for attacks is increasing given the proliferation of different types of system software, hardware, and cloud computing technology. For this reason, Lewin's change theory, specifically his idea of field theory is needed to assess the wide range of attack points in E-healthcare systems. In Lewin's field theory, it is important to assess the environment and how it affects the social relations and behaviors between actors. Instead of changing individuals, it is necessary first to change the group dynamic³. In the area of electronic health information systems, this would entail not only the way that security measures are promoted for employees, but the interrelation between the various cybersecurity actors in an organization, including the cybercriminals, coders, software designers, and medical device engineers.

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The Healthcare Cybersecurity Environment

Langer explains the three main types of black hat, or criminal cyber activity as: 1) stealing data (passwords, credit cards), 2) vandalism of intellectual property 3) terrorism or injury to people. The White Hat, or cyber security experts, are concerned with auditing the services, users, and policies of network traffic to ensure authentication (user verification), authorization (user privilege), and privacy (information stays secure)¹. Since the cloning of user account data is one of the most prevalent ways of conducting multiple different kinds of attacks, they will also seek additional authentication measures. Due to the risks to data and network integrity, cyber security personnel will also find ways of increasing data reliability and recover ability.

Cybersecurity Threats to Medical Devices

The threat posed by malfunctioning software used in medical devices has become a greater concern as seen in the 1.2 million adverse events in five years, with over 20% related to computer technology, and over 90% of those being high risk. This statistics might even be low given the negative consequences for errors and the reluctance of clinicians to report them fearing loss of patient confidence and reputation. However, the number one risk is not hacking of medical devices, but the lack of integrity of medical databases . However, both risks to devices and to data systems are heightened by old software that is used, and can be repositories for old malware . For examples, research on hospitals in 2012 found that some were relying on long outdated windows operating systems, such as an MRI machine using Windows 95 . A vast majority did not have regular updates to their current versions of windows, leaving them vulnerable to many cyber threats⁴. In addition to addressing these basic software updating issues, there is much more that healthcare organizations can do.

Major Risks of Cyber Criminal Activity and their Counter-Measures

Kruse et al., (2016) identified that the most common strategies for preventing and preparing for cyber attacks involve 1) clearly defining the roles for IT professionals, including timely updates to software, 2) using a VLAN (virtual local area network), 3) using cloud-based computing with high security and data protection/hardware redundancy, and 4) employee training on the increased importance of cybersecurity measures. By

far, the largest numbers of breaches are the result of employees accessing or downloading malicious files, which are not preventable by most health information technology systems, and therefore would require employee training programs⁵. Other studies have found that medical institutions encourage the use of personal mobile devices, but nearly half said they provide no security measures for the use of these devices. A 2017 report by a security company found that employee training could prevent around half or more of cyber attacks on hospitals (Parwani, 2017).

The most basic cybersecurity practice is using a firewall permitting only approved websites for user access, often using a subscription service. The downside is that users will have high dissatisfaction with this system, particularly if they have trouble gaining access to sites that provide an important service, or if the website themselves are approved, but still vulnerable to being used by cybercriminals to attack visitors. After interviewing medical personnel researchers analyzed the data to determine knowledge of security protocols and found that the current IT climate created tensions among employees. Cybersecurity experts are unable to tell whether an attack has the harmful intent and has to treat all evasions as breaches and take appropriate responses. The source of this problem seems to be that designers of the cybersecurity protocols often do not have adequate information about how their policies are going to impact workflow for clinicians⁶.

Another strategy is to limit incoming email to only approved sources, which can also be purchased as part of a security software package, such as Barracuda Essentials for Email. For these measures, users can also be given separate devices for PHI network activities, and daily browsing, personal email activities. Programs like the Cisco Identity Services Engine are available for this purpose, but do not stop a cybercriminal once he/she has gained access to user privileges in the system . Therefore, the security solution involves detection scanning of the network activity to prevent intrusions. It is also important to use an active scan of vulnerabilities in the system¹.

Suggested steps for improving the security of networks, include implementing security policies that prevent users from installing software, auditing of the firewall and data integrity, removing unneeded services from servers while tightening the incoming and outgoing

traffic permitted by needed services, and frequently checking data integrity and file changes. Although there is no sure way to completely secure computer systems against all attacks, Langer suggests the creation of security drills to test the network detection and prevention capabilities. For example, the cybersecurity team could practice attacking the network and using another team to defend it. Drills could be conducted where a successful attack is simulated, like all patient data being hacked, and IT security professionals practice rebuilding the systems¹.

Protecting Medical Devices from Cyber Threats

To address the vulnerability of cyber threats to medical devices, technology manufacturers should design the software with the previously mentioned risks (such as outdated software) in mind⁴. However, until this is done, a wide array of other protective measures have been developed, for example, for devices that respond to patient needs in real time. Particular systems are faced with unique cybersecurity risks, such as diabetes therapy systems, which monitor glucose metabolism and insulin response. These devices communicate via wireless technology, making the remote software and computer systems and the insulin pump they are connected to vulnerable. A cyber attack could have adverse effects on the patient, such as either hypoglycemia or hyperglycemia. Zeadilly, Issac, and Baig, propose what is known as a rolling or changing the encryption key after every transmission of data. The down side is that this encryption is only as good as the encryption algorithm⁷.

Protecting Patient Private Information

Another cybersecurity threat is the stealing of authentication keys needed for decryption of network data. Liang et al., suggest a two-part system, where communications between sensor nodes, they also send authentication code that is unique to the sensor and the patient private identity. This technique could be added to any routing protocol to prevent clone attacks and injection of false information into the system. Social networks use profile-matching approach algorithms that assess the likeness of two profiles without making apparent connections between their characteristics. This method proposed uses what are called the eCPM, iCPM, and IPPM protocols, (standing for explicit, implicit, and implicit predicate profile matching respectively), which allow comparison of values without revealing them and keeping all information sharing without it being linked

to user profiles⁸.

One of the most significant problems with securing patient data is that they often transmit health data through their private messaging and email systems. Therefore, the patient location should not be monitored in real time since this data can be used by hackers to determine a patient's daily patterns and habits which can be used to fully identify a patient. Lu et al., have proposed a method where a patient with similar conditions can share their experiences over a social network securely by using a pseudonym and then authenticating shared data for each user. The authors present a framework that divides processing into separate non-threatening components, so that devices and sensors cannot be overloaded.⁹

Conclusion

Currently, the federal government, and the financial services sector spend around 15% of their budgets on cybersecurity measures, but healthcare organizations spend far less. The preceding research indicated that improving this ratio could significantly reduce risk from cyber threats that are presented on several fronts. The first priority should be on employee training, as lack of awareness is how most network intrusions occur. The next step will require institutional analysis, and determination of the systems and functions most vulnerable (software security updating, devices firmware upgrade, etc.). Although in the future we will hopefully see more integration of healthcare technology engineering design processes and cybersecurity demands, the development of other devised methods, protocols and network technologies, is rapidly filling the gaps in healthcare security.

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Effect of Time Since Death on Morphological Changes of Red and White Blood Cells-An Autopsy based Study at S.M.S. Medical College & Attached Group of Hospitals, Jaipur During the Year 2016-2017

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Abstract

The proper estimation of time since death sometimes gives important hints for solving the crime to the investigating agencies and punishing the true offender and proper administration of justice. Numerous cells in blood show varying degree of post-mortem changes and these changes vary with regards to the post-mortem interval. Therefore, this hospital based descriptive observational study were carried out at the Department of Forensic Medicine, SMS Medical College, Jaipur to study the estimation of time since death by morphological changes in red & white blood cells. The present study proposes that lymphocytes are the most resistant blood cells as regards to degeneration after death. Other white blood cells and also red blood cells also show certain pattern of degradation which can be correlated to the time passed since death. Although a single cell change viewed in isolation may not do wonders in framing opinion of time elapsed since death but a study of morphological appearance of various cells at the time of examination may lead to meaningful inferences. Thus we concluded that the present study proves that changes in the morphology of red blood cells & white blood cells can be helpful as supplementary procedure for estimating time since death.

Keywords: Time since death, W.B.C., R.B.C, Cellular changes, Degeneration.

Introduction

Determination of 'time since death' is one of the important content of the post-mortem report and is desired by the law administrating agencies. The proper estimation of time since death sometimes gives important hints for solving the crime to the investigating agencies and punishing the true offender and proper administration of justice.¹

Traditionally the triad of algor mortis, livor mortis and rigor mortis has been used to estimate the time since death from ages and also recently ample amount of studies have been done for time since death which are based on various chemical and physical changes that occur after death but none of them has proven to be satisfactory enough to narrow the range of time since death.²

Following cessation of the circulation, ischemia in organs and tissues leads to reversible, then irreversible changes affecting their structure and function. The cellular death arises by the irreversible change in the internal environment of body consequent to death. The time course of these phenomena is, however, very different, depending on the tissues; for example, brain cortex structures undergo definitive alterations after a few minutes, whereas other tissues kidney, skeletal muscle

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may tolerate prolonged ischemia for up to several hours.²

Numerous cells in blood show varying degree of post-mortem changes and these changes vary with regards to the post-mortem interval. During degeneration these cells pass through the series of changes in chronology study of which may prove useful in determination of time passed since death. In blood cells variation in morphology can be noted in integrity, shape, central pallor and periphery of Red Blood Cells and changes in morphology of all types of White Blood Cells i.e. Neutrophils; Lymphocytes, Eosinophils can be noted as normal, slightly dysmorphic, grossly dysmorphic, mixture of dysmorphic & lysed with the passage of time.¹

Keeping in mind the scarcity of expert hands and budget constraints of a developing country like India, the parameters should preferably be of such a nature that they are relatively inexpensive and can be incorporated into the routine work. Therefore, this study was undertaken to study the estimation of time since death by morphological changes in red & white blood cells.

Material & Method

This is a hospital based descriptive observational study were carried out at the Department of Forensic Medicine, SMS Medical College, Jaipur with assistance from Department of Pathology, for preparation and analysis of samples after obtaining due clearance from research and review board of SMS Medical College and Hospital, The morphological changes observed in RBCs and WBCs were observed in terms of change in their appearance, shape, central pallor, integrity and lytic activity in the cells and their internal structures. The observations were categorized on the basis of findings documented in earlier researches and available literature.

Inclusion criteria:

Dead individuals of either sex and any age

Deaths occurring at the institute wherein time of death is certified in hospital record.

Above cases where attendants consent to participate in the study

Exclusion criteria:

Cases who have received blood transfusion during hospitalization prior to death

Cases with any haemolytic disorder as per available history and documents.

Cases satisfying the inclusion criteria but whose attendants did not consent for participation in the study.

Method

All the corpses were kept in deep freezer at 4° C after certified death in the attached hospital. Time of death in included cases was taken as the time of death declaration officially recorded treatment record in International Death Certificate format. This time was then correlated to the morphological changes observed in different blood cells at different post mortem periods.

Sample Collection & blood smear preparation

After initial dissection of the dead body, 2 ml of blood was collected from the heart chambers in EDTA vial using aseptic precautions. Thin blood smear was prepared and air dried. This blood film was stained with Leishman's stain and microscopic examination of the slides was done under oil immersion lens (100x) and relevant findings were noted under the supervision of Department Of Pathology, SMS Medical College, Jaipur.

Observations & Results

A total of 8865 medico-legal autopsies were conducted during the study period out of which 150 cases were included in the study. . The majority of cases were seen in 21-40 years of age groups, followed by 41-60 years and minimum cases were seen in 0-10 years of age in our study (table 1). males were more preponderant as compare to female, male to female ratio was 4.35:1. We found that lymphocytes are the most resistant blood cells as regards to degeneration after death. Other white blood cells and also red blood cells also show certain pattern of degradation which can be correlated to the time passed since death.

Although uniformity was desired in the number of cases with different times since death but due to restraint of post-mortem after legal formalities, it was not absolutely achieved. Thus, the time since death of majority of cases included in the study were 12-18 hours & more than 48 hours (22% each respectively), followed by 21.33% cases of 0-6 hours and 16% cases of 6-12 hours (table 2).

Morphology changes in of RBC:

All cases examined after death the integrity of RBC was intact till 18-24 hours and mixture of lysed and intact after 24-36 hours. Complete lysis of RBCs was observed in all cases after 36 hours had elapsed after death. The shape of RBCs became slightly dysmorphic in 6-12 hrs and grossly dysmorphic after 12-24 hrs of death. Mixture of grossly dysmorphic with microcytic cells was seen at 24-36 hrs after death and completely lysis was seen after 36 hours of death. The central pallor was retained until 0-6 hrs, reduced during 6 hrs to 18 hrs and loss of central pallor was seen after 18 hrs in this study. Hemoglobinized periphery of cell was seen at 0-18 hrs, which got pale during 18hrs to 36 hrs and was not recognizable after 36 hrs after death in majority of smears (table 3).

Morphological Change in of WBCs:

In this study during the first 6 hours after death, in all cases morphology of all WBCs were found to be normal till 6 hours until death. After 6 hours of death, dysmorphic changes started in all types of WBCs. During 6 to 12 hours after death, Monocytes and Eosinophils became grossly dysmorphic. Neutrophils and Large Lymphocytes started exhibiting gross dysmorphism after 12 hours, whereas Small Lymphocytes after 18 hours. Complete lysis was an observed in most cells after 18 hours and all WBCs were lysed after 36-48 hours' time period (table 4)

Table 1 : Distribution of cases according to age

Age group (yrs.)	No. of cases	Percentage
0-10 yrs	05	03.33%
11-20 yrs	14	09.33%
21-30 yrs	41	27.33%
31-40 yrs	40	26.66%
41-50 yrs	25	16.66%
51-60 yrs	14	09.33%
>60 yrs	11	07.33%
Total	150	100%

Graph 1 : Distribution of cases according to gender wise**Table 2: Distribution of cases according Time since death**

Time since death	No. of cases	Percentage
0-6 hrs	32	21.33%
6-12 hrs	24	16%
12-18 hrs	33	22%
18-24 hrs	08	05.33%
24-36 hrs	13	08.66%
36-48 hrs	07	04.66%
>48 hrs	33	22%
Total	150	100%

Table 3 : Morphological changes in RBCs

Time since death	RBC			
	Integrity	Shape	Central Pallor	Periphery of cell
0-6 hrs	Intact	Normal	Intact	Hemoglobinized
6-12 hrs	Intact	Slightly dysmorphic	Reduced	Hemoglobinized
12-18 hrs	Intact	Grossly dysmorphic	Reduced	Hemoglobinized
18-24 hrs	Intact	Grossly dysmorphic	Lost	Pale
24-36 hrs	Mixture of lysed and intact	Grossly dysmorphic with microcytic	Lost	Pale
36-48 hrs	Completely Lysed	Lysed	Lost	Not recognized
>48 hrs	Completely Lysed	Completely Lysed	Lost	Not recognized in all

Table 4 : Morphological Change in of WBCs

Time since death	Neutrophils	Small lymphocyte	Large lymphocyte	Monocytes	Eosinophil
0-6 hrs	Normal	Normal	Normal	Normal	Normal
6-12 hrs	Slightly dysmorphic	Slightly dysmorphic	Slightly dysmorphic	Grossly dysmorphic	Grossly dysmorphic
12-18 hrs	Grossly dysmorphic	Slightly dysmorphic	Grossly dysmorphic	Lysed	Lysed
18-24 hrs	Grossly dysmorphic	Grossly dysmorphic	Grossly dysmorphic	Lysed	Lysed
24-36 hrs	Lysed with grossly dysmorphic	Lysed	Lysed	All Lysed	All lysed
36-48 hrs	All Lysed	Lysed	Lysed	All Lysed	All Lysed
>48 hrs	All Lysed	All Lysed	All Lysed	All Lysed	All Lysed

Discussion

This study showed that the majority of medico-legal deaths (54%) were seen in 21-40 years of age, which are the years of active life. Similar results were found by **Shah K, et al.(2015)³** with maximum cases (75%) seen in 21 – 50 years of age group. Similar results were observed by **Kundu SS, et al (2017)⁴** who reported majority of cases (46.43%) were seen in 21-40 years of age group.

In the present study, male were more preponderant as compared to female, male to female ratio was 4.35:1. Similar results were observed by **Kundu SS, et al (2017)⁴** & contradictory to those of **Shah K, et al (2015)³** who observed an almost equal M:F ratio being 14:15.

The majority of cases in the present study comprised of those where time since death at the time of autopsy was 12-18 hours & >48 hours (22% each respectively). **Penttila A and Laiho K (1981)⁵** have observed corpses with post-mortem interval ranging from 1.7 to 270.4 hours in their study. **Babapulle CJ and Jayasundera NP (1993)¹** observed corpses from 0 to 84 hour period in their study. **Dokgoz H, et al (2001)⁶** had observed in vitro and post mortem changes in morphology of blood cells ranging from 0 to beyond 120 hours of post mortem interval. **Bardale R and Dixit PG (2007)⁷** have observed the changes in corpses only up to 24 hours' time period after death, probably for reasons that their study was conducted on non-refrigerated cadavers. **Kumar B, et al (2014 & 2015)^{8,9}** observed blood cells in dead bodies up to more than 48 hours of time since death. **Manohar**

WS, et al (2015)² had observed corpses similar to **Dok Goz H, et al (2001)⁶** for a period up to 120 hours. **Shah K, et al (2015)³** observed the blood cells in corpses with time since death varying from 2.5 to 19 hours.

The present study showed that the integrity of RBCs was intact till 18-24 hours after death in all cases and a mixture of lysed and intact cells was observed after 24-36 hours of death in most cases. Beyond the 36 hours' time period following death, they were completely lysed losing their integrity. A study done by **Bardale R and Dixit PG, et al.(2007)⁷** who reported that up to two-hour post-mortem interval (PMI), the shape and morphology of Red blood cells (RBC) was found to be normal. Whereas, **Bardale R and Dixit PG (2007)⁷** found that a rise in temperature hastens decomposition of living substances.

The results of the present are quite in accordance of those of **Penttila A and Laiho K (1981)⁵**. **Mukherjee JB (2007)¹⁰** found that as fluid exudes out of vessels in dependent body parts in hypostasis, haematocrit value vary from place to place, hence not dependable. The results of the present study are also quite in coherence to those of **Shah K, et al (2015)³** who found that intact RBC's could be observed in all the cases up to 19 hours post-mortem and earliest post-mortem interval at which RBC's were found to be broken was 7 hours.

In this study during the first 6 hours after death, in all cases morphology of all WBCs were found to be normal till 6 hours until death. After 6 hours of death, dysmorphic changes started in all types of WBCs. During

6 to 12 hours after death, Monocytes and Eosinophils became grossly dysmorphic. Neutrophils and Large Lymphocytes started exhibiting gross dysmorphism after 12 hours, whereas Small Lymphocytes after 18 hours. Complete lysis was observed in most cells after 18 hours and all WBCs were lysed after 36-48 hours' time period.

Bardale R and Dixit PG (2007)⁷ observed in their study that neutrophils up to 20-24 hrs, lymphocytes up to 30 hours, eosinophils up to 21 hrs and monocytes are identifiable up to 18 Hrs after death.⁵ **Penttila A and Laiho K (1981)**⁵ stated that when corpses were kept at +4°C the lymphocytes seemed to be most resistant and basophils the least resistant to the effects of autolysis. **Dokgoz H, et al (2001)**⁶ found that eosinophils and monocytes were identifiable up to 72 hours, neutrophils up to 96 hours and lymphocytes up to 120 hours after death in non-refrigerated cadavers. **Arican N, et al (2000)**¹¹ found that the changes of total WBC counts and differential counts together may be used for evaluation of PMI. **Kumar B, et al (2014⁸ & 2015⁹)** reported normal morphology of neutrophils in 91% cases among the deaths autopsied within the first 6 hours after death and in rest 9% cases, they were slightly dysmorphic. In 6 to 12 hours after death they were normal in 60.7% and slightly dysmorphic in 39.2% cases. **Manohar WS, et al (2015)**² found that in Lymphocytes showed degenerative changes even after 84 hours, but could be easily identified even after that period.

The present study observed that Lymphocytes were the most resistant group of blood cells in view of autolytic morphological changes after death. Similar results have also been proposed by **Bardale R and Dixit PG (2007)**⁷.

Conclusion

The present study proposes that lymphocytes are the most resistant blood cells as regards to degeneration after death. Other white blood cells and also red blood cells also show certain pattern of degradation which can be correlated to the time passed since death. Although a single cell change viewed in isolation may not do wonders in framing opinion of time elapsed since death but a study of morphological appearance of various cells at the time of examination may lead to meaningful inferences. Thus we concluded that the present study proves that changes in the morphology of red blood cells

& white blood cells can be helpful as supplementary procedure for estimating time since death.

Conflict of Interest: None Declared.

Ethical Clearance: Taken from the Research , Review and Ethical Committee of SMS Medical College and Hospital.

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An Assessment of Perceived Stress Levels and Coping Strategies for the Same among Married Women Clerical Employees in a Tertiary Care Teaching Hospital

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Abstract

Married working women can be victims of stress both at home and at the work place. The ability of these women to cope and adapt to stressors has an important influence on their physical and psychological well-being. This is a questionnaire based assessment of the perceived stress levels and coping strategies for the same among married female clerical employees in a tertiary care teaching hospital. The assessment of perceived stress among 162 married female clerical staffs reflects that the majority (72.8%) were moderately stressed. About 2.5% were in severe stress, 21.6% had mild stress and 3.1% had no stress. A majority of the participants of the study are suffering from moderate stress. Most of them (72.4%) were under graduates. 70.3% of the participants are junior staff. A majority (72.4%) of the subjects suffering from moderate stress belonged to the income group of Rs10,001-15,000. 72.3% of the staff worked for 40 hours per week. 70.5% of the staff belonged to a nuclear family. It was observed that 72.5% were residing at home. Furthermore, 70.4% have not attended any stress management program and 70.6% of subjects who are suffering from moderate stress have work experience of 1-2 years. There is no association between stress and coping strategies among married female clerical staff ($p=0.829$). Since $p>0.05$ level of significance, null hypothesis is rejected and alternate hypothesis is accepted. From this result we can infer that there is no association between stress and coping strategies. This study can be used as a precursor to further assess the magnitude of stress among staff belonging to different hierarchical levels.

Keywords: Stress levels, Coping strategies, Married women clerical employees

Introduction

Every individual strives very hard to maximize pleasure, because of which there is competition in every walk of life and this competition results in stress.¹

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Occupational stress is stress involving work. Currently, the World Health Organization defines occupational or work related stress as the response people may have when presented with work demands and pressures that are not matched by their knowledge and abilities and which challenge their ability to cope². Married working women can be victims of stress both at home and at the work place. The ability of these women to cope and adapt to stressors has an important influence on their physical and psychological well-being.³

The sources of stress are: Environmental stressors, physiological stressors, social stressors, interpersonal issues, work place system characteristics, death in the family, changes at the work place, losing a job and drug

abuse.⁴The various challenges that working women face include poor access to adequate and fair pay,inadequate social protection,watered down basic rights and little or no say at the work place.Women also continued to bear the bulk of family responsibilities and an increased load of both paid and unpaid work.⁵Prolonged exposure to stressful working conditions may result in illness or disease.⁶According to the National Institute for Occupational Safety and Health (NIOSH) survey,60% of employed women experience significant stress at the workplace.⁷Stress has a huge impact on the health of the employees and society.⁸

Aim

An assessment of perceived stress levels and coping strategies for the same among married female clerical employees in a tertiary care teaching hospital.

Objectives

To assess the perceived stress levels among married women clerical employees.

To determine the level of coping strategies among married women clerical employees.

To find the association between perceived stress and coping strategies among married women clerical employees.

Research methodology

Questionnaire based study.

Key Variables

Perceived stress and coping strategies.

Extraneous Variables

Age,religion,educational status,designation,income per month,hours of work per week, type of family,place of residence,work experience.

Study setting

A tertiary care teaching hospital.

Population

Married women clerical employees working in a tertiary care teaching hospital.

Sample

162 married women clerical employees working in a tertiary care teaching hospital,who fulfilled the sampling criteria,were selected as the sample.

Sampling criteria

Inclusion criteria

Married women clerical employees of the tertiary care teaching hospital :

Voluntarily willing to participate in the study

Available during the period of data collection

Able to understand and read English

Data collection instruments

1. Demographic proforma.
2. Stress scale to assess the perceived stress levels among married women clerical employees.
3. Coping strategy checklist to determine the coping strategies used among married women clerical employees.

Description of the tool

Tool consisted of three parts, they are Tool 1 , Tool 2 , Tool 3

Tool 1:Baseline data of married female clerical staffs

TheDemographic proforma consists of 10 items which gives background information of the subjects such as age in years,religion,education,currently working as,income per month,hours worked per week,type of family,residence of the staff,history of attending any stress management programs regarding management of stress,experience of the staff.

Tool 2:Stress rating scale to assess stress among married female clerical staffs

Stress rating scale is a four point rating scale which consists of 40 items to assess the perceived stress level among married female clerical staffs of a tertiary care teaching hospital.This tool has a 4 point scale with responses as 'NEVER', 'SOMETIMES', 'OFTEN', 'ALWAYS'. The score were 3,2,1 and 0 respectively and reverse scoring was done for the negatively scored items.

The maximum score of stress scale is 120 and was arbitrarily graded as 'NO STRESS' (0-30), 'MILD STRESS' (31-60), 'MODERATE STRESS' (61-90), 'SEVERE STRESS' (91-120).

Tool 3: Coping checklist to assess the coping strategy of married female clerical staffs of a tertiary care teaching hospital.

The tool consists of 30 items and scale is in the form of statements. The tool consists of Dichotomous items with responses "yes" or "no". The scores are 1 and 0 respectively and reverse scoring is done for negatively scored items. The total scores were classified into 'LOW COPING' (0-10), 'MODERATE COPING' (11-20), 'HIGH COPING' (21-30) depending upon the total score. The total score is 30.

Data collection procedure

Data collection began after obtaining ethical clearance letter from the tertiary care teaching hospital. The purpose of the study, the method of data collection and time duration were explained for getting true responses. They were also given confidentiality assurance. Informed consent was given to all samples to ensure all are willing to participate in the study. The subject who fulfilled the sampling criteria was selected from tertiary care teaching hospital. Demographic proforma, stress rating scale and coping strategies checklist was administered to 162 married female clerical staffs.

Plan for data analysis

The data obtained were organized and analyzed by using descriptive statistics based on objectives

and hypothesis of the study and presented under the following headings.

Section 1: Demographic profile of the respondents.

Section 2: Description of perceived level of stress among married female clerical staffs of a tertiary care teaching hospital.

Section 3: Description of the level of coping strategies among married female clerical staffs of the tertiary care teaching hospital.

Section 4: Chi square test to find association between perceived level of stress and coping strategies among married female clerical staffs of the tertiary care teaching hospital.

Study Duration:

The duration of the study was 9 months.

Objectives of the study

To assess the perceived stress level among married working women.

To determine the level of coping strategies among married working women.

To find the association between perceived stress and coping strategies among married working women.

In order to analyze and interpret the data, it was first coded on a master sheet and was analyzed based on the objective of the study using statistical methods.

Section 1

Table 1: Frequency and percentage distribution of samples with respect to their demographic characteristics

SL.NO	VARIABLES	FREQUENCY	PERCENTAGE
1	AGE IN YEARS		
	25-29	59	36.4%
	30-34	63	38.9%
	>35	40	24.7%

Cont... Table 1: Frequency and percentage distribution of samples with respect to their demographic characteristics

2	RELIGION		
	Hindu	141	87%
	Christian	13	13%
	Muslim	2	2%
	Any other	6	6%
3	EDUCATION		
	SSLC	0	0%
	PUC	17	10.5%
	Under Graduate	87	53.7%
	Post Graduate	58	35.8%
4	Currently working as		
	In charge	2	1.2%
	Senior staff	42	25.9%
	Junior staff	118	72.8%
5	INCOME		
	< 5000	12	7.4%
	5001-10000	38	23.5%
	10001-15000	98	60.5%
	15001-20000	10	6.2%
	20001-30000	4	2.5%
	>30000	0	0%

Table 2: Frequency and percentage distribution of samples with respect to their demographic characteristics.

1	HOURS WORKED		
	Full time (40 hours)	119	73.5%
	Part time (< 40 hours	21	13%
	Over time(>40 hours)	22	13.6%
2	TYPE OF FAMILY		
	Nuclear	88	54.3%
	Joint	66	40.7%
	Extended	8	4.9%
3	Residence of staffs		
	Hostel	2	1.2%
	Staff quarters	18	4.9%
	Home	149	92%
	PG or Rent	3	1.9%

Cont... Table 2:Frequency and percentage distribution of samples with respect to their demographic characteristics.

4	Stress Management program		
	Yes	47	29.0%
	No	115	71.0%
5	EXPERIENCE		
	<1	2	12.0%
	1-2 YEARS	34	21.0%
	3-4 YEARS	21	13.0%
	>4 YEARS	105	64.8%

Age in years

The data presented in table 1 shows that the highest fraction(38.9%) of married female clerical staffs are in the age group of 30 to 34. None of them were more than 35 years of age. 36.4% of them were in the age group 25 to 29, 24.7% were above 35 years of age.

Religion

The data presented in Table 1 shows that 87% of the married female clerical staffs are Hindus, 13% are Christians, 2% are Muslims and 6% belong to other category.

Education

The data presented in Table 1 shows that the majority(53.7%) of the married female clerical staffs are under graduates, 35.8% of them are post graduates, 10.5% are PUC holders.

Currently working as

The data presented in Table 1 shows majority (72.8%) of the married female clerical staffs are junior staffs, (25.9%) are senior staffs and (1.2%) are in charge.

Monthly income in rupees

60.5% of married female clerical staffs belonged to income group of 10001-15000. 23.5% of them belonged to the income group of 5001-10000, 7.4% of them belonged to the income group of less than 5000. 6.2% of them belonged to 15001-20000. None of them earned more than Rs30,000.

Hours worked per week

73.5% of married female staffs worked 40 hours

per week. 13% of them worked more than 40 hours per week. 13.6% worked less than 40 hours per week.

Type of family

The data presented in Table 1 shows 54.3% of married female staffs belonged to nuclear family. 40.7% belonged to joint family and 4.9% belonged to extended family.

Residence of staff

92% of married female staff live in a home owned or rented by self/family. About 1.2% of them live in hostels. 1.9% live in Paying Guest/rented accommodation and 4.9% live in staff quarters.

Attendance in stress management programs.

71% have not attended any stress management program. 29% have attended a stress management program.

Work experience

64.8% of the staff have experience of more than 4 years. 21% have 1 to 2 years of experience. 12% have less than 1 year of experience. 13% of married female staffs have 3 to 4 years of experience.

Section 2

Description of perceived level of stress among married female clerical staffs of a tertiary care teaching hospital.

In order to assess the perceived stress level, a stress rating scale was used. The stress scores were classified in four levels such as: No stress, Mild stress, Moderate stress, and Severe stress with (0-30), (31-60), (61-90), (91-

120) respectively.

The majority(72.8%) of married female clerical staffs were moderately stressed.2.5% were severely stressed.21.6% were mildly stressed.3.1% had no stress.

Section 3

Percentage distribution of level of coping strategies among married female clerical staffs of the tertiary care teaching hospital.

The majority (72.2%) had moderate coping strategies, 11.7% had low coping strategies and only 16.0% had high coping strategies.

Section 4

Chi square test to find association between perceived level of stress and coping strategies among married

female clerical staffs of the tertiary care teaching hospital

Since the variables are of ordinal category we apply the chi square test.

On applying Linear-by-Linear Association, we estimated the value of p to be 0.892.

Calculated Chi square variable is greater than 0.05% level of significance ($P > 0.05\%$).

Therefore, we reject the null hypothesis.

The objective now gets satisfied stating that there is no association between the perceived levels of stress and coping strategies among married female clerical staffs of the tertiary care teaching hospital.

Table 3: Frequency and percentage distribution of samples with respect to their demographic characteristics versus stress.

	VARIABLES	SEVERE STRESS	MODERATE STRESS	MILD STRESS	NO STRESS
1	AGE IN YEARS				
	25-29	2(3.4%)	43(72.9%)	11(18.6%)	3(5.1%)
	30-34	2(3.4%)	48(76.2%)	11(17.5%)	2(3.2%)
	>35	0(0%)	27(67.5%)	13(32.5%)	0(0%)
2	Religion				
	Hindu	4(28%)	100(72.9%)	32(22.7%)	5(3.5%)
	Christian	0(0%)	12(92.3%)	1(7.7%)	0(0.0%)
	Muslim	0(0%)	0(0%)	0(0%)	0(0.0%)
	Any other	0(0%)	4(66.71%)	2(33.3%)	0(0.0%)
3	EDUCATION				
	SSLC	0(0%)	0(0%)	0(0%)	0(0%)
	PUC	0(0%)	9(52.9%)	7(41.2%)	1(5.9%)
	Under Graduate	2(2.3%)	63(72.4%)	20(23.0%)	2(2.3%)
	Post Graduate	2(3.4%)	46(79.3%)	8(3.8%)	2(3.4%)
4	CURRENTLY WORKKING AS				
	In charge	0	0	0	1(50%)
	Senior staff	0	34(81.0%)	7(16.7%)	1(2.47%)
	Junior staff	4(3.4%)	83(70.3%)	28(23.7%)	3(2.5%)
5	INCOME				
	< 5000	0	9(75.0%))	2(16.7%)	1(8.3%)
	5001-10000	1(2.6%)	26(68.4%)	9(23.7%)	2(5.5%)
	10001-15000	3(3.1%)	71(72.4%)	22(22.4%)	2(2%)
	15001-20000	0	9(90.0%)	1(10%)	0
	20001-30000	0	3(75.0%)	1(25%)	0
	>30000	0	0	0	0

Table 4: Frequency and percentage distribution of samples with respect to their demographic characteristics versus stress.

6	HOURS WORKED/ WEEK				
	Full time (40 hours)	3(2.5%)	86(72.3%)	26(21.8%)	4(3.4%)
	Part time (< 40 hours	1(4.8%)	16(76.2%)	1(10%)	1(4.8%)
	Over time(>40 hours)	0(0%)	16(72.7%)	1(25%)	0(0%)
7	TYPE OF FAMILY				
	Nuclear	3(3.4%)	62(70.5%)	22(25%)	1(1.1%)
	Joint	1(1.5%)	50(75.8%)	12(18.2%)	3(4.5%)
	Extended	0(0%)	6(75.0%)	1(12.5%)	1(12.5%)
8	RESIDENCE OF STAFF				
	Hostel	0(0%)	2(100%)	0(0%)	0(0%)
	Staff quarters	0(0%)	6(75%)	2(25%)	0(0%)
	Home	4(2.7%)	108(72.5%)	33(22.1%)	4(2.7%)
	PG or Rent	0(0%)	2(66.7%)	0(0%)	1(33.3%)
9	STRESS MANAGEMENT PROGRAM				
	Yes	0(0%)	38(80.9%)	7(14.9%)	2(4.3%)
	No	4(3.5%)	(70.4%)	28(24.3%)	3(2.6%)
10	EXPERIENCE				
	<1	0(0%)	1(50%)	1(50%)	0(0%)
	1-2 YEARS	1(2.9%)	24(70.6%)	7(20.6%)	2(5.9%)
	3-4 YEARS	0(0%)	15(71.4%)	6(28.6%)	0(0%)
	>4 YEARS	3(2.9%)	78(74.3%)	21(20.0%)	3(2.9%)

Table 5: Frequency and percentage distribution of samples with respect to their demographic characteristics versus coping strategies.

SL.NO	VARIABLES			
1	AGE IN YEARS	LOW	MODERATE	HIGH
	25-29	12(20.3%)	39(66.1%)	8(13.6%)
	30-34	10(15.9%)	46(73%)	7(11.1%)
	>35	4(10%)	32(80%)	4(10%)
2				
	Hindu	4(28%)	32(72.9%)	4(28%)
	Christian	0(0%)	1(77%)	12(24.5%)
	Muslim	0(0%)	0(0%)	0(0%)
	Any other	0(0%)	2(33.3%)	4(66.71%)

Cont... Table 5: Frequency and percentage distribution of samples with respect to their demographic characteristics versus coping strategies.

3	EDUCATION			
	SSLC	2(11.8%)	13(76.5%)	2(11.8%)
	PUC	14(16.1%)	64(73.6%)	9(10.3%)
	Under Graduate	10(17.2%)	40(69%)	8(13.8%)
	Post Graduate			
4	CURRENTLY WORKING AS			
	In charge	1(50%)	1(50%)	0(0%)
	Senior staff	7(16.7%)	28(66.7%)	7(16.7%)
	Junior staff	18(15.3%)	88(74.6%)	12(10.2%)
5	INCOME			
	< 5000	0(16.7%)	10(83.3%)	0(0%)
	5001-10000	5(13.2%)	27(71.1%)	6(15.8%)
	10001-15000	16(16.3%)	72(73.5%)	10(10.2%)
	15001-20000	2(20.0%)	60(60.0%)	2(20.0%)
	20001-30000	1(25.0%)	2(50.0%)	1(25.0%)
	>30000	0(0%)	0(0%)	0(0%)

Table 6: Frequency and percentage distribution of samples with respect to their demographic characteristics versus coping strategies.

1	HOURS WORKED/WEEK			
	Full time (40 hours)	14(11.8%)	90(75.6%)	15(12.6%)
	Part time (< 40 hours)	5(23.8%)	14(66.7%)	12(9.5%)
	Over time(>40 hours)	7(31.8%)	13(59.1%)	2(9.1%)
2	TYPE OF FAMILY			
	Nuclear	10(11.4%)	68(77.3%)	10(11.4%)
	Joint	14(21.2%)	43(65.2%)	9(13.6%)
	Extended	2(25.0%)	6(75.0%)	0(0%)
3	RESIDENCE OF STAFF			
	Hostel	1(50.0%)	1(50.0%)	0(0%)
	Staff quarters	1(12.5%)	6(75.0%)	1(12.5%)
	Home	23(54.4%)	108(72.5%)	18(12.1%)
	PG or Rent	1(33.3%)	2(66.7%)	0(0%)
4	STRESS MANAGEMENT PROGRAM			
	Yes	5(10.6%)	36(76.6%)	6(12.8%)
	No	2(18.3%)	81(70.4%)	13(11.5%)
5	EXPERIENCE			
	<1	2(16.7%)	10(83.3%)	0(0%)
	1-2 YEARS	5(13.2%)	27(71.1%)	6(15.8%)
	3-4 YEARS	16(16.3%)	72(73.5%)	10(10.2%)
	>4 YEARS	2(20.0%)	6(60.0%)	2(20.0%)

Discussion

The assessment of perceived stress among 162 married female clerical staffs reflects that the majority(72.8%) were moderately stressed.About 2.5% were in severe stress,21.6% had mild stress and 3.1% had no stress.A majority of the participants of the study are suffering from moderate stress.Most of them(72.4%) were under graduates.70.3% of the participants are junior staff.A majority(72.4%) of the subjects suffering from moderate stress belonged to the income group of Rs10,001-15,000.72.3% of the staff worked for 40 hours per week.70.5% of the staff belonged to a nuclear family.It was observed that 72.5% were residing at home.Furthermore,70.4% have not attended any stress management program and 70.6% of subjects who are suffering from moderate stress have work experience of 1-2 years.

There is no association between stress and coping strategies among married female clerical staff ($p=0.829$). Since $p>0.05$ level of significance,null hypothesis is rejected and alternate hypothesis is accepted.From this result we can infer that there is no association between stress and coping strategies.This study can be used as a precursor to further assess the magnitude of stress among staff belonging to different hierarchical levels.

Ethical Clearance- Taken from Institutional Ethics committee.

Source of Funding- Self

Conflict of Interest – Nil

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A Study on PTSD and associated Autonomic Dysfunctioning

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Abstract

Post-traumatic stress disorder (PTSD), is an after effect of trauma resulting in disharmony between physiological, psychological and behavioural bodily reactions. Such Patients go through abnormal fluctuations in their autonomic nervous system functioning (dysautonomia), leading either to exaggerated fight and flight behaviours or the opposite state of withdrawal from reality and immobilization. In this study, we have tried to assess the trauma patients for the presence of PTSD. The aim of our study was the early detection and management of PTSD. **Material & Method:** We have worked on 50 post trauma cases in the age group of 15-60 years coming to OPD of the Neurosurgery and Neurology departments of DrRMLIMS. These Participants were assessed for PTSD on the basis of Clinician Administered PTSD Scale (CAPS-5). After this, these cases were tested for autonomic function tests HR, BP and HRV in the Physiology Department. **Results:** PTSD was seen in 13 males and 12 females. Maximum cases were seen in the 25-44 year age group, amongst both the PTSD (56%) and non-PTSD (52%) subjects. Lowest incidence of trauma was seen in the 55-64 year age group, followed by 45-54 year age group. Associate alcohol and smoking addiction was more common in PTSD group. In our study the PTSD group showed lower HRV than non PTSD group at baseline and throughout the 30 seconds visuals related to trauma. Contrarily, the non PTSD subjects had a normal HR and a high HRV, with normal BP. **Conclusion:** The first and foremost problem is distinguishing between true PTSD from feigned or false PTSD. The psycho-physiological testing of suspected PTSD cases should be done for better assessment of PTSD's medico-legal cases. Forensic experts can also prove to be helpful in assisting the courts in ascertaining whether an individual actually suffers from PTSD or not.

Keywords: Post-traumatic stress disorder (PTSD), Dysautonomia, Clinician Administered PTSD Scale (CAPS-5), Heart Rate Variability (HRV), Heart Rate (HR)

Introduction

Post-traumatic stress disorder (PTSD), as the term indicates is an after effect of trauma resulting in disharmony between physiological, psychological and behavioural bodily reactions. This in turn blunts an individual's ability to adequately and appropriately respond to environmental stress. Such Patients go through abnormal fluctuations in their autonomic nervous system functioning, leading either to

exaggerated fight and flight behaviours or the opposite state of withdrawal from reality and immobilization. Though such reactions are necessary in dangerous and life threatening situations, however in day to day life it results in significant psychosocial distress and abnormal social behaviour. Eventually, these continuous maladaptive autonomic responses may contribute to the development of co-morbid mental health issues such as depression, loneliness, and hostilities towards others. These in turn act as stress factors for further alteration in endocrine and immune functions resulting in significant health deterioration through the development of brain dysfunction and cardiovascular diseases^{1,2}. However not every case of trauma results in precipitation of PTSD, therefore it is very essential to reassess and reconfirm the diagnosis of PTSD for its proper management and therapeutic intervention. For this purpose we need to

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focus on the biologic measurements or the physiological changes in the autonomic function tests so that the diagnosis of PTSD could be reconfirmed.

In this study, we have tried to assess the trauma patients for the presence of PTSD. The aim of our study was the early detection and management of PTSD. We have also studied the physiologic responses of these patients to trauma related stimuli and non-trauma related stimuli. The purpose of this biofeedback was to make the PTSD patients aware about their abnormal or exaggerated physiological responses, and thus indirectly promoting a better control over these responses. Subsequently, this reduction of anxious physiological responses leads to overall improvement in health. We have also tested the PTSD patients for autonomic dysfunction based on the results of autonomic function tests. The long term goal of our study was early detection of PTSD among trauma patients along with timely detection of potential risk of early onset of diseases like diabetes, cardiovascular diseases, Alzheimer's disease, and dementia.

Material & Method

We have worked on 50 post trauma cases in the age group of 15-64 years coming to OPD of the Neurosurgery and Neurology departments of DrRMLIMS. We have studied only those post trauma patients which had a probability of having PTSD in our study. These Participants were assessed for PTSD on the basis of Clinician Administered PTSD Scale (CAPS-5)³. Assessing for PTSD was done in the Department of Forensic Medicine and Forensic Psychiatry. After this, these cases were tested for autonomic function tests HR, BP and HRV in the Physiology Department.

We have checked the baseline physiological values of HR, BP, HRV in PTSD patients. Later we have studied the inter-individual differences between PTSD and non PTSD subjects after dividing them in two groups of 25 each simultaneously. The voluntary participants were also studied for other criteria like age, gender, smoking, alcohol and other substance abuse.

Each group was tested for HR, BP, ECG, and autonomic function test. Our primary objective was HR and HRV. The secondary objectives were BP and ECG. After 5 minutes, participants of both groups were again tested only for HR and HRV while watching a 30 second visual bearing a similarity to the type of trauma they have gone through.

Observations:

Table-1: Gender distribution among the PTSD and non PTSD groups

S. no.	Patient group	Males	Females
1	PTSD Patient	13	12
2	Non- PTSD Patient	16	9

Table-2: Classification of PTSD and non-PTSD patients according to Age

S.no.	Age	PTSD subjects (25)	Non PTSD subjects (25)
1	15-24 years	6	7
2	25-34 years	7	5
3	35-44 years	7	8
4	45-54 years	4	3
5	55-64 years	1	2
	Total	25	25

Table-3: Associated addictions in PTSD & non PTSD groups

s. no.	Patient group	Smoking	Alcohol
1	PTSD Patient	7	14
2	Non- PTSD Patient	5	8
	Total	12	22

Table-4: Baseline findings in both groups

S .no.	Physiological Testing	Baseline HR	Baseline HRV
1	PTSD Patient	Elevated	Low frequency
2	Non- PTSD Patient	Normal	High HRV

Table-5 Effect of trauma visuals on HR and HRV

S .no	Group	HR	HRV
1	PTSD Patient	No increase	No increase in LF HRV
2	Non- PTSD Patient	Increased HR	increase in LF HRV

Discussion

In our study, 58% patients of males and 42% of females were found to be having PTSD after applying the CAPS score. Among the 25 patients found to be positive for PTSD, 52% were males and 48% were females. This hints to slight male preponderance among the PTSD patients. This is in contrast with the research of Daniel et al which showed a higher prevalence of PTSD in females⁴. The likely reason for this could be the greater degree of movement among the males in a developing country like India, resulting in greater probability of their chances of trauma exposure. Though India witnesses a high rate of sexual crimes against the females, yet we came across less number of PTSD among females. Again we tend to give the blame to lower education status of females, leading to less awareness and thus incorrect reporting or underreporting of sex crimes.

Coming to the age related manifestations of PTSD, in our study we could not detect any significant age related differences in both the groups. We have got the maximum number of cases in the 25-44 year age group, amongst both the PTSD (56%) and non-PTSD (52%) subjects. Lowest incidence of trauma was seen in the 55-64 year age group, followed by 45-54 year age group, thus clearly pointing high propensity to trauma among the young productive youths. This is in consistent with Konner et al work where the older age veterans reported lower PTSD symptoms⁵. However Kessler et al's work showed a highest prevalence of PTSD in the 45-55 year group among males.⁶

We have also tried to assess the various types of addictions in both our study groups. PTSD subjects showed a higher rate of addiction (84%) in the form of Alcohol (56%) and smoking (28%), whereas the non PTSD subjects though projected a more or less similar pattern of addiction with a much lower incidence (52%). Brown P. Et al work on PTSD and substance abuse also demonstrated a higher prevalence of alcohol and substance abuse (60 to 70%) among war veterans with PTSD.⁷

A number of studies have been done on psycho physiological testing of PTSD patients. The researchers have observed the changes in heart rate and blood pressure along with skin conductivity in prediagnosed PTSD patients⁸. According to Pitman et al, the psycho physiologic measurement of PTSD may help in better

assessment of PTSD's medico legal cases⁹. Bauer et al compared the psycho physiological reactivity to script driven imagery with the clinician administered PTSD scale¹⁰. Similarly there is evidence of heightened and long lasting autonomic responses in PTSD patients when they were shown videos or films related to war, in comparison with normal control group, thus proving sympathoadrenal activation in response to memory evoking videos.¹¹

The results of autonomic nervous system testing among the PTSD and non-PTSD subjects were quite significant and helped us in reconfirmation of our diagnosis of PTSD. Although Psycho physiological assessment typically involves measurement of one of four key physiological systems- cardiovascular measurement, such as blood pressure and heart rate measurement, with electrocardiograms (ECG); electro dermal measurement of skin conductance; electromyographic measurement of muscle activity; and electro-cortical measurement with electroencephalograms (EEG)¹². We have studied only the BP, HR and HRV in both the groups. The PTSD group showed a remarkable increase in HR and a low HRV with high BP even at baseline testing. These physiological parameters did not show any significant increase on watching trauma related visual testing. Contrarily, the non PTSD subjects had a normal HR and a high HRV; with normal BP. A number of research studies have concluded to the occurrence of increased physiological response to trauma related videos in PTSD patients^{13, 14}. Blechert et al's study revealed similar findings, PTSD patients had attenuated parasympathetic and elevated sympathetic control¹⁵.

In our study the PTSD group showed lower HRV than non PTSD group at baseline and throughout the 30 seconds visuals related to trauma. This in accordance with the findings of Marit et al in his work on HRV analysis in PTSD patients.¹⁶

Pitman et al found that that skin conductivity gives a better measure of abnormal physiological responses in response to traumatic stimuli in PTSD and non PTSD war veterans.⁹

H. Cohen did a comparative study of power spectral analysis of HRV at rest and in response to recollection of trauma events or panic attack in patients suffering from Panic disorder and PTSD¹⁷. Both patients displayed elevated HR and low frequency of HRV at rest. The

PTSD patients did not show increase in HR and low HRV in recall stress.

Gabriel et al study assessed the efficacy of HRV biofeedback as a treatment option for PTSD patients and found to be very effective and feasible in combated related veterans who displayed a significantly depressed HRV.¹⁸

According to Pitman et al, the psycho physiologic measurement of PTSD helps in better assessment of PTSD's medico legal cases¹⁹. Orr et al has also studied the clinical applications of psycho physiological testing of PTSD Patients²⁰.

Conclusion

The first and foremost problem is distinguishing between true PTSD from feigned or false PTSD. We have to keep in mind that not every case of trauma will lead to development of PTSD. The psycho-physiological testing of suspected PTSD cases should be done for better assessment of PTSD's medico-legal cases. This will not only help in accurate detection of PTSD from feigned PTSD, but it will be beneficial for early detection of cardiovascular disease.

Forensic experts can also prove to be helpful in assisting the courts in ascertaining whether an individual actually suffers from PTSD or not. This is usually needed in cases medical compensation where the particular trauma led to development of PTSD in the patient.

Moreover, the early and accurate diagnosis of PTSD will be helpful in early management of the disorder and thus preventing the onset of secondary problems in the form of depression, Alzheimer's, diabetes, and hypertension.

Conflict of Interest: None

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Effectiveness of Concept Mapping on Conventional Teaching Method in Terms of Knowledge Regarding Arterial Blood Gas (ABG) Analysis among B.Sc. Nursing IV Year Students

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Abstract

Background: Teaching is an interactive process, primarily involving classroom talk, which takes place between teacher and pupils and occurs during certain definable activities. Concept mapping is one of the innovative teaching methods to teach the students. Concept mapping helps to enhance the knowledge of the students regarding the topic which are taught to the student. **Objective:** To evaluate the effectiveness of concept mapping on conventional teaching method in terms of knowledge regarding ABG analysis among B.Sc. Nursing IV year students. **Materials and Method:** A randomized controlled trial, using basic pretest, posttest control group design adopted for the study. The accessible population for this study consists of B.Sc. Nursing IV year students. Probability sampling technique- simple random sampling method (computing method) was used to select the participants for the study. The selected participants were randomized 30 each to experimental & control group using lottery method. Data was collected using self report structured knowledge questionnaire. The data was analyzed by using descriptive & inferential statistics, using SPSS, version 20 software. **Results:** The mean post test knowledge score (13.13 ± 2.11) of the experimental group was greater than the mean pre test knowledge score (9.16 ± 2.66) with the mean difference of 3.97. Hence, it shows the effectiveness of concept mapping on conventional teaching method. ($p < 0.05$) The mean post test knowledge score of the experimental group (13.13 ± 2.11) was greater than the mean post test knowledge score of the control group (10.56 ± 2.54) with the mean difference of 2.57; hence it shows the effectiveness of concept mapping on conventional teaching method. ($p < 0.05$) **Conclusion:** Concept mapping is effective teaching method to teach the students. Concept mapping helps to enhance the knowledge of the students regarding the topic which are taught to the student.

Keywords: Concept mapping, Conventional teaching method, nursing students.

Introduction

Background of the study

“The function of education is to teach one to think intensively and to think critically. Intelligence plus character that is the goal of true education.”

Martin LutherKing, Jr.

“Teaching is an interactive process, primarily involving classroom talk, which takes place between teacher and pupils and occurs during certain definable activities.” (Edmund Amidon 1967).

According to B. Sankaranarayanan, B Sindhu, 2012, teaching is structuring individual ideas and action by giving instruction and doing practices that lead to a learning behavior and capacity. Several methods can be use in teaching and it also depends on the nature of student and subject. Good teaching keeps the student active and this will promote his physical and mental health. It helps the student to develop desirable learning habits to achieve the desired aims change in behavior. Teaching not only trains the student to behave rationally than emotionally but also teaches to ventilate emotions in a healthy way.^[1]

Nursing education is considered professional education which is comprehensively scheduled and performed through instructions and discipline. It aims for the progress of social, physical, intellectual, emotional, spiritual powers or abilities of the student to provide professional nursing care to the people at different places in different health & illness in various settings with high quality of care.^[1]

A common practiced teaching technique includes the principles and methods which are used by the teachers to enhance the student learning. These strategies are partly based on the content to be taught and partly by the nature of the learner. The appropriate and efficient method has to be used for the particular teaching in relation with the characteristic of the learner. In today's school the trends are that it promotes a lot of creativity.^[2]

Every teaching method have shortcoming of their own none of teaching method is efficient enough to achieve overall goal of teaching. Students are mainly passive in the class teaching and teachers are not able take care of each student during teaching in class who are having different abilities and interests.

So according to scenario of present education, it is much needed to think out of the box. Innovation is much needed in teaching learning activity. Innovative teaching is a proactive approach to integrate new teaching strategies and methods into a classroom. The new ideas and techniques in teaching are critically examined, evaluated and some changes in the delivery of knowledge are recommended.

Concept mapping is important innovative teaching methods to teach the students. Concept mapping is a famous tool using in education worldwide. It was developed by **Novak in 1970s** for visualizing the relationship among different concepts (**Nirmala & Shakuntala, 2011**). Concept mapping is found as an advanced teaching method for successful learning (**Harpaz, Balik, & Ehrenfeld, 2004**).^[3]

According to **F. Sarhangi et.al (2011)**, Concept mapping should be used in order to provide comprehensively and patient-centered care in nursing education. It is used for the student to prepare them for clinical activities and correlate theory and clinical and it also helps to reduce students' anxiety, motivate the student to increase the higher learning level.^[4]

According to **Farrag Rania Eid 2016**, in concept mapping a rich social environment is used as master plan for learning method, in which the learners work either individually or may work in groups to enhance learning of each other. Concept maps provide opportunity to student to think about the relation between the terms being learned by the learner; secondly to organize the thoughts in a systematic way and illustrates the relationships between key concepts. Concept maps allow students to think deeply.^[5]

In present scenario teaching become monotonous in terms of the innovation; if innovative teaching learning method practiced a better outcomes can be achieved in learning which helps the learners. Hence, investigator planned to conduct this study to evaluate the effectiveness of concept mapping on conventional teaching method in terms of change in knowledge.

Statement of the problem

A Study to Evaluate the Effectiveness of Concept Mapping on Conventional Teaching Method in terms of Knowledge Regarding Arterial Blood Gas (ABG) Analysis among B.Sc. Nursing IV year Students in Selected Colleges of Nursing, Moradabad.

Objectives of the study

1. To evaluate the effectiveness of concept mapping on conventional teaching method in terms of knowledge regarding ABG analysis among B.Sc. Nursing IV year students.
2. To find the association of level of knowledge regarding Arterial blood gas (ABG) analysis & selected demographic variables.

Materials and Method

A Randomized controlled trial was conducted to evaluate the effectiveness of concept mapping on conventional teaching method in terms of knowledge regarding ABG analysis among B.Sc. Nursing IV year student in selected colleges of Nursing, Moradabad. The objectives of the study were: to evaluate the effectiveness of concept mapping on conventional teaching method in terms of knowledge regarding ABG analysis among B.Sc. Nursing IV year students, to find the association of levels of knowledge regarding Arterial Blood Gas (ABG) analysis & selected demographic variables. The conceptual framework for the present

study was based on Imogene King's goal attainment model (1971). A randomized controlled trial, using basic pretest, posttest control group design adopted for the present study. Probability sampling technique-simple random sampling method (computing method) was used to select the participants for the present study. The selected participants were randomized 30 each to experimental & control group using lottery method. The data collection tool consists of two sections: A demographic Performa consist of four items. It includes Age, Gender, Area of residence, previous exposure of using concept map for knowledge acquisition. Structured knowledge questionnaire on ABG Analysis consisted of 18 items regarding in meaning, purpose, indications, contraindications, sites, complications, components and acid base imbalances.

Results

The result of the study revealed that in experimental group, majority of participants i.e., 84% were belonged to the age group of less than 22 years and in control group, 76% of the participants were belonged to the age group of less than 22 years. In the experimental group model participants (93%) were females and only 7% of the participants were males. In control group almost half (53%) of the participants were females and 47% of the participants were males. in the experimental group major portion of participants i.e., 57% were belonged to the urban area and 43% of the participants were belonged to rural area. In control group also major portion of participants i.e., 60% were belonged to the urban area and rest of the participants were belonged to the rural area. In the experimental group approx half of the participants (53%) had previous exposure of using concept map for the knowledge acquisition. In control group only 33% of the participants had previous exposure of using concept map for the knowledge acquisition. Comparison of mean pre-test & mean post-test knowledge score of the experimental group revealed that the mean post test knowledge score (13.13 ± 2.11) of the experimental group was greater than the mean pre test knowledge score (9.16 ± 2.66) with the mean difference of 3.97, hence it shows the effectiveness of concept mapping on conventional teaching method. Comparison of post-test knowledge scores of the experimental and control group also revealed that the mean post test knowledge score of the experimental group (13.13 ± 2.11) was greater than the mean post test knowledge score of the control group (10.56 ± 2.54) with the mean difference of 2.57,

hence it shows the effectiveness of concept mapping on conventional teaching method. ($p < 0.05$) There was no association between pre-test knowledge score & selected demographic variables. ($p > 0.05$)

Discussion

The findings of the present study discussed with other related studies & organized under following sections.

Section A: Description of the Sample Characteristics

Majority of the participants of the experimental group (84%) & the control group (76%) belonged to the age group of less than 22 years with the mean age of 20.93 ± 0.48 . In the experimental group model participants (93%) were females & in the control group almost half (53%) of the participants were females. Majority of the participants of the experimental group (57%) were belonged to the urban area and in control group also major portion of participants (60%) were belonged to the urban area. Majority of the participants of the experimental group (53%) had previous exposure of using concept map for the knowledge acquisition. In control group only 33% of the participants had previous exposure of using concept map for the knowledge acquisition.

Finding of the present study in similar with study conducted F. Sarhangi, M. Masoumy et.al (2016) to assess the effect of concept mapping on critical thinking skills of the nursing students. The findings of the study showed that 60.6% of the students were female. The intervention group mean age was 21.23 (1.40) and control group mean age of 21.21 (0.82) years, and also intervention group previous term's average score was 17.05 (0.94) and in control group was 16.88 (1.02).^[4]

Section B: Effectiveness of Concept mapping on Conventional teaching method

Results of the present study revealed that the mean post test knowledge score of the experimental group was greater than the mean pre test knowledge score with the mean difference of 3.97. ($p < 0.05$) Results of the study also showed that the mean post test knowledge score of the experimental group was greater than the mean post test knowledge score of the control group with the mean difference of 2.57. ($p < 0.05$) This study suggests that concept mapping is effective teaching method to teach the students.

Findings of the present study in congruent with study conducted Passmore, Gregory G. (2011) conducted study to evaluate the effectiveness of concept mapping as a learning intervention for nuclear medicine technology students in a distance learning radiation protection and biology course. The findings of this study revealed that intervention group had 72.3 mean score of introductory radiation protection and radiobiology final examination for the distance learning students who use concept mapping as a learning method and median score was 70. The distance teaching students who didn't use concept mapping as a learning method mean score was 57.3 and the median score was 57. [6]

Also finding of the present study in consistent with study conducted Farrag Rania Eid (2016). The finding of the study reveals that the study group means knowledge score regarding concept mapping before and after awareness session. The mean score of student's knowledge before the awareness session was 8.9 ± 4.9 and after the sessions, it was 30.0 ± 5.9 . Before & after the awareness session there was a highly statistically significant difference in student's knowledge about concept mapping. [3]

There was no association between pre-test knowledge score & selected demographic variables. ($p > 0.05$)

Conclusion

The present study concludes that concept mapping is effective teaching method to teach the students. Concept mapping helps to enhance the knowledge & understanding of the students regarding the topic which are taught to the student.

Ethical Consideration: This study is ethically considered by the panel of Teerthanker Mahaveer College of Nursing, Teerthanker Mahaveer University after discussing with each and every point of this study.

Conflict of Interest: Nil

Source of Fundings: Self

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Correlation of Histopathological Changes with the Manner of Death in Fatal Burns in a Tertiary Care Hospital in Northern India

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Abstract

Objectives: To find the correlation of manner of death with histopathological changes in fatal burns in a tertiary care hospital in north India.

Method: This was a comparative study. Cases were thoroughly studied using specially designed proforma that included the demographic profile of deceased along with information gathered from relatives, police & hospital records and autopsy findings. Before taking the lung sample, proper consent was taken from the relatives after explaining the purpose of the study. After gross examination, sections were taken from different lobes of lungs.

Results: Tracheal congestion was found mainly in accidental deaths (49.77%), followed by suicidal deaths with 28.57% and homicidal deaths with 21.66%. This difference was found to be statistically significant ($p < 0.001$). Lung Consolidation was more commonly seen in accidental and suicidal deaths (48.4%) as compared to homicidal deaths (3.19%). Various other variables were also correlated with type of burns.

Conclusion: This association of histopathological changes in lung tissue could help to ascertain the mode of Death, as well as can hint towards conduction of proper inquest in suspicious cases of so called suicidal deaths

Key words: Fatal burn, Manner of death, Histopathological changes

Introduction

As per the definition Burn is a type of Thermal injury caused due to application of excessive dry heat to external and internal body surfaces resulting in tissue destruction¹. In a developing country like India, Burns constitute a major problem with an incidence of 6-7 million, out of which 70% victims are from the

productive age group of 15-40 years, coming from the lower socio economic strata². Not only this, Burns have another black dot to its name when it comes to dowry deaths, constituting a significant number to the medico-legal cases of the hospitals.

Accidental Burns are the most common form of Burns³. Fatal Burns as a result of residential fires account for 10% of all Accidental deaths in developed countries, with one-fourth of the deaths involving elderly people. Throughout ages Burns are considered as a common means of suicide and homicide across the globe. Apart from that, Burn injuries also tops the trauma list of the world, followed closely by Road traffic accidents, falls and interpersonal violence⁴.

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There is a huge list of factors leading to fire fatalities. The most frequent among them are smoke inhalation and accidental physical injuries. Examination of victims who have died from smoke inhalation usually reveals soot in the nostrils and mouth as well as burns, and coating of the larynx, trachea, and bronchi at autopsy. Soot can be detected with the naked eye 2 or 3 days after inhalation of smoke⁵. The extent of the burn is determined by the classic “rule of nine”: head (9% of body surface), upper extremities (each 9%), front of the trunk (18%), the back (18%), each lower extremity (18%), and the perineum (1%). Carbon monoxide inhalation is the cause of death in most of victims of house fires. In enclosed areas, in addition to carbon monoxide, hydrogen cyanide is responsible for death from smoke inhalation. Septicemia is the major cause of delayed deaths in cases of burns (45%)⁶.

The purpose of our research is to study the histopathological changes in fatal burns in a tertiary care hospital in north India. These histopathological changes are then linked with the manner of Burn injury i.e whether Accidental, suicidal or Homicidal.

All autopsies with history of burn injury were studied to find out the significant histopathological change in lung.

Material and Method

This was a comparative study conducted in the

mortuary of King George Medical University of Lucknow. All autopsies with history of burn injury were studied to find out the significant histopathological change in lungs. We came across 610 cases of burns during the course of our study period of one year. However we have included only 550 cases in our study. The cases with time since death of more than 24 hours were excluded from our study because lungs undergo decomposition after 24 hour period of death. Cases with having previous history of lung diseases and anatomically distorted lungs were also excluded from the study.

All the Cases were thoroughly studied using specially designed proforma that included demographic profile of deceased, history from relatives, police & hospital records, autopsy findings. Before taking the lung sample, proper consent was taken from the relatives after explaining the purpose of the study. After gross examination sections from different lobe were taken. These sections were sent to Department of Pathology for microscopic examination through a multi-step process. Routine Hematoxylin & Eosin staining was done. The histopathological changes were studied under the electron microscope.

Statistical Analysis

The results were taken in frequencies and percentages. Chi-square test was used for comparisons. The p-value < 0.05 was considered significant. All the analysis was carried out on SPSS 16.0 version (Chicago, Inc., USA).

Results

Manner of Death and Histopathological findings

Variables	Total +ve	Accidental		Homicidal		Suicidal		Statistical significance	
		No.	%	No.	%	No.	%	χ^2	p
Trachea									
Congestion (n=550)	433	215	49.77	94	21.66	124	28.57	25.943	<0.001
Soot particle (n=548)*	39	15	38.46	17	43.59	7	17.95	20.007	<0.001
Lung									
Pneumonia (n=323)**	188	91	48.40	6	3.19	91	48.40	67.316	<0.001
Congestion (n=323)***	314	142	45.22	53	16.88	119	37.90	1.941	0.379
Capillary dilatation (n=323)**	147	65	44.22	48	32.65	34	23.13	51.350	<0.001

Cont... Manner of Death and Histopathological findings

Alveolar and interstitial edema (n=323)**	82	45	54.88	9	10.98	28	34.15	5.165	0.076
Alveolar and interstitial hemorrhage (n=323)**	237	114	48.10	14	5.91	109	45.99	86.024	<0.001
Alveolar wall disruption (n=323)**	75	31	41.33	37	49.33	7	9.33	78.632	<0.001
Inflammatory cells (n=323)**	115	63	54.78	9	7.83	43	37.39	12.946	0.002
Hyaline membrane (n=323)**	24	7	29.17	0	0.00	17	70.83	13.677	0.001
Fibrin strands (n=323)**	24	7	29.17	0	0.00	17	70.83	13.677	0.001

*Autolyzed excluded, **Autolyzed and not done excluded

Tracheal congestion was found in higher proportion of cases in whom manner of death was Accidental (49.77%) as compared to Suicidal (28.57%) and Homicidal (21.66%) and this difference was found to be statistically significant ($p < 0.001$).

Tracheal soot particles were found in statistically significantly higher proportion of cases in where manner of death was Homicidal (43.59%) or accidental (38.46%) as compared to suicidal (17.95%).

Consolidation in lungs was found in statistically significantly higher proportion of cases in whom manner of death was Accidental or Suicidal (48.40% each) as compared to Homicidal (3.19%).

Lung congestion was found in higher proportion of cases in whom manner of death was Accidental (45.22%) or Suicidal (37.90%) as compared to Homicidal (32.65%), but difference was not found to be statistically significant.

Capillary dilatation in lung was seen in significantly higher proportion of cases in whom manner of death was Accidental (44.22%) or Homicidal (32.65% each) as compared to Suicidal (23.13%).

Alveolar and interstitial edema in lung was statistically found in significantly higher proportion of cases in whom manner of death was Accidental (54.88%) or Suicidal (34.15%) as compared to Homicidal (10.98%).

Alveolar and interstitial hemorrhage in lung was statistically found in significantly higher proportion of

cases in whom manner of death was Accidental (48.10%) or Suicidal (45.99%) as compared to Homicidal (5.91%).

Alveolar wall disruption in lung was found in statistically significantly higher proportion of cases in whom manner of death was Homicidal (49.33%) or Accidental (41.33%) as compared to Suicidal (9.33%).

Inflammatory cells of lung was statistically found in significantly higher proportion of cases in whom manner of death was Accidental (54.78%) or Suicidal (37.39%) as compared to Homicidal (7.83%).

Hyaline membrane and Fibrin stands in lung was found to be affected in statistically significantly higher proportion of cases in whom manner of death was Suicidal (70.83%) as compared to Accidental (29.17%) or Homicidal (0.00%).

Discussion

Burn injuries have been occurring throughout the world since ancient times making the Human race pay the price for mishandling the precious fire element of nature. Burns cause a variety of medical and psychological problems along with inflicting severe economic and social burden on the victims' families and ultimately the society in both the developed and developing countries. In the present study, maximum patients were of age group 11-30 years with peak incidence in 21-30 years of age group. These findings concurred with the observation of El-Muhtaseb (1984), Ragheb et al (1984), Lari (2000) and Kachare et al (2005)^{7,8,9,10}.

In the present study, all the histopathological findings were significantly associated with type of burns. In our study, most of the burns cases were accidental. Chawla et al (2011) & Jagannath HS et al (2011) studied majority of cases due to accidental burns^{11, 12}. In the study by Bhanvadia et al (2017), majority of gross findings of lungs showed heavy, firm, congestion followed by congestion & frothy fluid on cut surface & consolidation, which is in accordance with other studies¹³.

Bhanvadia et al (2017) found that majority of histopathological features showed diffuse alveolar damage followed by interstitial pneumonitis, diffuse interstitial edema, bronchopneumonia and pulmonary edema¹³. Rare findings like focal atelectasis, areas of emphysema, necrotizing bronchiolitis were also seen. Toor et al (1990) observed diffuse alveolar damage in 16 (48.48%) patients, acute bronchopneumonia in seven (21.21%) patients, and necrotizing inflammation in seven (21.21%) patients, which is accordance with other study¹⁴.

Argamaso (1967) showed changes of pulmonary edema in majority of cases (70.00%) followed by pneumonitis and abscess formations in 26.66% of cases¹⁵. Hasleton et al (1983) noted congestion of alveolar walls, interstitial and intra alveolar edema and intra alveolar hemorrhage in first 48 hours¹⁶. Pneumonia and septicemia were common findings after 48 hours. Intravascular microthrombi denoting disseminated intravascular coagulation along with above changes were also noted after 48 hours. Chopra and Sabherwal (1988) have proved that the examination of myocardium after acridine orange stain, under fluorescent light is more sensitive than autofluorescence for detecting ischemia¹⁷.

Conclusion

Our study has tried to associate the histopathological findings in burn cases with the manner of death. This has got great relevance medicolegally in suspicious cases of Burns. This association of histopathological changes in lung tissue could help to ascertain the mode of Death, as well as can hint towards conduction of proper inquest in suspicious cases of so called suicidal deaths. Besides India being a so called hub for the dowry deaths, the culprits mainly try to portray the homicidal burns as accidental or suicidal burns. Therefore a further enhancement of laboratory techniques for histopathological study of lung tissue in fatal burns may turn out to be an essential tool

of forensic importance for our legal system.

Conflict of Interest: None

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Original Research Article

Role of 2nd Digit:4th Digit Ratio(2D:4D Ratio) in Establishing the Biological Profile of an Individual

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Abstract

Introduction: The process of identification focuses mainly on establishing the biological profile by estimating the sex, age and stature which significantly narrows down pool of suspects. The 2D:4D ratio is a sexually dimorphic trait which is influenced by prenatal estrogen and testosterone levels. Studies also suggest that there might be strong relationship of this ratio and stature and age well. This study is taken in combination of all the 3 primary parameters of biological profile and co-related with that of 2D:4D ratio. And there is no such study conducted in this part of Karnataka.

Aims and Objectives: To study the role of 2D:4D ratio in establishing the biological profile(Sex, Age and stature) of an individual by manual digital measurements and digital print measurements.

Material and Method: Hundred first year medical students (n=100) (males= 50 and females =50) of S. N. Medical college, Bagalkot were included in the study. Authentic proof of age was collected and height measured by stadiometer and 2d:4d by digital callipers for both hands. SPSS 17.0 used to analyse the data.

Results: In Males, the ratio varied from 0.89 to 1.04 with mean and standard deviation of 0.97 ± 0.03 on right side and on left side it varied from 0.85 to 1.03 with mean $\pm$ SD of 0.98 ± 0.04 . While in females ratio varied from 0.91 to 1.11 with Mean $\pm$ SD of 0.97 ± 0.04 on right side and on left side it varied from 0.83 to 1.12 and Mean $\pm$ SD of 0.98 ± 0.04 on left side

Based on the mean 2D:4D ratio for both the sexes, 0.97 on right and 0.97 on left side, sectioning point was derived. When all the cases below and equal to 0.97 were considered as males and those above 0.97 were considered as females, one could accurately determine the sex up to 90% accuracy.

Conclusions: 2D:4D ratio can be effectively and accurately used to establish the biological profile of an individual which can help forensic experts and medicolegal experts to narrow down the pool of suspects in crime or identify the victims of crime, mass disasters, road traffic accidents etc. Moreover 2D:4D, ratio relatively less time consuming, and cost effective.

Keywords: 2d:4d ratio, Biological profile, identification, sex, stature, age

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Introduction

Human identification has always been a major concern for forensic investigation and other law enforcement agencies. The process of identification focuses mainly on establishing the biological profile by estimating the sex, age and stature¹. In this era of

increasing crimes, violence, Road traffic accidents, natural calamities identification from mutilated remains poses a great challenge to the forensic experts. Most of the times in violence and road traffic accidents its only dismembered parts which are available for the experts to establish the biological profile of victims. Dismembered parts may be limbs, hand, foot etc. In case if hands are recovered from the site then one can establish the biological profile of an individual. Examination of the recovered hand proceeds with the somatometry of the hand then osteological and radiological analysis of the hand which helps to provide primary identity indicators such as sex, age, and stature².

The human hand is the most frequently used and versatile part of the body, and is of great scientific importance to investigators in the field of anthropometry, forensic pathology, orthopedic surgery, and ergonomics³.

Among the hand measurements, 2d: 4d ratios (measures of the relative lengths of index and ring fingers) attract considerable research interest because they exhibits sexual dimorphism and left–right asymmetry and is associated with a surprising variety of morphological, physiological, sexual preference and behavioural traits as well as with ability in certain sports and with the risk of developing medical conditions such as autism, infertility and breast cancer ⁴.

Sex and 2D:4D

As stature and other parameters are influenced by sex, thus the determination of sex is the foremost criterion in identity authentication of an individual among all the primary parameters of identification. The 2D:4D ratio is a sexually dimorphic trait which is influenced by prenatal estrogen and testosterone levels. High prenatal levels of androgens (high testosterone / estrogen) determine lower values of 2D:4D and vice versa. Hox A and Hox D genes are responsible for both gonadal and digital differentiation ⁵. This sexual dimorphism in 2D : 4D ratios is apparent by 2 years of age and appears to be established early in life, possibly by the 14th week of gestation ⁶⁻⁸. This confirms the fact that digit ratio (2D:4D) acts as a sexually dimorphic phenotypic trait ². Digit ratio is a sexually dimorphic trait found in a variety of species ranging from humans and mice to zebra finches and is constant since birth ⁹. It is generally agreed that 2D : 4D ratios tend to be greater in females (closer to 1.0) and that gender differences tend

to be larger for the right hand than for the left ^{10,11}.

Age and 2D:4D

Among the various parameters of identification, individual's stature is an inherent characteristic, the estimate of which is considered to be important in those cases where only fragmentary or mutilated remains of an unknown person are recovered¹². Gillam et al study findings indicate that the 2D : 4D ratio does increase with age⁽⁴⁾. According to Williams et al, lower 2D : 4D ratios were found in both genders early in postnatal life but stabilize at a higher value in adults ¹³.

2D:4D ratio and stature

Danborn B et al, reported that stature can be estimated using 2D:4D ratio in both males and females and from both right and left hands and the ability to accurately¹⁴. According to predict height from 2D and 4D is greater in the males than the females due to the lower values of standard error of estimates ¹⁵.

Need for the study

Previous studies have co-related 2D:4D ratio with either stature or sex or age . This study is taken in combination of all the 3 primary parameters of biological profile that is sex, stature and age and co-related with that of 2D:4D ratio. And there is no such study conducted in this part of Karnataka. This has prompted authors to test the role of 2D:4D ratio in establishing the biological profile of an individual. This research study proves beneficial for identity authentication, for criminal investigation and a powerful forensic tool for medico-legal cases. Also the data so collected can be useful as forensic anthropology population data.

Aims and objectives

To study the role of 2D;4D ratio in establishing the biological profile(Sex, Age and stature) of an individual by manual digital measurements and digital print measurements.

Material and Method

Hundred first year medical students (n=100) (males= 50 and females =50) of S. N. Medical college, Bagalkot were included in the study after taking the informed consent. Ethical clearance obtained from Institutional ethical committee. Research study was conducted on single community to minimize regional

& environment bias. Each participant was required to fill in a form containing basic demographic profile (e.g. sex; age; ethnicity). Informed consent was obtained. Participants with any medical history of hand, disease, injury, deformity were excluded from the research study.

Morphometric measurements

Recording of the height:

All the readings were taken at the same time of the day to minimize the diurnal variation. The height of each subject was recorded by asking the subject to stand erect with barefoot on the base of the standard stadiometer in a Frankfurt plane. The subject was instructed to stand without support and the arms by the side of the body. The horizontal plate being attached to the vertical wooden scale of two meters height and the reading was taken from the base of the stadiometer to the vertex of the head in centimetres.

2D:4D ratio: Measured by using digital callipers to the nearest millimetres.

2DL (length of Index finger): It is measured as the distance between the mid-point of metacarpo – phalangeal crease at the base of index finger to the tip or most forwardly placed point of the index finger. (A to B).

4DL (length of the Ring finger): It is measured as the distance between the mid-point of metacarpo – phalangeal crease at the base of ring finger to the tip or most forwardly placed point of the ring finger. (X to Y).

2D:4D digit ratio

2D: 4D Digit Ratio : Length of the index finger/ Length of the ring finger

Sectioning point

Sectioning point or cut-off was calculated based on average 2D:4D digit ratio for both hands and in both sexes. Percentage accuracy of sex determination was performed on the basis of sectioning point for 2D:4D digit ratio in the entire population.

Statistical analysis

SPSS 17.0 was employed for the statistical analysis of the research data. Descriptive statistics i.e. mean, standard deviation, range, standard error for 2D & 4D digit length was calculated. Male – female differences

for the variables were observed using student's t-test at $p < 0.05$ as level of significance.

Results

Table 1: Descriptive statistics of 2D:4D ratio

Parameters	Right hand		Left Hand	
	Male	Female	Male	Female
Sex				
Minimum	0.89	0.91	0.85	0.83
Maximum	1.04	1.11	1.03	1.12
Mean	0.97	0.97	0.96	0.98
Standard Deviation	0.03	0.04	0.033	0.04
Sectioning Point	0.97		0.97	

Descriptive statistics of 2D:4D ratio is shown in Table no.1. In Males, the ratio varied from 0.89 to 1.04 with mean and standard deviation of 0.97 ± 0.03 on right side and on left side it varied from 0.85 to 1.03 with mean $\pm$ SD of 0.98 ± 0.04 . While in females ratio varied from 0.91 to 1.11 with Mean $\pm$ SD of 0.97 ± 0.04 on right side and on left side it varied from 0.83 to 1.12 and Mean $\pm$ SD of 0.98 ± 0.04 on left side

Based on the mean 2D:4D ratio for both the sexes, 0.97 on right and 0.97 on left side, sectioning point was derived. When all the cases below and equal to 0.97 were considered as males and those above 0.97 were considered as females, one could accurately determine the sex up to 90% accuracy.

Table 2: Linear regression formulae were calculated for estimation of stature from 2D:4D ratio

Male	Height = $168.9 + 1.94(\text{Right sided ratio}) - 0.08(\text{Left sided ratio})$
Female	Height = $114.98 + 16.7(\text{Right sided ratio}) + 28.5(\text{Left sided ratio})$

Table 2 shows the linear regression equations derived for both the sexes to estimate the stature of an individual

Table 3: Linear regression formulae were calculated for estimation of age from 2D:4D ratio

Male	Age = 8.4+7.8(Right sided ratio)+ 24.4(Left sided ratio)
Female	Age = 35.1+9.3(Right sided ratio)-22.0(Left sided ratio)

Table 3 shows the linear regression equations derived for both the sexes to estimate the age of an individual

Discussion

This study was conducted to know the role of 2D:4D ratio in establishing the biological profile of an individual. Digit ratio is a sexually dimorphic trait found in a variety of species ranging from humans and mice to zebra finches and is constant since birth. Traits ranging from musical abilities, numerical and spatial skills and sporting capabilities and medical conditions have been reported to be associated with the digit ratios in different populations ¹⁶.

Sex and 2D:4D

Manning et al. demonstrate that 2D:4D is the only trait that measurably explains sexual dimorphism. It reflects prenatal androgen action (such that higher testosterone is associated with lower 2D:4D ⁷). Females have relatively high ratio whereas males show lower 2D:4D digit ratio. These statistically significant differences may be due to the early onset of puberty in females than males as males have two more years of physical growth. According to sangeeta et al study, ratio below and equal to 0.99 is suggestive of male sex for both hands, while a ratio of more than 0.99 is suggestive female sex for both the hands ². In our study, a sectioning point of 0.97 derived for both right and left hands in both the sexes. When all the cases below and equal to 0.97 were considered as males and those above 0.97 were considered as females, one could accurately determine the sex up to 90% accuracy.

With respect to handedness, few authors reported that ratio was found slightly higher for right hand than left hand ². In present study there was no significant difference on right and left side.

Age and 2D:4D ratio

Previous studies on effect of age on 2D:4D ratio are discrete and inconclusive. According to study done by

Gillam et al, 2D : 4D ratio does increase with age². More recently, a 4-year longitudinal study on children between 7 and 17 years of age found that 2D : 4D ratios increased slightly with age, with the effect more marked in the left hand ¹⁷. In present study we have calculated the linear regression formulae for both sexes which can estimate the age from 2D:4D ratio for population of this region.

Stature and 2D:4D ratio

According to Danborno et al¹⁴, 2D:4D ratio could be used to estimate the height and weight of an individual accurately. In present study we have calculated the linear regression formulae for both sexes which can estimate the age from 2D:4D ratio for population of this region.

Conclusion

In this era of increasing the violence, road traffic accidents, crimes, forensic experts faces a challenge to establish the identity of an individual. 2D:4D ratio can be effectively and accurately used to establish the biological profile of an individual which can help forensic experts and medicolegal experts to narrow down the pool of suspects in crime or identify the victims of crime, mass disasters, road traffic accidents etc. Moreover 2D:4D, ratio may prove to be a reliable sex indicator, easy to carry out, relatively less time consuming, and cost effective. It has great implication in case of when fragmented part is retrieved and DNA analysis is out of reach. This study has to be carried out in larger population at community level involving different ethnic groups to increase its predictive value.

Conflict of Interest: None

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Knowledge and Attitudes of Mental Health Professionals Regarding Informed Consent and Patient Confidentiality in Clinical Practice and Research in Udupi District

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Abstract

The control of patient information regarding mental illness is a challenging issue in mental health care. Patients have the right to control and know all information concerning their health. In India, an individual's identity is intimately connected to his or her family's; family is integral to one's self. This study was conducted to increase awareness among mental health professionals regarding informed consent and patient's confidentiality protection in clinical practice and research. The findings of this study can help hospitals frame policies. The objectives of the study were to assess the knowledge (K) and attitudes (A) of mental health professionals regarding 'informed consent' and confidentiality protection in clinical practice and research. The study was conducted in three different phases. In phase one, a questionnaire was formulated, validated and distributed among the mental health professionals to analyze K&A regarding informed consent and confidentiality protection in clinical practice and research. In phase two, an education module was developed and distributed among healthcare professionals. In phase three, the participants were reassessed on their K&A using the same questionnaire. The results show no significant difference in the mean values (mean=7.46, SD=1.22) in both confidentiality and consent during phase one. However, after administering the education module, the mean score of knowledge and attitude towards consent and confidentiality has increased (mean=9.86, SD=0.40) compared to the pretest. It was concluded that the delivery of the education module incorporating the updated information on acts and amendments related to the mental health profession has been effective.

Keywords: Knowledge; Attitude; Awareness; Consent; Confidentiality; Educational module

Introduction

Trust is an important factor in a doctor-patient relationship. In the process of treatment, informed consent seeks to protect the patients' self respect, autonomy

and wellbeing. The paternalistic approach has been revised to the patients' right to self-determination. This is officially authorized and protected in law. Control of patient information regarding mental ailments is a challenging issue in mental health care. Patients have the right to control and know all information regarding their health. In India, an individual's identity is intimately connected to his or her family^[1]; family is integral to one's self. The matter of protecting personal privacy and confidentiality of personal information is thus convoluted when another individual is so important to oneself. The Indian contract act 1872 defines free consent as follows: Consent is free when it is not generated by

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compulsion, influence, cheating, misinterpretation and/or error.^[2]

The Medical Council of India's Code of Ethics Regulations protects patient confidentiality by stating that the physician shall not disclose the secrets of a patient that have been learnt in the exercise of his/her profession except in a court of law under orders of the Presiding Judge in circumstances where there is a serious and identified risk to a specific person and/or community; [or in case of] notifiable diseases."^[3] With respect to patient confidentiality, health care providers should not disclose patients' personal information without their explicit consent. Doctors, administrators and public information officers of a healthcare institution are also ethically required not to reveal the health information of patients. Likewise, researchers must also maintain the confidentiality of their research participants. Confidentiality is an important part of the informed consent agreement.^[3]

The Right to Information (RTI) Act 2005 is widely seen as a watershed development in Indian democracy. It provides citizens the right to secure access to information which is under the control of public authorities, in order to promote transparency and accountability.^[4] It is often held to be an effective tool to control corruption, make governments accountable, and curb the arbitrary use of power. The question here is whether it can be used to justify the breach of a patient's or research subject's confidentiality. Confidentiality is the basic foundation for psychotherapy. Breach of public trust that the information of treatment sessions is confidential could have a terrible outcome in psychotherapeutic practice. Confidentiality should be maintained whenever possible with the exception of situations where there is a risk of harm to others. 84.3% of respondents think that patients' consent should always be obtained before diagnostic and therapeutic procedures, whereas 47% reported that they always obtain consent in their clinical practice.^[4] Privacy rights are important, especially when it comes to mental health care. Unfortunately, the practice of consent and patient confidentiality protection for adults, minors, family members and even treatment providers can be unclear. The "Medical Council of India's Code of Ethics Regulations" protects patient confidentiality by stating that the physician "Shall not disclose the secrets of a patient, that have been learnt in the exercise of his/her profession except in a court of law under orders of the Presiding Judge; in circumstances where there is

a serious and identified risk to a specific person and/or community. The first is the famous Tarasoff v. Regents of the University of California (1976) case, in which the court held that therapists might need to breach confidentiality to protect third parties who may be in danger from a client being seen in therapy.^[4]

There is a rapid growth of computerization of medical record keeping. With the internet there is an increased risk of breach of confidentiality and release of patient information.^[5] The American psychiatric association says that a mental health professional can reveal the confidential information only with the endorsement of the patient.^[6]

Material and Method

Study design: Interventional study

Study setting: Udupi district

Study population: 11,77,908

Statistical method: Paired-t-test

Tool: A Questionnaire-based study

Sample size: 50

Inclusion and exclusion criteria: All mental health professionals in Udupi district.

This study is aimed to assess the knowledge and attitudes of mental health professionals regarding informed consent and patient confidentiality protection in clinical practice and research. The assessment will be conducted as a pretest and a post-test. The same questionnaire will be used for both the pre test and the post test. The questionnaire will assess knowledge and attitudes regarding consent and confidentiality. After the initial assessment, a knowledge module will be delivered to the healthcare professionals, after which a test will be conducted again to see any changes in their knowledge and attitude regarding consent and patient confidentiality in clinical practice and research. This study is conducted in three phases. In the first phase, questionnaires are distributed among the mental health professionals, to assess their knowledge and attitudes regarding informed consent and confidentiality protection in clinical practice and research. The knowledge module was developed by referring to legislation like the Mental health act, the Right to information act, the Indian contract act 1872, the Indian medical Council act and the Health Information

Portability and Accountability Act of 1997(HIPAA). In phase two,an education module is developed and distributed among the healthcare professionals. These modules can be used for training the professionals.In phase three,the participants were reassessed based on their K & A using the same questionnaire.

Results

Objective:

Assessing the knowledge and attitudes of mental health professionals regarding confidentiality protection

in clinical practice and research.

Answer: A Paired Sample T-test was conducted to compare the knowledge and attitudes of mental health professionals regarding confidentiality protection in clinical practice and research pre and post-intervention. There was a significant difference in the knowledge and attitude of mental health professionals regarding confidentiality protection in clinical practice and research pre(mean=7.46,SD = 1.22) and post-intervention(mean=9.86,SD= 0.40) intervention;t(49) = -12.81,p<0.001.

Table 1. Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	K_pre_tot	7.46	50	1.21571	0.17193
	K_post_tot	9.86	50	0.40457	0.05721

Table 2. Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	K_pre_tot & K_post_tot	50	-0.115	0.425

Table 3. Paired t Test

Pair 1 K_pre_tot - K_post_tot	Paired Differences							
	Mean	Std. Deviation	Std. Error Mean	Std. Error Mean	95% Confidence Interval of the Difference	t	df	Sig. (2-tailed)
					(Upper & lower)			
	-2.4	1.3248	1.3248	0.18736	-2.0235	-12.81	49	<0.001
					-2.7765			

Assessing the knowledge and attitudes of mental health professionals regarding patient informed consent in clinical practice and research.

Answer:A Paired Sample T-test was conducted to compare the knowledge and attitude of mental health professionals regarding patient informed

consent in clinical practice and research pre and post-intervention. There was a significant difference in the knowledge and attitudes of mental health professionals regarding patient confidentiality protection in clinical practice and research pre(mean=7.02,SD=1.78) and post intervention(mean=9.90,SD=0.36); t(49) =-11.09,p<0.001.

Table 4. Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	C_pre_tot	7.02	50	1.78988	0.25313
	C_post_tot	9.9	50	0.36422	0.05151

Table 5. Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	C_pre_tot & C_post_tot	50	-0.028	0.846

Table 6. Paired Samples Test

Pair 1 C_pre_tot - C_post_tot	Paired Differences							
	Mean	Std. Deviation	Std. Error Mean	Std. Error Mean	95% Confidence Interval of the Difference	t	Df	Sig. (2-tailed)
					(Upper & lower)			
	-2.88	1.83659	1.3248	0.25973	-2.35805	-11.088	49	<0.001
					-3.40195			

Discussion

This study has increased awareness among the mental health professionals regarding ethical practices like informed consent and confidentiality. Before administering the educational module, the awareness was low. With respect to knowledge and attitudes towards consent, informed consent must be a mandatory document for every patient and accurate information has to be provided. Only 56% of respondents said that a patient with mental illness could make a decision about their treatment. If s/he is not able to do so, then the legal representative can make the decision. The Indian contract act 1872 says that informed consent must be free. Grossman and Summer observed that a severely mentally ill patient was also capable of giving informed consent for the treatment procedure^[7]. Anderson and Mukherjee observed that a person with severe mental illness was capable of providing meaningfully informed consent^[8]. In the current study, 28% of respondents said that a mentally ill person is not competent to consent.

If a medical practitioner attempts to treat a person without valid consent, then s/he will be liable under both tort and criminal law.^{[9],[10]} Tort is a civil wrong for

which the aggrieved party may seek compensation from the wrongdoer. The consequences would be payment of compensation (in civil cases) and imprisonment (in criminal cases). 68% of respondents said that informed consent was a guard against medical malpractice cases. The professionals must safeguard the patient records confidentiality. 30% of respondents were not participating in this process.

Conclusion

We can conclude from this study that there could currently be an unmet critical need in knowledge and awareness among mental health professionals regarding consent and confidentiality. Bridging this gap would require the conduct of knowledge-based educational sessions among mental health professionals to increase awareness among them.

Ethical Clearance- Taken from Institutional ethics committee

Source of Funding- Self

Conflict of Interest - None

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Insights about Child Abuse among Dentists in Tamilnadu

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Abstract

Aim: The aim of the study is to assess the Knowledge, Attitude and Practice of Dental Practitioners regarding child abuse. **Materials and Method:** A pre-tested questionnaire containing 19 closed ended questions was distributed who had atleast one year of clinical experience. Data collection was carried out by direct interview with the dentist and the collected data was entered in the Windows Microsoft excel sheet. Descriptive statistics and Chi square test was carried out. Level of significance was set as 0.05. **Result:** The study showed that 57 percent of dentists are seeing around 1 to 10 patient below 17 years per week. 10 percent of dentists investigated child abuse patients themselves. 28 percent of them had contacted a doctor, colleague, dental association or children's hospital if they suspected a case and 59 percent of dentist are uncertain about diagnosing child abuse. **Conclusion:** Detecting and treating child abuse is a benefit not only to the child but also for the society. Thus it should become mandatory that the dentists are trained to recognize it, so that more cases would be diagnosed and reported by the dental profession.

Keywords: child abuse, Dentists, knowledge.

Introduction

The wealth of the nation does not only depend on its economical and natural resources. But, it lies more decidedly in the kind and quality of its youth and children. Children have boundless stores of energy, will, capability, zeal, enthusiasm and have the power to mould the destiny of the nation. This infinite storehouse of energy has to be properly moulded. Children of today will be adults of tomorrow.

Childhood should be carefree, playing in the sun, not living in a nightmare in the darkness of the soul¹. Child abuse is a common finding in the society today. Child abuse may be defined as an act by parents or caregiver who endangers a child's or young person's physical or emotional health or development². A child

should have an environment that demonstrates love, compassion, trust and understanding nature. When these are present around the child, it can grow up with a good mental status. Many children these days do not receive this type of lifestyle. Rather their life is filled with resentment, hatred, distrust and constant negativity. Child abuse is when a parent or a caregiver, cause injury, death, emotional harm or risk of serious harm to a child, either through action or failing to act. There are four forms of child abuse such as – physical abuse, sexual abuse, emotional abuse and neglect³. But in recent years, the community has become increasingly aware about the problem of child abuse in the society. For the purpose of child protection, the Government of India has brought out many acts like: Prevention of children from sexual offense Act, 2012; Juvenile justice Act, 2006; National plan of action for children, 2005³. Numerous studies have shown that the head and orofacial region are the most common sites of trauma from child abuse, like scalp-79%, neck-59%, forehead-52%, cheek-49%, lower jaw-48%, Upper lip-45%¹. This may be due to these areas being the most exposed and accessible. Hence, dentists play a major role in detecting and treating child abuse. But there exists a dilemma if dentists are aware

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about it or show a lethargic attitude towards this issue. Detecting and treating child abuse is a benefit not only to the child but also for the society. Thus, it should become mandatory that the dentists are trained to recognise it, so that more cases would be diagnosed and reported by the dental profession.

Hence, the aim of this study is to assess the knowledge, attitude and experience of dentists in and around Chennai city with regards to child abuse and to assess the association with their graduation and the years of experience of the dentist.

Methodology

The present study was conducted randomly among 100 dental practitioners in and around Chennai city, Tamil Nadu. The study was explained to the dentists and only who were willing to participate were included in the study. Data collection was carried out by direct interview with the dentists.

A pre-tested closed ended questionnaire⁴ was used for this study. The questionnaire consists of 19 closed ended questions, of which, 6 questions were based on the attitude, four questions were based on the knowledge and eight questions were based on the practise of dentists about child abuse.

The data obtained were entered in the Microsoft excel sheet database and statistical analysis was done using SPSS version 16. Descriptive statistics and Chi square statistics was carried. Level of significance was set as 0.05.

Result

The mean age of the study population were 33.61 years with average clinical experience of 10.05 years. Of the 100 practitioners participated 53 were males and 47 were females and 41 were BDS graduates and 59 were BDS graduates and 57% of dentists are seeing around 1 to 10 patients below 17 years per week and 2% of dentists have seen no patients below 17 years recently.

Table 1: Association between graduation, overall career experience and experience of dentist's regarding child abuse:

With reference to child abuse, I have/would have	TOTAL%	Response	GRADUATION		Chi Square Sig. value	OVERALL CAREER EXPERIENCE		Chi Square Sig. value
			BDS	MDS		Dentist with experience above 10 years	Dentist with experience below 10 years	
suspected cases in my dental office	20	Yes	13	7	0.364	15	5	0.118
	80	No	46	34		46	34	
reported cases in my dental office	14	Yes	10	4	0.236	9	5	0.516
	86	No	49	37		52	34	
recorded signs in patient's record	13	Yes	10	3	0.133	8	5	0.609
	87	No	49	38		53	34	
known appropriate avenues for reporting	16	Yes	6	10	0.052	11	5	0.345
	84	No	53	31		50	34	

Cont... Table 1: Association between graduation, overall career experience and experience of dentist's regarding child abuse:

investigated a suspected case myself	10	Yes	6	4	0.612	8	2	0.17
	90	No	53	37		53	37	
contacted a doctor, colleague, dental association or children's hospital, if I suspected a case	28	Yes	18	10	0.331	18	10	0.427
	72	No	41	31		43	29	
contacted health department, police, community services, social worker or school, if I suspected a case	23	Yes	15	8	0.329	16	7	0.239
	27	No	44	33		45	32	
ignored a suspected case	6	Yes	4	2	0.523	4	2	0.566
	94	No	55	39		57	37	

Table 1 reveals that 86 percent of the dentists have not recorded, reported, investigated or suspected any case of child abuse in their dental office. 84 percent of dentist to have very little knowledge regarding the avenues for reporting child abuse. Data shows that there is no significant difference among dentist regarding with their graduation status and clinical experience in treating abused children.

Table 2: Association between graduation, overall career experience and attitude of dentist regarding child abuse:

In reporting child abuse, I would consider ...	Total%	Response	GRADUATION		Chi Square Sig. value	OVERALL CAREER EXPERIENCE		Chi Square Sig. value
			BDS	MDS		Dentist with experience below 10 years	Dentist with experience above 10 years	
patient's confidentiality	90	Yes	52	38	0.349	55	35	0.599
	10	No	7	3		6	4	
possible effects on my practice	61	Yes	39	22	0.148	41	20	0.084
	39	No	20	19		20	19	
uncertainty about diagnosis	59	Yes	36	23	0.387	30	29	0.01
	41	No	23	18		31	10	
fear of litigation	34	Yes	21	13	0.427	20	14	0.457
	66	No	38	28		41	25	
possible effects on child's family	79	Yes	47	32	0.518	48	31	0.566
	21	No	12	9		13	8	
possible effects on the child	86	Yes	51	35	0.551	51	35	0.29
	14	No	8	6		10	4	

Table 2 reveals that 90 percent of the dentists consider patients confidentiality, 86 percent of considered possible effects on the child and its family. There is no level of significance in uncertainty about their diagnosis.

However, they say, 66 percent of the dentist does not consider the fear of litigation but 79% percent them bother about the possible effects on their practice.

Table 3: Association between overall career experience, graduation and knowledge of dentist's regarding child abuse:

I Think that.....	Total%	Response	OVERALL CAREER EXPERIENCE		Chi Square Sig. value	GRADUATION		Chi Square Sig. value
			Dentist with experience below 10 years	Dentist with experience above 10 years		BDS	MDS	
child abuse is more prevalent in particular socio-economic group	68	Yes	39	29	0.193	39	29	0.395
	32	No				20	12	
dentists are legally required to report child abuse in Tamilnadu.	86	Yes	51	35	0.29	51	35	0.551
	14	No				8	6	
dentists can be called in front of children's court to give evidence to child abuse	83	Yes	49	34	0.272	49	34	0.596
	17	No				10	7	
identity of a dentist reporting child abuse, remains confidential	78	Yes	44	34	0.061	50	28	0.045
	22	No				9	13	

Table 3 shows 68 percent of dentists feel that child abuse is prevalent in a particular socioeconomic group. 85 percent of dentists feel that dentists can be called in front of children's court for evidence and can legally report child abuse in Tamilnadu.

Discussion

Child abuse is one of the alarming condition India is facing today. Child abuse is the physical, sexual, emotional mistreatment, or neglect of children. Most child abuse occurs in a child's home, with a smaller amount occurring in the organizations, schools or communities.

The dental health professionals are the first in detecting child abuse based on their oral signs and reporting child abuse. Signs for child abuse include trauma to the teeth and injuries to the mouth, lips, tongue or cheeks that are not consistent with an accident, fractures of the maxilla and mandible and oral burns. Injuries to the upper lip and maxillary labial frenum may be a characteristic in severely abused young children. But there is a dilemma if dentist are really contributing towards this issue. There seems to be negligence by the dentist and a lack knowledge regarding this issue. If more awareness is created among them in detecting and treating child

abuse, many innocent children can be protected from this and help in the upliftment of the society.

The present study was conducted to evaluate the experience, knowledge and attitude regarding child abuse among the dentists. Based on this study, there appears to be no significance in the relationship between the experience and graduation with the attitude or knowledge of child abuse. Most of the dentists regardless of their graduation status or years of experience show a negligent attitude towards child abuse.

20 percent of dentist suspected cases of child abuse in our study. Of the 20 percent suspected cases of child abuse seen; only 14 percent of cases actually were reported. 61 percent of dentist have been reported to have found possible effects on their dental practice, but failed in reporting mainly because of dentist considered patient confidentiality, 51 percent are uncertain in diagnosing child abuse. However, 23 percent of dentist contacted a doctor colleague, dental association or children's hospital about suspected case. Vijay John et al (1999)⁴, performed a survey in Victoria, Australia reported that 28 per cent of dentists reported that they had suspected child abuse in one or more of their patients 51 percent of suspected cases contacted a doctor, dental association or children's hospital.⁴ Colleagues are generally readily accessible, and it is understandable that a dentist would feel more comfortable discussing such a sensitive matter within his professional circle.⁸ 6 percent of the dentist ignored suspected cases in our study. However Vijay John et al.,(1999) in his study reports that 1-2 percent of respondents indicated that they would ignore a suspected case; this is considered an inappropriate response and indicates a reluctance to comply with moral obligations to report currently imposed on them.⁴

The present study showed that, 13 percent recorded signs in patient records. Dabaan et al.,(2014)⁸ conducted a study among dentist living in Saudi Arabia and reported only 39.4 percent of the respondents indicated that they had recorded suspected findings in the affected child's medical record. Good record keeping is essential in dentistry for legal purposes. Lack of awareness about the legal aspects of child abuse can be a reason for not recording signs in patient records. Dental practitioners should be trained in the handling of such cases and in the completing of these forms.⁸

The present study showed that, while reporting the child abuse 34 percent of dentist have the fear of litigation, this supports the lack of confidence in child protection services and their ability to handle such sensitive cases has also been identified as a potential barrier for the reporting of cases (John et al., 1999)⁴. 79 percent of dentists in our study while reporting child abuse consider possible effects on child's family. According to Darbaan et al.,in Saudi Arabia(2014) performed a survey in that 49 percent neglect to report the cases due to the fear of family reprisal and lack of certainty about the diagnosis of child abuse.

In this study, 68 percent of professionals reported child abuse cases are more prevalent in particular socio – economic groups. Sonbol et al., (2011)⁹ conducted a study in Jordan and found that, more than half of the dentists surveyed (57 percent) reported that child abuse occurred mostly in low socio - economic households, rather than in middle or high socio economic classes. Link between parent unemployment and the risk of child maltreatment was identified. Despite these findings, however, it is important for healthcare providers to recognize that child maltreatment is not confined to poverty and low socio-economic classes.

While the court decision raises doubts about the effectiveness of the child abuse Act 2012⁸, this applies to non-mandated professionals such as dentists, because of the voluntary nature of their reporting at present is reinforced by the present study, which clearly showed the lack of knowledge about the reporting of child abuse on the part of dentists.

One of the major limitations of this study is that, all the questions were asked hypothetically. It did not determine the exact statistics of the attitude towards child abuse. Another drawback is that, it was confined to a limited population.

In future , further studies can be carried out to a broader population to find out the exact statistics of abused patient in Tamilnadu. It will be welcoming, if knowledge is shared among our fellow dentists regarding child abuse and educate them for the welfare of the society.

Conclusion

Detecting and treating child abuse is a benefit not only to the child, but also for the society. Thus, it should

be mandatory that dentists are trained to recognise it, so that more cases would be diagnosed and reported by the dental profession.

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A Retrospective Study of Motorised Two Wheeled Vehicular Accident Cases Attending the Emergency Department of a Tertiary Care Hospital

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Abstract

Introduction: Road traffic accidents are responsible for a number of deaths and injuries every year in India of which a significant portion is contributed by motorised two wheeled vehicle accidents. In recent years, Meghalaya has witnessed an increased in the ownership of two wheeled vehicles among the population. Therefore, this study was undertaken to determine the pattern of motorised two wheeled vehicular accidents attending a Tertiary care hospital.

Methodology: This observational study conducted from January 2012 to December 2014, includes consecutive cases of motorised two wheeled vehicular accidents attending the Emergency Department of a Tertiary care hospital in Meghalaya. The data were extracted from the medicolegal register maintained in the Medical Record Department of the Institute.

Results: A total of 368 cases were studied. Most of the victims were males and in the age group of 20 – 30 years. The majority of accidents occurred between 12 pm and 5:59 pm. The injuries sustained were mostly to the head and neck (39.70%) and no difference was seen in the localisation of the injuries among the different groups of victims; $\chi^2 (8) = 6.92, p = 0.5458$.

Conclusion: The victims of motorised two wheeled vehicular accidents were predominantly the young male riders. Most of these injuries occurred in the head and neck region. Since there is no difference in the localisation of injuries among the riders and pillion riders, usage of helmets should not be mandated to the riders alone.

Keywords: Two wheeled vehicular accidents, Emergency department.

Introduction

Road traffic accident (RTA) is defined as a collision involving at least one vehicle in motion on a public/private road that results in at least one person being

killed or injured.¹ Globally, RTA is responsible for over 1.2 million deaths each year and is the main cause of death in those aged between 15 and 29 years. These deaths occur mostly in the low and middle income countries (90%), although they accounted for only 54% of the world's registered vehicles. Among the road users, motorcyclists attributed to nearly a quarter of all road traffic deaths out of which the South East Asian and Western Pacific regions each accounting for 34% of the motorcyclist deaths.²

In India, motorised two wheeled vehicle (MTV) involvement in 33.8% of the 480652 RTA that occurred in

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2016 is the highest among the vehicle categories leading to 52,500 deaths and 1, 53, 060 injured.³ In recent years, Meghalaya has witnessed an increase in ownership of MTV from 27237 in 2005 to 94843 in 2016.⁴

The first step in developing any prevention strategy requires an understanding of the magnitude of the problem. Although data were available from various government agencies eg police department, etc, these lack certain information like injury pattern sustained by the victims. Moreover, study on the pattern of motorised two wheeled vehicular accidents (MTVA) from this region of the country, especially Meghalaya, is found to be deficient.

Therefore, this study is undertaken to find out the pattern of MTVA attending the emergency department of a Tertiary care hospital in Meghalaya.

Materials and Method

This retrospective observational study was conducted in a tertiary care hospital in Meghalaya from January 2012 to December 2014. The study includes consecutive cases of MTVA attending the Emergency Department during the study period. The cases include the rider, pillion rider and pedestrian hit by MTV. The motorised two wheeled vehicles include all types of motorcycles and scooters. Cases which were brought dead were excluded from the study. The data were extracted from the medicolegal register maintained in the Medical Record Department following the approval of the concerned authority of the hospital. The parameters studied were the age and sex of the victim, date and time of accident, the types of victims involved in two wheeler accidents, mode of accident, sites of injury sustained by the victims and the manner of disposal of the cases (discharged/ admitted/death).

The data were analysed using Excel 2007 and Medcalc version 18. Student's t test and Chi square test were used to compare means and proportions. The results were considered significant for a p-value of less than 0.05.

Results

Out of a total of 1162 victims of RTA attending the Emergency department during the study period, 368 (31.67%) were due to MTVA. Table 1 shows the

demographic characteristics of the victims of MTVA. Males constituted the majority of the cases with 85.60% in comparison to females (14.40%). The mean age of the males ($M = 26.47$ years, $SD = 11.08$) was slightly lesser than that of the females ($M = 28.92$ years, $SD = 17.85$), although statistically there was no significant difference between the two ($t(266) = 1.26$, $p = 0.21$). However, a significant difference in the age group of those affected by MTVA was seen with nearly half (48.10%) of the victims belonged to the age group 20 – 30 years, $\chi^2(6) = 20.85$, $p = 0.0020$. In relation to the time of day (Fig 1), most of these accidents happened between 12 pm and 5:59 pm (39.95%) followed by 6 pm to 11:59 pm (35.05%).

As shown in Table 2, the most vulnerable group was the riders (238) followed by the pillion riders (72) and pedestrians (58). Out of the 238 riders, males constituted 228 (95.80%) of the cases and females 10 (4.2%). In contrast to the male victims where 72.38% of them were riders, the females were mostly pedestrians (45.28%) and pillion riders (35.85%). This relationship between gender and the types of victims involved was found to be statistically significant, $\chi^2(2) = 62.72$, $p < 0.0001$.

When comparing the mode of accidents, more self accidents were responsible for the MTVA than collisions (Table 3). Of the 310 riders and pillion riders, self accident was responsible for injuring 68.71% of the cases and collision 31.29% of the cases. Also, a difference was seen in the two modes of accidents between the rider and pillion riders ($\chi^2(1) = 4.75$, $p = 0.029$).

The total number of injuries (859) exceeded the cases as several victims suffered multiple injuries to the body (Table 4). The injuries sustained by the victims were mostly localised on the head and neck region (39.70%), lower limb (28.17%) and the upper limb (21.77%). However, there was no difference in the localisation of the injuries among the different groups of victims; $\chi^2(8) = 6.92$, $p = 0.5458$.

Overall, nearly 70% of the cases were discharged after initial treatment and 27.45% were admitted into the various wards. In addition, there was a difference in the proportion of cases admitted among the various group of victims ($\chi^2(4) = 10.81$, $p = 0.0288$) with 32.77% of the riders, 15.28% of the pillion riders and 20.69% of the pedestrians were admitted (Table 5).

Table 1: Demographic Characteristics of Victims

Characteristics	Male N (%)	Female N (%)	Total N (%)
Gender	315 (85.60)	53 (14.4)	368
Mean age	26.47±11.08	28.92±17.85	26.83±12.29
Age group (years)			
0 - 10	17 (5.40)	7 (13.21)	24 (6.52)
10 - 20	63 (20.00)	11 (20.75)	74 (20.11)
20 - 30	160 (50.79)	17 (32.08)	177 (48.10)
30 - 40	46 (14.60)	6 (11.32)	52 (14.13)
40 - 50	14 (4.44)	5 (9.43)	19 (5.16)
50 - 60	12 (3.81)	3 (5.66)	15 (4.08)
Above 60	3 (0.95)	4 (7.55)	7 (1.90)

Table 2: Type of Victims

Characteristics	Rider N (%)	Pillion Rider N (%)	Pedestrian N (%)	Total N
Male	228 (72.38)	53 (16.83)	34 (10.79)	315
Female	10 (18.87)	19 (35.85)	24 (45.28)	53

Table 3: Type of Accidents

	Rider N (%)	Pillion Rider N (%)	Total N (%)
Self accidents	156 (65.55)	57 (79.17)	213 (68.71)
Skid and fall	144	54	198
Hit stationary object	12	3	15
Collision	82 (34.45)	15 (20.83)	97 (31.29)
Light motor vehicle*	49	14	63
Motorised two wheeler	15	0	15
Heavy motor vehicle**	14	1	15
Autorickshaw	2	0	2
Hit pedestrian	2	0	2

*cars, jeep, gypsy **bus, truck

Table 4: Site of Injury

	Rider N (%)	Pillion Rider N (%)	Pedestrian N (%)	Total N (%)
Head and neck	223 (38.58)	63 (38.18)	55 (47.41)	341(39.70)
Thorax	30 (5.19)	5 (3.03)	5 (4.31)	40 (4.66)
Abdomen	35 (6.06)	9 (5.45)	5 (4.31)	49 (5.70)
Upper limb	125 (21.63)	43 (26.06)	19 (16.38)	187 (21.77)
Lower limb	165 (28.55)	45 (27.27)	32 (27.59)	242 (28.17)

Table 5: Treatment Outcome

	Rider N (%)	Pillion Rider N (%)	Pedestrian N (%)	Total N (%)
Discharge	153 (64.29)	59 (81.94)	43 (74.14)	255 (69.29)
Admission	78 (32.77)	11 (15.28)	12 (20.69)	101 (27.45)
Others (under observation and LAMA)	7 (2.94)	2 (2.78)	3 (5.17)	12 (3.26)

Discussion

In the three year study period, MTVA victims constituted 31.67% of the overall victims of RTA attending the emergency department. This rise coincided with the growth in the registration of MTV in Meghalaya, from 65712 (as on 31st March 2012) to 85,996 (as on 31st March 2015)⁴. Although a similar observation was made by Nwadiaro HC et al⁵ (30.3%) and Solagberu BA et al⁶ (27.2%), other studies⁷⁻¹⁰ have reported higher figures as MTV were increasingly being used as a commercial means of transport in some of those countries^{9,10}.

The victims involved in MTVA were young, a fact which was endorsed by several authors,^{5,6,11,12} has raised concern as they form the most productive age group of the population. Similarly, victims between 20years and 50 years constituted almost 68% of all cases which concurred with the study by Vijayakumari N et al¹³ (72.5%). As far as gender distribution was concerned, male were the frequent victims which was in compliance with Cavalcanti AL et al¹¹ (85.8%) and Niraj R et al¹⁴ (86.4%). In the past, several studies¹⁵⁻¹⁷ have shown that young male individuals were more often overconfident in their ability, have poor attitude towards safe driving, higher tendency towards risky riding behaviour eg over

speeding, violation of traffic rules etc and hence more likely to encounter an accident. These same reasons could be the contributing factor for the maximum involvement of the young and male victims in our study. These MTVA happened mostly at the time of day when the traffic density was at its maximum i.e. between 12 pm and 5:59 pm. According to Chalya PL et al,⁹ 73.9% of the accidents took place during the day and 23.9% at night.

Self accidents due to skidding was the frequent mode of accident observed, as similarly reported by Vijayakumari N et al.¹³ The state of Meghalaya being mountainous with winding roads coupled with being one of the wettest place in the country, with an annual average rainfall of 4000 mm to about 11436 mm,¹⁸ may have contributed to the majority of accidents due to skidding. Corresponding to the finding of our study, a number of authors^{6,9,12,19} have reported riders to constitute a majority of the victims followed by the pillion riders and pedestrians. In our study of the relation between gender and the type of victims, most of the male victims were riders; female victims were either pedestrians or pillion riders. Oluwadiya KS et al²⁰ in their study observed that 60.3% of the males were riders and 70.9% of the females

were pillion riders.

The head and neck region was the site in which the surface injuries were commonly found followed by the lower and upper limbs, a finding also supported by others.^{5,10} This again emphasises the importance of wearing a helmet as this will greatly reduce morbidity and mortality among the victims. According to WHO, helmet use diminishes the risk of fatal injury by up to 39% and severity of injury by about 72%.²¹ However, the severity of injury is not only affected by mere usage of helmet but by the type of helmet used²² and the correct way of wearing it.²³ Moreover, the usage of helmet should not be mandated to riders alone but also to the pillion riders as it has been suggested that the injury pattern of both riders and pillion riders were similar.²⁴ However, this was a drawback of this study as the helmet wearing status of both the riders and pillion riders at the time of accident could not be ascertained from the data available. Another limitation of this study was that the prevalence of alcohol consumption among the victims could not be determined; evidence has shown that alcohol plays a role in these accidents²⁵ as it affects the riding skill and performance of riders.²⁶ While most of the victims were discharged following treatment, 27.45% of them were admitted in different wards; a finding similarly observed by Nwadiaro HC et al.⁵ This could be because of low velocity impact as many of these accidents happened in the town itself.

Conclusion

The number of motorised two wheeled vehicle accidents has shown an increasing trend. The victims were mostly males and belonged to the younger age group. Injuries sustained were mostly to the head and neck and this pattern was seen in the different group of victims. Therefore, it may be suggested that helmet wearing should not be mandated to the riders alone but also to the pillion riders.

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Ethical Clearance: Approved by Institutional Ethics Committee (IEC).

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Suicidality with Time Distribution and Serum Cholesterol Estimation

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Abstract

The act of taking one's own life intentionally is called Suicide. Widely prevalent, the suicide rates vary from place to place and there is no nation that has an escape from it. Every year all over the world, according to the WHO, one million people attempt to commit suicide. In the entire world, every year about eight lakh people commit suicide. With 17.5 percent of world population, 1,35,000, i.e, 17 percent are those who reside in India. Ministry of health has estimated that every year in the country around 1, 20,000 people kill themselves by committing suicide. Of these 40% of them are less than 35 years of age. Variations in pattern of seasons seem to influence the timing of suicide. Alterations in length of the day and temperature variations also affect when maximum suicides take place. A rise in the suicide behavior can also be due to abnormal biology as suggested in several studies. Some markers like Cholesterol and brain-derived neurotrophic factor (BDNF) are measured in the plasma or blood serum. These low serum biomarkers levels are seen implicated with impaired resilience of the brain among individuals having suicidal tendencies.

Keywords: Suicide, Age groups, Serum Cholesterol level, South Indian Population.

Introduction

The act of taking one's own life, intentionally is called Suicide. The meaning of the word is "the killing of oneself", which is itself derived from the Latin suicidium,²

Suicide studies have illustrated that though this human action is personal to an individual, it also implicates an interaction with other people in the society. This means that the individual cannot be secluded from his social matrix. Widely prevalent, the suicide rates vary from place to place and there is no nation that has an escape from it.

Over the past few years, the number of unnatural deaths have been on the increase. The unnatural deaths can be further classified as intentional and unintentional. Accidents are the most common type of unintentional deaths, while intentional deaths are mainly homicides and suicides. Suicide is a form of unnatural death. They are the leading killer of today's world especially among the adolescent and middle age groups. The causes of deaths have changed from infections towards social etiologies in the last few decades.

Every year all over the world, according to the WHO, one million people attempt to commit suicide. Each year, about 12 per 100,000 persons i.e., 0.5% to 1.4% of people die by suicide.^{3,4} Every 40 seconds, one person dies as a result of suicide, according to a new WHO report released in 2014.⁴ The developing world is plagued with suicide rates amounting to three quarters of the global suicide rates.⁵ Amidst the causes of death, Suicide leads as the tenth cause of death.⁶ It is observed that more than 20 million disability adjusted life years are lost because of suicide worldwide.⁷

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Alteration in the time pattern of suicide has been associated directly to geophysical effects as well as to the social and psychological factors. Variations in pattern of seasons seem to influence the timing of suicide. Alterations in length of the day and temperature variations also affect when maximum suicides take place.⁸

In the entire world, every year about eight lakh people commit suicide. With 17.5 percent of world population, 1, 35,000, i.e., 17 percent are those who reside in India. India's Ministry of health has estimated that every year in the country around 1, 20,000 people kill themselves by committing suicide. Of these 40% of them are less than 35 years of age. In 2014 as many as 1,31,666 people committed suicide. As per the NCRB statistics, fifteen suicides takes place every hour in India.⁹

Kerala and Tamil Nadu were estimated to have had the highest suicide rates per 100,000 people by a survey done in 2012. Compared to the suicide rates in the northern states where the rate is less than 3, these southern states had a suicide rate of more than 15.⁹

A rise in the suicide behavior can also be due to abnormal biology as suggested in several studies. Therefore a combination of biological factor with psychosocial factor might be a method, more reliable to predict the suicide behaviour.

Some markers like Cholesterol and brain-derived neurotrophic factor (BDNF) are measured in the plasma or blood serum. These low serum biomarkers are seen implicated with impaired resilience of the brain among individuals having suicidal tendencies.¹⁰

In the past, research had examined biological markers that could be potential predictors of suicide behaviour, especially in the connection with mood disorders. It is evident that they have used the brain or CSF as samples to study the neurological biomarkers related to the Serotonin system. However not in all cases can these be easily accessed. Hence it is important to develop biomarkers for predicting suicide behaviour that not only reflect the psychopathology of suicidal behaviour, but it should be one that is easily measurable in a non-invasive manner.

Hence this study is undertaken to identify a potential biomarker, i.e. Serum Cholesterol level which could be used to predict suicide behaviour and can be measured

without using invasive procedure.

Materials & Method

The study was carried on in Forensic Medicine & Toxicology and Biochemistry departments of Sri Ramachandra Institute of Higher Education and Research, Porur, Chennai. The control group consisted of healthy volunteers (n=40) willing to give an informed consent for participation in the study who have never attempted suicide with no history of metabolic disorders, psychiatric illness and treatment with drug therapy (SSRI) and cases (n=40) consisted of individuals brought for post-mortem to the Department of Forensic Medicine, who have died due to suicide.

Blood samples were collected from the cases and control group, which was then analysed for Serum Cholesterol levels.

Approval was obtained from the IEC of Sri Ramachandra Institute of Higher Education and Research, Porur, Chennai, and was performed in accordance with its recommendations.

Samples which met the following criteria were included.

Inclusion Criteria

Suicide Completers (cases):

1. Age group 15-65 years
2. Sex- both males and females
3. First time suicide attempt
4. No past history of major psychiatric disorder
5. No past history of psychiatric treatment
6. Consent from the legal heirs of the deceased

Controls:

1. Age group 15-65 years
2. Sex- both males and females
3. No past or present history of major psychiatric disorder
4. No past history of psychiatric treatment
5. Willing to consent for the study

To rule out the presence of the major psychiatric disorders, the MINI International Neuropsychiatric interview, DSM,IV English Version 5.0.0 was administered both for the cases and controls with the help of a Psychiatrist.

In every case the age and time of suicide were collected using a proforma framed for this purpose. Psychological autopsy was used to obtain data regarding the deceased from the relatives, friends of the deceased, investigating officer and the inquest report. The controls were directly interviewed after getting informed consent from them.

Additionally, based on the time of incidence, data obtained was analysed to understand which part of the day, the rates of suicide was higher by dividing 24 hours of the day into periods of 6 hours each as follows:

12.01 AM to 6.00AM	-	Morning
6.01 AM to 12.00 Noon	-	Afternoon
12.01 PM to 6.00PM	-	Evening
6.01PM to 12 midnight	-	Night

Collection of Blood Sample

Cases: After obtaining informed consent from the relatives/Legal heirs in the presence of a witness, it was proceeded to collect blood from the deceased. Five cc of blood was collected at the mortuary, from a peripheral vein from the dead body brought for autopsy and it was immediately transferred to a sterile serum separator tubes.

Controls: Five cc of blood was collected from the healthy volunteers after taking their consent from either the right or left the cubital veins by a phlebotomist and it was immediately transferred to a sterile serum separator tubes.

All the blood samples collected were centrifuged to extract the serum by being spun at a speed of 3000 rpm for 15minutes. The samples were transferred to ependoff and they were frozen at -80 degree Celsius for subsequent processing.

Estimation of Serum Cholesterol

Serum cholesterol was estimated in both cases and controls using BECKMAN COULTER AU 680 automated machine.

Results and Discussion

A case control study consisting of 40 cases and 40 controls were collected during the period from March 2016 to March 2017.

Table 1: Distribution of cases based on time when suicide was committed

TIME	NO. OF CASES (n = 40)	PERCENTAGE (%)
12.01 AM- 6.00 AM	12	30
6.01 AM – 12.00 noon	7	17.5
12.01 PM – 6.00 PM	11	27.5
6.01 PM – 12.00 midnight	9	22.5
Not known	1	2.5

The time of incidence was maximum in the morning with 12 cases out of the 40(30%) committing suicide between 12.01AM – 6.00AM.

This is followed by 9 cases (22.5%) committing suicide in the evening between 12.01PM to 6.00PM.

In one case the exact time of committing suicide could not be ascertained neither from the circumstantial evidence nor from the post mortem findings.

High rates during the morning could be due to the fact that the most of them would be asleep and hence it would be easier to commit suicide without anyone's attention. This was similar to the study conducted by Aadamali et al¹⁸, where it was observed that late evening of 4-8 pm was the time period more than a third of the group of people committed suicide while late night and early morning hours were the time period, one third committed suicide.

But VikramPalimar¹⁹ contradicted that in his study and observed that 6 am - 6 pm was the time period when the maximum rate of suicides took place. A rise in stress levels as the day progressed with maximum stress levels in the evening was attributed as a probable cause for the increased rate of suicide during the latter half of the day.

Table 2: Serum Cholesterol Levels in Controls and Cases

	GROUP	N	Mean	Std. Deviation	Std. Error Mean
Serum Cholesterol level mg/dl	CONTROL	40	158.70	37.018	5.853
	CASES	40	132.73	30.840	4.876

The mean Cholesterol levels in the cases were 132.73 mg/dl and control group was 158.70 mg/dl. There was significant difference in their level with $p=0.001$.

To understand the association between Serum Cholesterol and suicide was the basic aim of the study. This study has shown that there is significant difference in the Serum cholesterol levels ($p=0.001$) between the case and controls and it is significantly reduced in cases as compared to the controls.

Sullivan et al.²⁰ who conducted a study in a sample of 90 men and women, to understand that if there was an association between Total Cholesterol levels and suicide behavior found that the risk of suicide increased with lower cholesterol levels.

These findings were confirmed by Kunugi et al²¹ who similarly observed a relationship between suicide attempts and low serum cholesterol. Papassotiropoulos et al²² who reported that the risk of acute suicidality decreased with increasing Total Cholesterol levels irrespective of age, sex and state of nutrition.

Conclusion

Article 21 of the Constitution of India, states: “No person shall be deprived of his life or personal liberty except according to a procedure established by law.”

The physical act of breathing is not the meaning of “Life”. Right to live with dignity, right to livelihood and right to healthy life, etc., conveys the fundamental purpose of Life.²³

Individuals with suicidal thought should be identified as early as possible and counseling should be started at grass root level. Curbing the menace of suicide requires an approach that is multidisciplinary in nature with active participation from teachers, doctors, social activists, the legal authorities and judiciary system.

Further studies with larger sample size and involving patients who survive a suicide attempt can be undertaken.

Research to study the genetic polymorphisms with respect to the specific type of Cholesterol that is associated with suicide can be undertaken.

Thus in conclusion, from the above observations it is evident that suicide is a multi-factorial behavior that requires multidimensional approach to prevent it.

Conflict of Interest: Nil

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Ethical Clearance: Ethical clearance was obtained from the Institutional Ethics Committee.

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Human Bite Mark – A Physical Evidence

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Abstract

Forensic Odontology include evaluation of human bite mark which is a trace evidence for connecting the assailant and the victim of a crime. Evaluation of the morphology of bite mark and comparison with the dental pattern of the suspected person helped in providing a corroborative evidence in identification of the criminal¹. Most of the bite mark evaluated in Forensic practice does not reproduce all the characteristics of the dental pattern of the suspected person as the complete dental arch is not reproduced on the injury however in most of the cases the pattern of the anterior dental arches or their portion is impregnated on the injury². The study involved evaluation of all the injuries due to human bite over a period of nine years on the dead body brought for medicolegal autopsy and on the subjects involved in crime brought for examination of wounds and certification of injuries. Evaluation of the bite mark and its correlation with the dental characteristics of the suspect revealed that the evidence is corroborative and supportive. As the number of physical characteristics for comparison and identification became more , it resulted in a better match between the morphology of bite mark and the dental characteristics of the suspected person³. The more the number of imprint of teeth seen clearly on the skin the better was the chances of identifying the assailant, however the chances of other people having similar dental pattern cannot be excluded completely.

Keywords: *Human bite, Physical evidence.*

Introduction

Bite marks can be considered to be a spectrum of injuries ranging from imprint of a suction mark, marks indicating violence ranging from bruising with no indentations to deep lacerations made by the penetrating teeth. Proper preservation, analysis and interpretation of human bite mark can be useful in establishing the criminal or excluding the innocent. Care should be taken during bite mark analysis and evaluation as it may lead to miscarriage of justice or conviction of the innocent⁴. The first and the foremost thing is the recognition and identification of a human bite mark. The preliminary examination include observing the upper and lower jaw pattern, marks of individual teeth, and the dynamic nature of biting process and force transmitted^{5 6}. This

helps in the retrospective evaluation of the emotional state of the assailant at the time of committing the crime. The multiplicity of bite also helps in exposing the deliberation on the part of the assailant. The central area of petechiae or erythema is the end result of pressure and suction due to pressure of the tongue on the soft tissues. The presence of sexual emotion after sinking the teeth into soft tissues is accompanied by the pleasure of suction of soft tissues which may vary in the force exerted but which is invariably present in a love bite resulting in the central erythema. In the living these manifestations may get altered or may even heal by the passage of time. Hence a scaled photograph should be taken as a record and evidence immediately during the examination of the injury in the living. Comparative evaluation with the suspected persons dentition is only possible after the assailant is identified and produced for Forensic odontology studies⁷. A bite mark is not a result of *static confrontation*, but is a product of a dynamic process resulting during or following the movement of the victim, and the assailant during or after the bite process. Hence the bite mark may or need not be a reciprocal imprint of the dental configuration and pattern, but may show

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modifications due to the dynamicity during the course of bite. The act of biting is considered as a “process” rather than being an event.

Aims and Objectives

Comparative Evaluation of the pattern, nature and configuration of human bite mark with the dental morphology of the biter.

By examining the morphology of the bite mark whether it is possible to positively identify the dentition of the assailant(biter).

Materials and Method

Forensic odontology studies conducted in the Department of Forensic Medicine, Govt. Medical College Kozhikode over the year 2004-15 were evaluated. The details of physical characteristics of the bite mark was compared with the dental morphology and the points of characteristic similarities were correlated and reevaluated for the purpose of the study. Permission for the same obtained from institutional research and ethical committee.

Inclusion criteria: The medico legal cases subjected for odontology studies at the Department with photographs and details of the subject who had inflicted the injury were included in the study. The author had personally observed the dental morphology and bite mark during the medico legal examination involved in this study.

Bite mark analysis:

Presumption that every person's dentition is unique is based on the fact of the entire dental characteristics, which is often not seen as imprint in a bite mark. The characteristics which makes the bite mark unique are the differences of anatomical surfaces, restorations, prosthesis, decay, malposition, malrotation and peculiar shapes, however a sufficient representation of the uniqueness is not represented in the bite mark always.

Method of comparison:

Direct examination of the bite mark and dentition of the suspected person and comparison of dental morphology with bite mark was done as it provides a three dimensional comparative evaluation. Photographs and casts were preserved for the purpose of documentation. The bite indentations in the living are photographed to

prevent loss of evidence due to healing process.

Observations

Seven cases of bite marks were evaluated. Five of the seven bite marks had only the imprint of anteriorly placed teeth and were pressure abrasion marks. One of the cases showed deep bite mark lacerations resembling the teeth of upper and lower jaw with avulsion of soft tissues. The central portion of the bite marks showed erythema or evidence of suction in two cases. Three cases of the six bite marks were resolving.

Case 1: History of attempting to stifle cry of a child during sexual abuse. Bite mark showed the imprint of upper incisor tooth on the back aspect of web space of thumb and index finger during the attempt of smothering. The mammelons of the incisors were seen as imprint on the bite mark.

Case 2: Death during smothering – The bite mark was inflicted during attempt to close the mouth using the hand. The gap between the incisor teeth of upper jaw was visible on the bite mark and only the imprint of incisor teeth were seen on the bite mark.

Case 3: A lacerated wound (0.7 x 0.2 x 0.3cm) was seen incidentally on the inner upper quadrant of right breast in a case of homicide due to blunt injury inflicted to the head. Even though the injury resembled teeth pattern the presence of a single laceration did not raise the concern, however after a few days the accused in the case of homicide was brought to the Department for physical examination. The doctor who conducted the autopsy of the deceased observed the unusual presence of a single protruding upper incisor tooth, which made him suspect the injury on the breast of the deceased to be the bite mark of the suspected assailant. This was later confirmed by the accused during his confession. The morphology of the bite mark on the breast was also consistent with the attrition and dimension of the incisor tooth.

Case 4: An adivasi couple after intake of country made liquor was found physically abusing each other during the late night hours which the people around considered as part of daily routine after alcohol intoxication. The next day the female was found dead with injuries over the cheek and face. The injuries were found to be characteristic human bite marks. Circular areas of avulsed soft tissues were seen with the margins

showing teeth marks adjoining the lacerated avulsion.

Case 5: Bite over the right cheek in a sexual assault revealed upper and lower arches. The bite mark was resolving during examination. The absence of 1st premolar on the left lower quadrant of the subject was corroborative with the abrasion free area within the lower arch on left side. The age of the injury was also consistent with 5 days old history of crime. The attrition of the incisor tooth also had an influence on the nature of the abrasion of upper and lower arches of bite mark. There was a gap between the first and second incisor, on the right upper quadrant of the suspect which was also seen as an area of non-continuity along the bite mark injury on right side of upper arch.

Case 6: Healed bite mark showing healed abrasions with abrasions grazing towards the central area due to attempt to close the mouth after the bite. The upper jaw teeth were seen as larger teeth marks and the spacing of tooth between incisors were evident on the bite mark. The broken canine of the right lower quadrant was seen as intact area corresponding to the absent tooth.

Case 7: Typical love bite with central area of erythema (suction contusion). The gap between the incisors of upper and lower jaw was evident on the bite mark. The angulation of upper outer incisor tooth was seen as an obliquely displaced bite mark



Photo 1 dental morphology



Photo 2 bite during stifling cry



Photo 3 bite during smothering



Photo 4 bite during sexual violence



Photo 5 healed bite mark



Photo 6 love bite with suction

Table – 1: Dental morphology and pattern/nature of injury

	Complete / Incomplete	Dental pattern regular/not	Nature of injury	Missing tooth	Irregularity	Mal aligned	Broken tooth
Case 1	Incomplete	Irregular	Pressure abrasion	Nil	+	+	Nil
Case 2	Incomplete	Irregular	Pressure abrasion	Nil	+	+	Nil
Case 3	Incomplete	Single tooth	Laceration	+++	+	-	Nil
Case 4	Complete	Regular	Laceration	Nil	-	-	Nil
Case 5	Complete	Regular	Abrasion	+	+	-	Nil
Case 6	Complete	Regular	Healing abrasion	+	+	+	+
Case 7	Complete	Regular	Pressure abrasion	Nil	+	+	Nil

Discussion

Attempts to smother or stifle the cry of a person with the bare hands had resulted in the victim biting the assailant and the bite mark was partial having imprint of incisors of upper jaw. The dental morphology of the cutting edge of the central incisors were impregnated on the bite mark pattern. The compressive effect of pressure of the hand on to the teeth during the process of bite had resulted in pressure abrasion in all the cases. This would have resulted in the inability of the victim to close the mouth completely and biting the palmar and dorsal surface of the hand which was within the mouth, pressing into the mouth preventing the closure of the mouth. Love bite is revealed by the central suction erythema in one case and the vulnerable site of bite in the other (cheek). The pattern revealed the imprint of upper and lower jaw teeth upto the molars in both the cases. The pressure abrasion suggests the nature of the emotion which resulted in the sinking of teeth into the soft tissues. The gravity of suction applied after sinking the teeth into the soft tissues results in the central erythema. In one of the cases, there was a superficial lacerated wound on the breast which resembled tooth mark, the accused person of the crime had only one incisor on his upper jaw, otherwise both the jaws were adentulous. The explanation provided by him to the police was that he

had not voluntarily bitten the breast, but had sank his only tooth deeper into the soft tissues of the breast as the tooth was preventing him from applying the gums on the breast to get enough suction and satisfaction. Bite mark as a part of physical violence was seen as avulsed lacerated wounds with circular nature, wound margins showing teeth pattern. When both the arches of upper jaw and lower jaw was evident on the bite mark, the upper jaw teeth mark were found larger and prominent. The immobile upper jaw teeth mark appear to have been used to fix the jaw onto the soft tissues and the action appear to have been mediated by the mobile lower jaw teeth.

Conclusion

Comparative evaluation of bite mark which function as a physical evidence is only a corroborative evidence which is more useful in exclusion rather than positively identifying a person⁸. As the number of tooth pattern increases in the bitemark a better comparison and evaluation is possible during Forensic odontology studies. Just as we record identification marks in every medicolegal report/certificate for identifying the subject examined, the more the number of similarity between the morphology of bite mark and suspected dentition of a subject the greater the probability that the bite mark

is that of that particularly subject. The upper and lower jaw tooth imprint on the bite mark showing the arches and number of teeth were more prominent in situations of love bite rather than bite inflicted accidentally in situations like attempted smothering. Avulsed lacerations were seen on the bite only when the bites was under the influence of alcohol, the emotion during which period could not be exactly evaluated. The imprint of the broken or absence of tooth was well marked on the bite mark as intact area within the arch adjacent to the teeth marks . Minimal distortion of the teeth or its angulation were not marked on the bite pattern possibility due to elasticity of the skin. The unique nature of the dental morphology with respect to irregularity of anteriorly placed teeth (gap, crowding and overlapping), loss of tooth, broken tooth, malaligned teeth makes the identification of the individual more specific and reliable⁹.

Conflict of Interest: Nil

Source of Funding: Self

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Pattern of Organophosphate Poisoning in Bapuji Hospital, Davangere (2011-2013)

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Abstract

Introduction: Poisoning is an important health hazard and one of the leading causes of morbidity and mortality worldwide. Organophosphorus compounds are commonly used for suicide worldwide. **Method:** This observational study was conducted on patients of organophosphate poisoning admitted to Bapuji Hospital, Davangere during the period spanning October 2011 to March 2013. Total number of cases studied were 150. Data was collected from hospital admission records, hospital MLC registers, patient case history. **Results:** The maximum number of cases was seen in the 21 to 30 years age group with male predominance. All the study participants were found to be employed in agricultural labor. The commonest poison consumed in the study was Malathion. Majority of the patients consumed twice the lethal dose of poison. All the fatalities had suicidal manner of consumption, and all the accidental consumption cases survived. **Discussion:** Our study showed a notably higher fatality rate possibly due to higher amounts of poison consumed with other findings comparable with previous studies. **Conclusion:** This study concludes that most cases of organophosphorus poisoning were reported in adult male farmers with malathion being the most common source for poisoning. Even though malathion is not suitable to be an ideal suicidal poison and has unpalatable taste, majority of the patients consumed poison in quantities more than the lethal dose which translates to higher mortality rates.

Keywords: Organophosphate, suicidal poisoning, malathion

Introduction

Poisoning is an important health hazard and one of the leading causes of morbidity and mortality worldwide¹. The type of poison generally seen to be ingested accidentally, or used for suicidal or homicidal purpose, may depend upon ease of access, availability and mode of action. However, there is a progressive shift towards suicidal poisoning and accidental poisoning in the household and in agriculture². Accidental poisoning which is common among children is ascribed to the

increased use of numerous chemical articles in the household. Industrial poisoning is gradually receding statistically, owing to advances in industrial hygiene and medical service and to the increasing automation of industrial processes. In adults the manner of poisoning, irrespective of sex of the victim can be: 1. Suicidal 2. Accidental 3. Homicidal 4. Self-treatment 5. Injudicious medication. Organophosphorus compounds and Endrin are commonly used for this purpose^{2,3}. These poisons are easily obtained in the market in the form of insecticides, pesticides, rodenticides and weed killers. Following general awareness of the highly lethal nature of these substances they have become popular as suicidal and homicidal poisons^{4,5}. Information from Medical Record Division of Bapuji Hospital shows high incidence and mortality due to organophosphate poisoning, which prompted the undertaking of this study

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Objectives

- To study case load of acute Organophosphate poisoning.
- To study the demographic characteristics of the patients with acute Organophosphate poisoning.

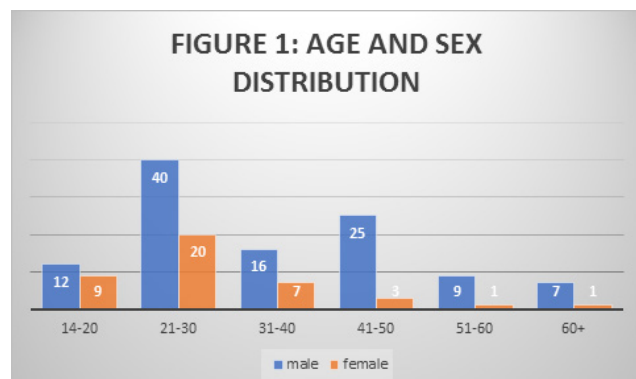
Methodology

This observational study was conducted on patients of organophosphate poisoning admitted to Bapuji Hospital, Davangere during the period spanning October 2011 to March 2013, after obtaining approval from the institutional ethics committee. Total number of cases studied were 150. Data was collected from hospital admission records, hospital MLC registers, patient case history and history from eye witness, relatives, friends of deceased, investigating officers. All patients with Organophosphate poisoning aged more than 14 years belonging to either sex were included in the study after obtaining informed consent from the participants (from guardians in case of minors). Detailed history was obtained regarding the type of poison, quantity of poison and manner of poisoning from the patient and his/her relatives and also from the police. Examination of the poison container was also done whenever available.

Results

Patient Characteristics: Age and Sex

The age and sex distribution of the study group is shown in figure 1. The maximum number of cases was seen in the 21 to 30 years age group. Youngest patients were 2 females of age 14 years each and oldest patient was a male of age 76 years. Sex distribution of the cases studied had a male predominance in each age group with 109 (73%) male patients to 41 (27%) female patients.

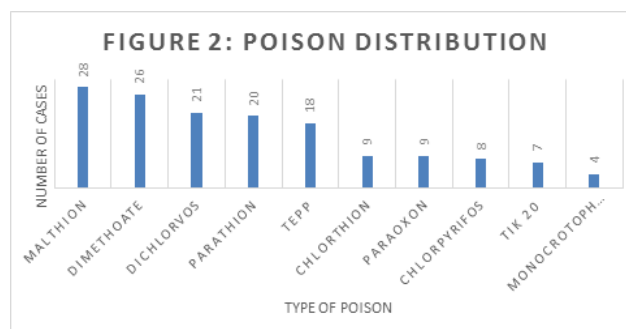


Education and Occupation:

The maximum educational level of the individuals studied was 6 years of schooling with only one 14-year-old boy who had studied upto 7th standard and dropped out. Of the remaining a large proportion were illiterate (63 out of 150, 42%) and all the study participants were found to be employed in agricultural labor including those below 18 years of age.

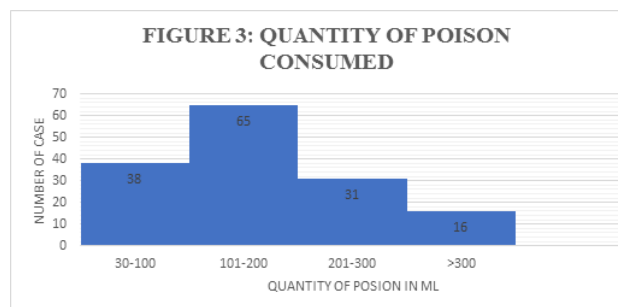
Type of Poison Consumed:

The distribution of patients according to type of poison consumed is shown in figure 2. The commonest poison consumed in the study was Malathion (28 patients, 18.67%). Second commonest was Dimethoate (26 patients, 17.33%), followed by dichlorvos and parathion. All poisons belonged to organophosphorus class.



Approximate Quantity of Insecticide Ingested

65 patients (43.33%) had consumed 101ml to 200ml of organophosphorus compound. 38 patients (25.33%) had consumed 30ml to 100ml of organophosphorus compound. 31 patients (20.67%) had consumed 201ml to 300ml of organophosphorus compound. Very high doses of consumption i.e. > 300ml were seen in 16 patients (10.67%). Data depicted in figure 3.



5. MANNER OF CONSUMPTION AND FINAL OUTCOME

Suicidal consumption of organophosphorus compounds was seen in 128 patients (85.33%) and accidental consumption of the same was seen in remaining 22 patients (14.67%). No homicidal administration of organophosphorus compounds was seen during this study.

In the 3-day follow-up 60 patients (40%) had fatal outcome and 90 patients (60%) survived with treatment. Of the 60 fatalities, 26 cases (17.33%) died within 24 hours.

All the fatalities were associated with severe poisoning. Among those who survived 18 patients (12%) had severe poisoning. Another striking fact noted was that all the fatalities had suicidal manner of consumption, and all the accidental cases survived. Thus, we arrive at a fatality rate of 46.87% (60 out of 128) in suicidal poisoning cases.

Discussion

In the present study, the sex incidence shows males are more affected (73%) than the females (27%). Similar observations were made by Singh et al.³⁰, consisting of 67.95% males and majority of the cases were adults belonging to the age group of 21 to 30 years. Our study shows that all of the patients admitted were agricultural laborers. This could be due to easy availability and accessibility of poisons, particularly insecticides which are responsible for high incidence of poisoning among the agricultural workers. Similar incidence was reported by Sozmen et al.⁷ and although the total exposure time was similar in both areas, BuChE and PON1 activities of farmers who work in tobacco production were lower. Overall, BuChE and PON1 activities showed a depletion in the farmer group compared to age-matched controls. When the farmers were categorized according to the number of their symptoms, the BuChE activities of farmers who had two or more symptoms were found to be depleted ($n = 43$, 2948 ± 756 and Naravaneni & Jamil²¹ 0 farmers exposed to pesticides and 160 non-exposed individuals were enrolled for determining the genotoxicity and AChE levels. The AChE levels were determined in plasma and RBC lysate from blood samples collected from farmers and control subjects. AChE (true and pseudo where in all the patients chosen for the study with exposure to organophosphate insecticide were

farmers. In all cases the poisons were consumed via the oral route. Malathion is one of the most commonly used organophosphate insecticide and is commonly available for agricultural use. Even though it has a disagreeable taste, it is most often taken orally because of its easy availability to farmers and also lethality of its action. Other studies also reflect similar findings⁹⁻¹².

Majority of the patients in our study had consumed 101ml to 200ml of organophosphorus compound (43.33%). This dose is in excess of the lethal dose for the two most common poisons found to be used in our study i.e Malathion and Dimethoate.

The patients were followed up for 3 days during which 40% had fatal outcome and 60% survived with treatment. Of the total number of fatalities 17.33% died within 24 hours of admission to the hospital. A study by Nilamadhab Kar et al.¹³ found a mortality of 26% in patients with suicidal organophosphorus poisoning, but our study showed a notably higher fatality rate. This difference may possibly be explained by higher amounts of poison consumption in our study group, lower prices/better affordability and also increased awareness since 2006, when their findings were published. A study by Singh et al.⁶ reports a 24 hour mortality of 17.30% which is in agreement with our 24 hour mortality rate.

Conclusion

This study concludes that most cases of organophosphorus poisoning were reported in adult male farmers with malathion being the most common source for poisoning. Even though malathion is not suitable to be an ideal suicidal poison and has unpalatable taste, majority of the patients consumed poison in quantities more than the lethal dose which translates to higher mortality rates. Estimation of plasma pseudocholinesterase levels in Organophosphorus poisoning can be a significant factor in improving the outcome of such patients as it can be a good prognostic tool. Since majority of the cases in this study are farmers who have easy access to such poison, the use of such poisons by them need to be monitored and regulated also counselling to those in need would reduce the incidence of suicide. Organophosphates usually are consumed in conjunction with other drugs like alcohol, barbiturates, benzodiazepines, etc. or mixed with food and beverages to make it more palatable which requires further exploration.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Obtained from Institutional Ethics Committee, Jjm Medical College (Attached to Bapuji Hospital), Davangere.

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A Study on Adherence to International Patient Safety Goals in a Tertiary Care Cardiac Centre in India

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Abstract

Introduction: Aim: To assess adherence to International Patient Safety Goals among medical and paramedical staff. Objectives: To assess awareness levels about the goals amongst the hospital staff and implementation of the goals by the medical and paramedical staff.

Method: This is a cross-sectional study. The stratified sampling method was used where the healthcare providers who are directly associated with patients in patient care, were sub-grouped into doctors, nurses and paramedical staff which include physiotherapists, lab technicians, radiologists, dieticians, etc. 18% - 20% of the staff under each sub-group was randomly considered for sampling. A structured observational checklist was used along with interview and the questionnaire consisted of 20 questions covering all the 6 goals. The study was carried out from 3rd May 2017 to 15th June 2017 with a sample size of 306 in total.

Results and Discussion: Overall compliance (category wise) is observed to be highest in Doctors with 72%, followed by Nurses with 69% and then Paramedics with 68% compliance.

It was noted that the cause of non-compliance with the goals by staff was either because of lack of knowledge or extra work load which reduces the ease of implementation or sometimes combination of both. Doctors and paramedical staff have mentioned insufficient training classes as the reason for their non-compliance. Nurses had classes on a regular basis but still failed to acknowledge and implement the same.

Keywords : Adherence, International patient safety goals, tertiary care cardiac centre.

Introduction

The study setting is a tertiary care cardiac centre in India with National Accreditation Board for Hospitals and Healthcare (NABH) and Joint Commission International (JCI) accreditations. It is a 1000-bedded, super speciality

hospital and is equipped with over 20 dedicated Cardiac Operation Theatres and 5 Digital Cath Labs of which one is a Hybrid. It is proficient in performing both interventional cardiac procedures as well as complex heart surgeries. 200 critical care beds are devoted to post-operative care. The hospital has successfully treated heart problems on patients ranging from newborns to geriatric adults, from several countries and has done free cardiac procedures for children. It performs over 30 heart surgeries per day and is equipped to perform up to 60 heart surgeries per day to treat complex heart defects like Atrial Septal defect (ASD), Ventricular Septal Defect

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(VSD) and Tetralogy of Fallot (TOF) with surgeries including heart valve repair, coronary artery bypass graft, heart transplant, etc.

IPSG (International Patient Safety Goals) speaks for itself i.e. improving safety of patients in hospitals. This is one of the key standards to be met by the hospital in order to get certified by the Joint Commission International (JCI). Based on the report produced by Department of Health and Human Services of USA in 2010, 1.8 million hospital patients die every year because of infections, surgical mistakes and/ or other medical harm. Another 1.4 million are seriously hurt by their hospital care.^{1,2,3,4}

Methodology

Aims and Objectives:

The aim of this study is to find out how many medical and paramedical staffs are adhering to/complying with the International Patient Safety Goals. The objectives of the study are to find the awareness level of the goals amongst the hospital staff and implementation of the goals by the medical and paramedical staff.

Scope of the study:

For this cross-sectional study, stratified sampling method was used where the healthcare providers who are directly associated with patients in patient care, were sub-grouped into doctors, nurses and paramedical staff which include physiotherapists, lab technicians, radiologists, dieticians etc. 18% - 20% of the staff under each sub-group was randomly considered for sampling. A structured observational checklist was used along with interview and the questionnaire consisted of 20 questions covering all the 6 goals. The study was carried out from 3rd May 2017 to 15th June 2017 with a total sample size of 306.

Sources of data

It is primary data where staff of the hospital were audited (observed and interviewed) who are involved in patient care directly. Sample includes doctors (surgeons, anesthesiologists, consultants, junior doctors), nurses (shift in charge nurses, floor in charge nurses, cath lab nurses, OT nurses, nurses from radiology, nurses posted at wards and OPD) and paramedical staff (physiotherapists, radiologists, ECG technicians, TMT technicians, technicians at phlebotomy and blood bank)

of a tertiary care cardiac centre in India.

Limitations of the study

Since there was no access to the operation theatres and cath labs, the findings on goal 4 are based purely on interviews.

Due to the lack of availability of information on the exact number of dietary staff employed, they could not be included as a part of the sample.

Results and Discussion

Overall Compliance Percentage : Category wise

The overall compliance (category wise) is observed to be highest among Doctors (72%), followed by Nurses (69%) and then Paramedics (68%).

Though the compliance rate of doctors is 72%,

1. 51% of the doctors (14 out of 27) audited were unaware of IPSG.
2. The remaining 49% (13 out of 27) were partially aware of the goals.

Going by implementation, only 69% compliance is observed among nurses. Going by the awareness, out of the 213 nurses audited,

3. 21% (45) were aware and followed the goals,
4. 23.5% (50) were unaware and
5. 55% (118) were either partially aware or aware but ignorant about certain parameters.

Paramedics include physiotherapists, lab technicians, radiologists, clinical nutritionists and infection control nurses. In total 66 were audited. Out of this 66,

6. 30% (20) were aware of the goals,
7. 54.5% (36) were unaware and
8. 15% (10) were either partially aware or ignorant about the same.

Goal wise observation

Goal 1: Identification of Patient Correctly

Following are the parameters with which they were audited for compliance with goal 1. 1.1 Are at least 2

identifiers (name and MRN) used to identify patients?

1.2 Are any other identifiers used to identify patients apart from name and MRN?

1.3 Are the patients identified every time prior to a course of action (before giving drugs, before serving diet-specific food, before procedure, etc.)?

1.4 Are colour coded ID bands used for patient identification?

Compliance observed in different categories under each parameter of the goal.

Doctors have a good compliance rate in parameters 1.1 and 1.3 which deals with the identification of patients using a minimum of 2 identifiers and the identification of the patient every time prior to any course of action involving patients, respectively.

The rate of compliance is less than impressive in parameters 1.2 and 1.4 which are about not using the bed number as one of the identifiers and using colour coded ID bands with basic patient information on it respectively.

In nurses, the compliance is highest in parameter 1.1 (209/ 213) followed by 1.3 (185/213), 1.2 (96/213) and 1.4 (86/206). It is important for nurses to have good compliance, considering the amount of patient contact they establish during patient care. Wrong identification of patients can lead to serious complications.

Paramedical staff, just like the other two categories seem to follow the compliance level when compared parameter wise with highest being parameter 1.1 with almost full (65/66) compliance followed by 1.3 (56/66), 1.2 (43/66) and 1.4 (20/40) with only half the sample being compliant.

Correct identification of patients by paramedical staff is also important considering the amount of contribution they have in delivering patient care. Wrong identification can lead to wrong tests and/or wrong report delivery which can create a lot of chaos and/ or lead to wrong treatment thereby putting the patient's life in jeopardy.

Goal 2: Improving Effective Communication

Following are the parameters with which staff were audited for compliance with goal 2:

2.1 Are the hands off forms filled regularly?

2.2 Are verbal orders taken even when there is no emergency?

2.3 Is Read-Back, Repeat-Back policy (confirmation) followed for verbal orders?

Parameter 2.1 speaks about patient handover. Since this is a study involving observation and interview, compliance based on knowledge alone was not considered. With respect to giving verbal orders, doctors have shown satisfactory compliance. Only 25 nurses were observed to be carrying out patient transfers during auditing, out of which only 17 seemed to be aware of the hands off form (patient transfer checklist) and also documented the same. With respect to taking verbal orders, 203 nurses took it during the time of observation out of which 13 did it while there was no emergency. The parameter is about not taking verbal orders and taking only written orders at times other than emergencies and hence the compliance of 190.

When verbal orders are taken from doctors, the policy is to follow read-back and repeat-back for confirmation of the same. Out of 9 nurses audited for this parameter, only 6 were compliant i.e. followed the read-back and repeat-back policy. Taking or giving verbal orders is not applicable for paramedical staff since they do not have the authority for the same except for 5 of them in TMT (Treadmill Test) laboratory. Out of these 5, none of them took verbal orders at the time and hence were compliant with parameter 2.2 while parameter 2.3 is nil since it is not applicable unless verbal orders are taken or given.

Patient transfer was applicable only for the nurses at the time of study period and hence observation for parameter 2.1 is seen only under nurses while 100 percent compliance is seen in paramedical staff doctors for parameters 2.2 and 2.3, respectively.

Goal 3: Improving the Safety of High-Alert Medications

Following are the parameters with which staff were audited for compliance with goal 3:

3.1 Are high alert medications stored as per policy?

3.2 Are the high alert medications labeled and color coded appropriately?

3.3 Are concentrated electrolytes labeled correctly

and color coded appropriately?

3.4 Are look-alike and sound-alike drugs labeled and colour coded appropriately?

3.5 Are near expiry medicines segregated regularly?

3.6 Is double verification done before administration of high alert drugs?

Goal 3 talks about the storage of high alert medication as per regulations. In the hospital, doctors were not given the responsibility to maintain emergency medicine trolley or crash cart, there by eliminating them as study subjects for this goal. In spite of that, 3 doctors with this responsibility were identified from the ECG and dental units where there are no nurses, thus passing on the duty to the doctors present there.

Out of the three doctors observed, not all of them were given all the types of medications to manage in the emergency trolley. Since only selected medications are given to them for handling, the number of doctors audited under this goal varies.

Out of 213 nurses audited, not all were applicable for this goal even though the whole burden of maintaining high alert medications lies on them, because a few nurses from cath lab do not require to store them. This is the reason behind the varying sample size under this goal.

Nurses showed least compliance for parameter 3.6 which deals with double verification prior to administration of high alert medications. The highest compliance was for parameter 3.5 which deals with policies for drugs close to expiry. Paramedical staff on the other hand are also not allowed to maintain the crash carts except in the TMT and ECG rooms. This condition brought the sample number down to 12. Overall, paramedical staff compliance to goal 3 is not found to be good. Parameter 3.6 is not applicable to paramedical personnel since they are not authorized to administer drugs.

The highest compliance among doctors is 100% for parameter 3.6, which speaks about double verification prior to administration while the lowest compliances are in parameters 3.3, 3.4 and 3.5, all with 0% compliance. These three parameters talk about labeling, colour coding, storing of LASA drugs and concentrated electrolytes and storage of prior expiry drugs.

Goal 4: Ensuring Correct-patient, Correct-procedure and Correct-site of Surgery The parameter with which staff were audited for compliance with goal 4 is whether 'Is time-out procedure done before a procedure/surgery or not?'

There is only one parameter under this goal that was checked for compliance and that is about following the documentation of time-out procedure to ensure correct-site, correct-procedure and correct-patient, prior to wheeling the patients into operation theatre and cath labs. Full compliance is seen under this goal by both doctors and nurses from the OT and cath lab. It is not applicable for paramedical staff.

Goal 5: Reducing the Risk of Healthcare Associated Infections

The parameters with which auditing was done for goal 5 are:

5.1 Are the 5 moments of hand hygiene followed?

5.2 Are the 7 steps of hand washing followed?

5.3 Are hands washed after handling *Clostridium difficile* infected patients?

Good level of compliance is seen for the parameter 5.1 which is above 60% while parameter 5.2 ranges from 45% to 66% with the highest compliance in the former parameter being by doctors and in the latter parameter being by nurses.

Parameter 5.3 is not applicable for any category because it is about handling of *Clostridium difficile* infected patients and there were no patients admitted with *Clostridium difficile* infection during the period of the study.

Goal 6: Reducing the Risk of Patient Harm Resulting From Falls

Patient falling is the most common patient safety incident reported (Al-Qahtani & Messahel, 2013)¹. Prevention of patient falls during their stay is an important aspect to be taken care of and hence gave birth to goal 6 of IPSPG which is about fall risk assessment, reassessment and measures taken to prevent fall of patients.

Compliance to goal 6 of IPSPG was assessed based on the followed parameters:

6.1 Is fall assessment done for all patients?

6.2 Is fall assessment and reassessment done regularly (after fall, change of drugs, post-surgery)?

6.3 Are measures taken to prevent fall?

The highest compliance is seen among doctors with 100% on parameters 6.1 and 6.2 while the lowest compliance is seen among nurses where it is 49.74% for parameter 6.2. Implementation of Health care-associated infections are today by far the most common complications affecting hospitalized patients. Surgical-wound infections constituted the second-largest category of adverse events.⁵ Currently, between 5 and 10 percent of patients admitted to acute care hospitals acquire one or more infections, and the risks have steadily increased during recent decades.^{6,7} These adverse events affect approximately 2 million patients each year in the United States, result in some 90,000 deaths, and add an estimated \$4.5 to \$5.7 billion per year to the costs of patient care.^{8,9} Many patient safety practices drawn primarily from nonmedical fields (e.g., use of simulators, bar coding, computerized physician order entry, crew resource management) deserve additional research to elucidate their value in the health care environment.¹⁰

Conclusion

Though the compliance gathered from the data can be characterised as good, hospitals must always strive to drive further improvements. It was noted that the cause of non-compliance with the goals by staff was either a lack of knowledge or excessive work load which reduces the ease of implementation or sometimes a combination of both.

Doctors and paramedical staff have pointed out that the reason for non-compliance from their side is due to insufficient training classes conducted while nurses had the classes on a regular basis but still failed to acknowledge and implement the same. Additionally, it was found that a few staff lacked the fundamentals and motivation to learn and imbibe the same for which interventional measures are to be taken and the same were suggested to the hospital.

Ethical Clearance- Taken from Institutional ethics committee

Source of Funding- Self

Conflict of Interest - Nil

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Morphometric Analysis of Sexual Dimorphism in Foramen Magnum

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Abstract

Introduction: The establishment of human sex identity is of paramount importance in the field of forensic medicine especially when it comes to medico legal cases of disputed sex, completely decomposed or charred bodies, and decapitated cadaveric remains, exhumation of skeletonized remains where skull is recovered and referred to a forensic expert for opinion by the police, etc.

Methodology: Study sample includes 77 dry human skull bones obtained from department of forensic medicine, department of anatomy and student volunteers of T.O.M.C.H & R.C. T. The sex of the skull bone is estimated by using morphological characteristics. The antero-posterior diameter and the transverse diameter of the foramen magnum is measured using a Vernier caliper. The results are tabulated in Microsoft Excel 2013 document and the areas of foramen magnum were calculated using the formulae derived by Routal and Teixeira. Statistical analysis for correlation between the measurements and the sex of the skull was performed using SPSS software.

Results: Majority of skulls belonged to the female sex with maximum distribution in 25 to 35 age group followed by 18 to 25 age group. The length, breadth, and the area of foramen magnum are found to be larger in males than females. However, statistically significant sex differences were observed only for the breadth and areas of the foramen magnum.

Discussion: Our findings with regard to the sexing potential of foramen magnum dimensions found a statistically significant difference for breadth of the foramen magnum but the sexual dimorphism index and logistic regression for the same does not indicate a significant difference. The present research also reports a statistically significant sex differences in the area of foramen magnum as derived by formula given by Teixeira and Radinsky which is similar to that reported in earlier studies.

Conclusion: Parameters analyzed for sexual dimorphism of foramen magnum the area of the foramen magnum proves to be a better predictor of sex compared to other features but foramen magnum alone should not be considered for sexual differentiation unless the skull is mutilated.

Keywords: sexual dimorphism, foramen magnum, morphometric analysis

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Introduction

The establishment of human sex identity is of paramount importance in the field of forensic medicine especially when it comes to medicolegal cases of disputed sex, completely decomposed or charred bodies, and decapitated cadaveric remains, exhumation of skeletonized remains where skull is recovered and

referred to a forensic expert for opinion by the police, etc. Sexing accuracy of the human skeleton varies for the different bones and in different population groups. Human skull is considered as one of the most reliable bones for sex differentiation¹

The foramen magnum lies in an anteromedian position. It is oval, wider behind, with its greatest diameter being anteroposterior. It contains the lower end of the medulla oblongata, the vertebral arteries and the spinal accessory nerve. Anteriorly, the margin of the foramen magnum is slightly overlapped by the occipital condyles which project down to articulate with the superior articular facets on the lateral masses of the atlas.²

Skull may be shattered during high velocity impact injuries or in disruptive injuries and only fragments of bones may be available for examination. Identification of sex becomes challenging in such instances. The basal region of the occipital bone is likely to survive the physical insults than the other parts of skull owing to the abundant soft tissue cover, skull thickness in the region, and its relatively well-protected anatomical position. Thus, there is an increased possibility of recovering this part of skull even in cases of severe trauma, and studies on the occipital bone may provide useful clues in identification of significantly disrupted remains³ explosions or violence. The basal region of the occipital bone is covered by a large volume of soft tissue and is therefore in a relatively well-protected anatomical position, and as such, classification of sex using the occipital bone may prove useful in cases of significantly disrupted remains. The aim of this paper is to evaluate manually recorded morphometric variables of the region of the foramen magnum using both discriminant function analysis and linear regression. The skulls utilised in this study were selected from the eighteenth to nineteenth century documented skeletal collection of St. Bride's Church, Fleet Street, London. Adult human skulls n = 158 (male symbol82/female symbol76

The occipital bone is frequently considered for the determination of sex in both forensics and anthropology. Qualitatively the nuchal line roughness and the prominence of external occipital protuberance are considered good indicators for determination of the sex⁴. Quantitatively many indexes have been built based on the dimensions of foramen magnum and the occipital condyles. Also many authors have described their use

in determination of sex especially when the skeleton is incomplete or in case of fractures of the cranial bones⁵⁻⁷

The present research was planned to evaluate the sexing potential of foramen magnum by way of morphometric analysis using sexual dimorphism index.

Materials and Method

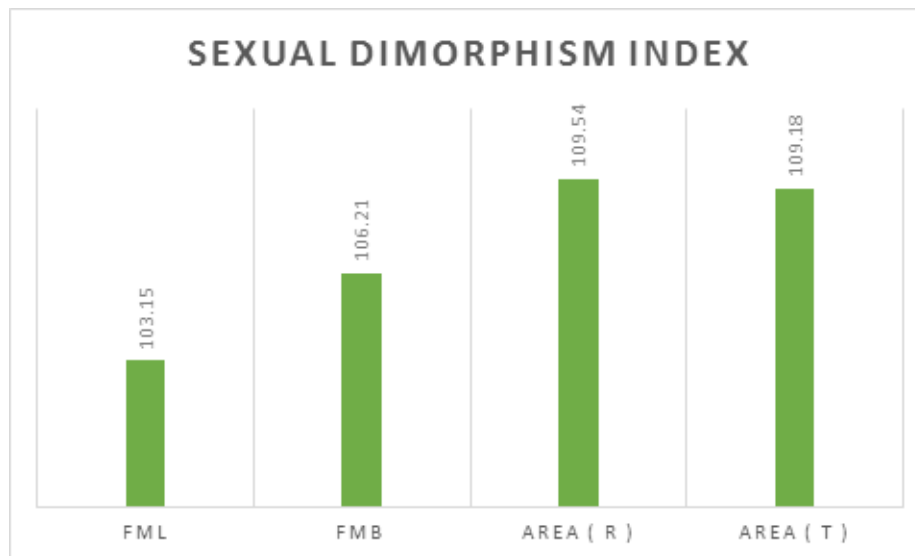
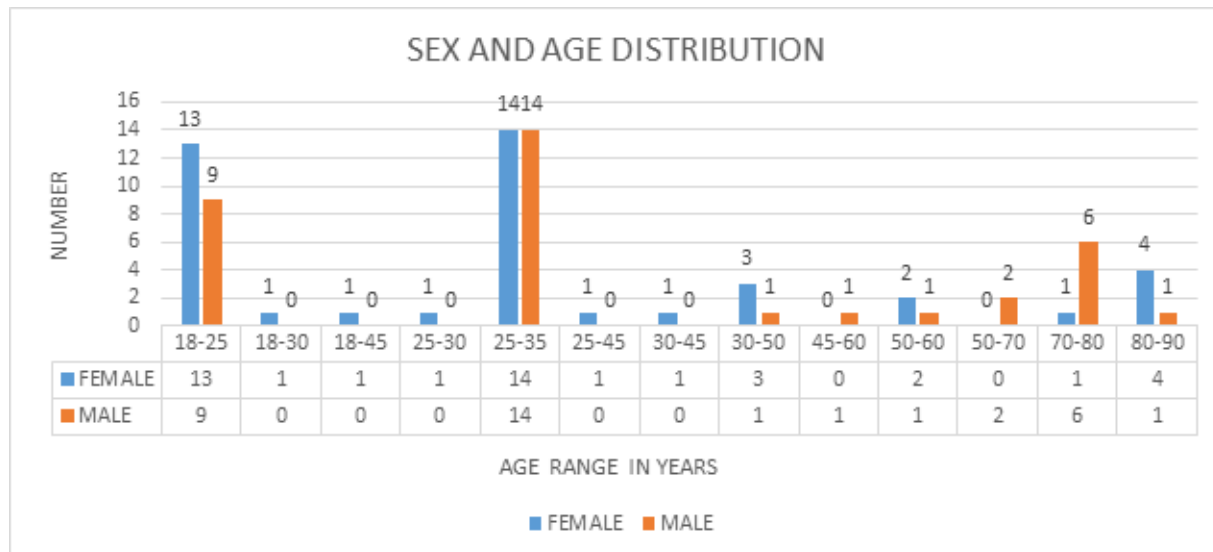
The present study was conducted in The Oxford Medical College, Hospital and Research Center (T.O.M.C.H & R.C), Bangalore (affiliated to Rajiv Gandhi University of Health Sciences). An approval was obtained from the Institutional Ethics Committee of T.O.M.C.H & R.C before conducting the study. Study sample included 77 dry human skulls preserved in the museums of Department of Forensic Medicine and Department of Anatomy in T.O.M.C.H & R.C. The sex and age of the skulls was assessed by morphological and sutural examination using data as described in literature¹ and all skulls were confirmed to be of adult age. All the samples were free from any fractures, deformity or damage.

The following dimensions of foramen magnum were measured using Vernier caliper and were graduated till the last 0.01cm.

Foramen magnum length (FML): The distance between Basion and Opisthion.

Foramen magnum breadth (FMB): The distance between the lateral margins of the foramen magnum at the point of greatest lateral curvature.

The data was tabulated in M.S Office 2013 Excel sheet and was analyzed statistically using SPSS (Statistical Package for Social Sciences) version 11.0 computer software (SPSS, Inc., Chicago, IL, USA). The area of foramen magnum (A) was calculated from the length and breadth of foramen magnum utilizing the formulae derived by Routal⁸ and Teixeira⁶. Male-female differences in measurements were tested using Student's t-test and statistical significance (p-value) was defined at $\alpha = 0.05$. Sexual Dimorphism Index was calculated to find the ability of each variable in sexing the skulls as; Mean Male value/ Mean Female value multiplied by 100.

**GRAPH 1:****GRAPH 2:****TABLE 1: DESCRIPTIVE STATISTICS: DIMENSIONS AND AREA OF FORAMEN MAGNUM**

	MALE (N=35)			FEMALE (N=42)				
	Mean	S.D	Range	Mean	S.D	Range	t-value	p-value
FML	3.368571	0.20871	2.94 - 3.8	3.265714	0.260863	2.8 - 3.92	1.883	0.064
FMB	2.826857	0.217604	2.22 - 3.34	2.661667	0.190608	2.49-2.78	3.55	0.001*
AREA (R)	7.48852	0.830576	5.81 – 9.29	6.836074	0.81971	5.32 – 8.61	3.457	0.001*
AREA (T)	7.558685	0.82607	5.92 – 9.29	6.923123	0.836323	5.43 – 8.63	3.339	0.001*

FML–Anteroposterior diameter (cm), FMB–Transverse diameter (cm), Area(R)–Area from Routil's formula, Area(T)–Area from Teixeira's formula, S.D. – Standard Deviation

Table 2: Logistic regression of breadth of foramen magnum

Variable	Gender		Odds ratio	p value
	Male(mean±SD)	Female(mean±SD)		
FMB	2.901±0.217	2.721±0.191	0.013	0.002

FMB–Transverse diameter (cm); Mean in cm; SD – Standard Deviation

Results

Graph 1 shows the values of sexual dimorphism index from which it is evident that area of the foramen magnum calculated using the formula derived by Routil and Teixeira are better predictors of sex when compared to the length and breadth of the foramen magnum. Graph 2 shows the sex and age distribution of the male and female skulls where in more number of skulls belonged to the female sex (42 female: 35 male) and the age distribution of skulls based on their osteological age showed maximum distribution in 25 to 35 age group followed by 18 to 25 age group. Table 1 shows the descriptive statistics for the length, breadth, and the area of the foramen in males and females. The length, breadth, and the area of foramen magnum are found to be larger in males than females. However, statistically significant sex differences were observed only for the breadth and areas of the foramen magnum. Table 2 shows the logistic regression of breadth of foramen magnum in which the odds ratio was found to be 0.013 which implies that for every 1 cm decrease in Foramen magnum breadth, the odds of the skull being a female is 0.013 (but since measurements are almost similar, clinically it will not be helpful).

Discussion

The first researcher who published his research on estimation of sex based on the size of foramen magnum was probably Teixeira⁶. In past, studies on estimation of sex from foramen magnum have been conducted on British³ explosions or violence. The basal region of the occipital bone is covered by a large volume of soft tissue and is therefore in a relatively well-protected anatomical position, and as such, classification of sex using the occipital bone may prove useful in cases of significantly disrupted remains. The aim of this paper is to evaluate

manually recorded morphometric variables of the region of the foramen magnum using both discriminant function analysis and linear regression. The skulls utilised in this study were selected from the eighteenth to nineteenth century documented skeletal collection of St. Bride's Church, Fleet Street, London. Adult human skulls n = 158 (male symbol82/female symbol76, Central European⁹ Turkish^{10,11} and Indian^{8,12–14} populations using different methodologies and statistical considerations. All the previous researchers have reported a larger size of foramen magnum in males compared to that of females. Our findings in this regard are consistent with that reported in the earlier studies^{6,8–14}. These studies however, have observed a varying degree of sexing accuracy from the dimensions of foramen magnum.

Our findings with regard to the sexing potential of foramen magnum dimensions found a statistically significant difference for breadth of the foramen magnum but the sexual dimorphism index and logistic regression for the same does not indicate a significant difference. Therefore, the authors are of the opinion that even though a statistically significant difference exists in the breadth of foramen magnum it is unlikely to be a good predictor in sexual dimorphism of foramen magnum. This finding is in agreement to studies reported by Gruber et al⁹ and other Indian^{8,12–14} studies who did not find any sexual dimorphism in the diameters of foramen magnum

The present research also reports a statistically significant sex differences in the area of foramen magnum as derived by formula given by Teixeira and Radinsky which is similar to that reported in earlier studies from different parts of the world^{3,10,14} explosions or violence. The basal region of the occipital bone is covered by a large volume of soft tissue and is therefore in a relatively well-protected anatomical position, and as such, classification of sex using the occipital bone may

prove useful in cases of significantly disrupted remains. The aim of this paper is to evaluate manually recorded morphometric variables of the region of the foramen magnum using both discriminant function analysis and linear regression. The skulls utilised in this study were selected from the eighteenth to nineteenth century documented skeletal collection of St. Bride's Church, Fleet Street, London. Adult human skulls n = 158 (male symbol82/female symbol76).

Though the differences in the observations of previous researchers are attributed to the variations in the study samples, methodology, and statistical analysis employed, most of the researchers are of the opinion that the dimensions of the foramen magnum and its area are not a very reliable indicator in estimation of sex of an unknown skull and thus, these should only be used as a corroborative finding

Conclusion

This study observes that out of all the parameters analyzed for sexual dimorphism of foramen magnum the area of the foramen magnum proves to be a better predictor of sex compared to other features. Also, it is to be noted that foramen magnum alone should not be considered for sexual differentiation unless the skull is mutilated and it should always be corroborated with other findings for better accuracy of achieving sexual dimorphism.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: obtained from Institutional Ethics Committee, The Oxford Medical College, Hospital and Research Center.

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Various Risk Factors Associated with Severity of Liver Disease in ALD Patients

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Abstract

Introduction: Excessive intake of alcohol becomes a major healthcare issue worldwide with consequences affecting socially, economically, and clinically and recorded 3.3 million deaths in 2012 (WHO 2014)²⁹. Heavy drinking over a long period of time damages almost every organ of the body especially liver.

Objective: To assess the various risk factors associated with severity of liver disease in ALD patients

Material and Method: There were 953 total subjects taken for study. They all were drinking alcohol, out of which 60 were diagnosed as ALD patients and they were further studied for various risk factors responsible for progression of ALD.

Results: Total 953 males drinking alcohol from minimum five years were studied. Out of the 953 drinkers, 60 were ALD patients (various degree of progression). None of the were taking any medicines since last 2 months. Anti-HCV and HBsAg were negative in all patients. Various risk factors were studied like average daily alcohol intake, duration of drinking, type of alcohol beverage and drinking habits etc. Daily alcohol consumption higher than 20gm and minimum for 5 years found to be significant with progression of ALD. It was also resulted that maximum subjects (38.61%) were drinking hard liquors followed by Beer (30.74%), Multiple alcohol beverage (20.25%) and wine (10.38%). 87.82% of the total subjects were drinking alcohol at meal time or with meals and the daily alcohol intake was significantly lower than that of the alcohol consumed at any time (means with and without meals) ($p < 0.05$).

Conclusion: The analyzed data highlights that ALD is a major and chronic health condition resulting from various risk factors which can be preventable.

Keywords: Alcoholics, Alcohol liver diseases (ALD), Risk factors, Alanine amino transferase (ALT), carbohydrate-deficient transferrin (CDT)

Introduction and Background:

Excessive intake of alcohol becomes a major healthcare issue worldwide with consequences affecting socially, economically, and clinically and recorded 3.3 million deaths in 2012 (WHO 2014)²⁹. Heavy drinking over a long period of time damages almost every organ

of the body. The primary site of ethanol metabolism is the liver, so excessive drinking leads to highest degree of tissue injury to the most sustainable organ of the body i.e. liver (Lieber 2000)¹³.

Presently, there is no specific biological marker which can be used to correlate the association between alcohol and the underlying cause of liver damage. But there are numerous laboratory parameters used clinically and shows the relation of chronic alcohol consumption and alcoholic liver damage. Certainly, the sensitivity of carbohydrate-deficient transferrin (CDT) and γ GT to evaluate the drinking of greater than 50 g per day is 69%

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and 73%, respectively. (Angulo 2002)¹.

Regular or heavy drinking at the early period of life enhances the risk of severe ALD development as compared to occasional or binge drinking habit. It has also found that some genetic factors are also responsible for the development of alcohol related disorders. But only few data support this comment. The available literature suggests that it is because of the changes that occurs in the genes which encodes or contain genetic codes for cytokines, inflammation causing mediators, antioxidant enzymes and the enzymes responsible for alcohol metabolism play a crucial role in the pathogenesis (Stewart 2002)²³, some of the latest study showed that the changes that occur in the polymorphism of TNF-238A^{23} and PNPLA3(protein (patatin-like phospholipase which contains protein 3 (Thurman 2000)²⁶ may affect the prognosis of alcoholic cirrhosis who takes alcohol but this data is not sufficient and may require more documented literature .ok or genetic mutations.

The prime factors which determines the progress of liver related disorders are the type of beverages consumed and the quantity and habit of drinking(e.g. outside mealtime).consumption of >40-80 gms of pure ethanol daily in case of males and around 30-40 gms daily by females for a long period is a common predictor for the diagnosis of more severe cases of alcohol related disorders like alcoholic steatohepatitis, fibrosis (Becker *et al.*, 1996)³.

It is documented that females are more prone to alcohol related liver disease. Higher blood alcohol concentrations in females than males ingesting the same amount of alcohol, resultant from a lower percentage of body water (Mumenthaler *et al.*, 1999)¹⁷. Other reports also showed that female hold a lesser capacity than a male to oxidize ethanol in the gut (Frezza *et al.*, 1990)⁷.

Age may be another risk factor responsible for the progression of ALD, but there is insufficient data on it. However, it is a predictor for ALD (Masson *et al.*, 2014)¹⁵, as old age (i.e. 65 and above) is more susceptible to ALD and show higher degree of ethanol-induced injuries than young age people (Meier and Seitz 2008)¹⁶. Other influential factors are specific genetic markers (i.e., single-nucleotide polymorphisms) that have identified by various studies associated by Genome-wide that shows the genes encoding alcohol-metabolizing

enzymes, cytokines, and antioxidant enzymes are linked to the advancement of ALD (Stickel & Hampe 2012)²⁴.

Dietary fat is a macronutrient and it is also the modifier for ALD. In rodents, dietary saturated fat appears to guard against alcohol-induced liver damage, whereas dietary unsaturated fat enriched in linoleic acid reportedly promotes such damage (Kirpich *et al.*, 2016)¹¹. Various population-based studies have showed a significant relationship between the risk of liver damage and alcohol consumption in people having body mass index greater than normal values (Ruhl & Everhart 2005)²⁰. Smoking is linked with higher risk of alcoholic cirrhosis in humans (Klatsky & Armstrong 1992)¹².

Alcohol-abused patients show the worsened conditions in the course of hepatitis C (HCV) and hepatitis B (HBV) viral infections, triggering fast development to fibrosis, cirrhosis, and even hepatocellular carcinoma (Szabo *et al.*, 2006)²⁵. Numerous common mechanisms of viral infection and alcohol-induced damage have been suggested (Zakhari 2013)³².

Material and Method

Study population:

Total 60 males suffering from ALD were taken to study the risk factors leading the progression of liver disease.

Inclusion criteria: Willing male patients having ALD were included.

Study design: Descriptive and cross- sectional study.

Tools used:

Questionnaire (both open and close ended) with interview schedule were used to know the risk factors affecting the patients.

Statistical analysis:

Statistical analysis was performed with SPSS 16 statistical package. A logistic-regression model was used in the multivariate modeling of associations. Odds ratios (ORs) and 95% confidence intervals (CI) were also calculated.

Results

Study Population: Total 953 patients, all males,

having alcohol from minimum five years age, were taken. Out of the 953 drinkers, 60 were ALD patient. None of the were taking any medicines since last 2 months. Anti-HCV and HBsAg were negative in all patients. Various risk factors were studied like average daily alcohol intake, duration of drinking, type of alcohol beverage and drinking habits etc.

Daily alcohol consumption and duration of drinking as risk factors for ALD:

Analysis of data investigated that daily alcohol consumption higher than 20gm is significant with progression of ALD and serve as a major risk factor for this condition (table 1). It was also found that the mean duration of drinking longer than 5 years also may

be the reason for ALD and it was found significant in results. Above this threshold, the OR for ALD increased proportionally with consumption of alcohol daily. The highest OR (10.68, $P<0.01$) occurred when daily consumption exceeded 160 gm/day. It was observed that when alcohol intake is at highest level, the percentage of ALD patients (18.7%), were significantly higher than that of the lowest level of alcohol intake having less than 20gm/day. Only those subjects were found to be suffering from ALD, whose daily alcohol consumption was above 20 gm and the duration was also above 5 years. So, it can be concluded that daily intake of 20 gm alcohol for 5 years is the risk threshold. In case of ALD patients who were drinking less than 20gm/day from 10-15 years (longer duration), the percentage of morbidity was very less i.e. 2.2% only.

Table 1: Average daily alcohol intake and duration of drinking

Alcohol intake	N	<5Yr	>=5-9Yr	>=10-14Yr	>=15-19Yr	>=20 Yr	Total	OR (95%CI)
(g/d)		197	220	175	107	254	953	
<20	585	0	1	2	4	6	13(2.2%)	-
>=20-39	163	1	1	4	4	8	18(11.4%)	5.43
>=40-79	112	1	4	3	2	5	15(13.5%)	7.02
>=80-159	57	1	2	1	1	3	8(14.6%)	8.24
>=160	36	0	1	1	1	3	6(18.7%)	10.68
Total	953	3(1.5%)	9(4.0%)	11(6.3%)	12(11.2%)	25(9.8%)	60(6.3%)	

$P<0.01$, vs group of alcohol intake <20g/d.

Type of alcohol beverage and drinking habits as risk factors for ALD:

In present study population, it was observed that maximum subjects (38.61%) were drinking hard liquors followed by Beer (30.74%), Multiple alcohol beverage (20.25%) and wine (10.38%). 87.82% of the total subjects were drinking alcohol at meal time or with meals and the daily alcohol intake was significantly lower than

that of the alcohol consumed at any time (means with and without meals) ($p<0.05$). It was also observed that the daily intake of hard liquor alcohol without meals was significantly higher than that of other categories of drinkers. Also, it was found that morbidity of ALD was much higher than that of drinkers who drink only wine or beer at mealtime. (Table 2)

Table 2: Type of alcoholic beverage and drinking habits.

With meals only			At any time					
Type of beverage	n (%)	Daily intake (g)	n (%)	Patients (%)	Daily intake (g)	n (%)	Patients (%)	X ²
Beer	293 (30.74%)	6.09±3.65	264 (90.10%)	1 (0.37%)	8.79±3.98	29 (9.89%)	0	
Wine	99 (10.38%)	10.69±5.28	88 (88.88%)	1 (1.13%)	18.67±8.90	11 (11.11%)	1 (9.01%)	-
Hard liquor	368 (38.61%)	44.97±14.90	312 (84.78%)	34 (10.89%)	66.89±20.49	56 (15.21%)	11 (19.64%)	5.43
Multiple	193 (20.25%)	29.50±12.0	173 (89.63%)	11 (6.35%)	42.68±13.32	20 (10.36%)	2 (10%)	7.02
Total	953 (100%)		837 (87.82%)	47 (5.07%)		116 (12.17%)	14 (12.06%)	8.24

P<0.05, vs Beer.

Discussions

Alcohol consumption is the major factor responsible for the progression of the chronic liver diseases (Crews; Rehm et al; Schuckit et al; (2003); Dal Maso 2002)^{4,19,21,6}. The natural history of ALD ranges from different stages from asymptomatic to end stage liver disease. Specific clinical features are mostly absent in patients with ALD (Vaquero *et al.*, 2003; Gordon 2001)^{27, 8}. The patients having different types of liver disease (fatty liver with alcoholic steatohepatitis, non-alcoholic fatty liver) without confirmatory lab tests, required the overall history of drinking pattern & habits, ultrasonography and liver biopsy (Skelly *et al.*, 2001; Angelico *et al.*, 2003; Jarque-López *et al.*, 2001; Hourigan *et al.*, 2001)^{22,2,10,9}.

Various factors are responsible for progression of ALD including genetic and others like age, gender, BMI, body weight & type, frequency and duration of alcohol intake. The habit of consuming hard liquors without meals or at any time is other major factor (Thurman; Walsh et al., 2000)^{26, 28}. Study revealed that, there is no enough data to describe the risk threshold in terms of regular alcohol consumption in relation with years of alcohol intake and it was also observed that there is a wide range exists between 30gm/day to 80gm/day (Gordon

2001)⁸. Geographic dissimilarities also included due to great difference between eastern and western countries (Stewart 2002; Naveau *et al.*, 2001)^{23, 18}.

In a study, the risk threshold of daily alcohol intake was 20 g; the duration was 5. Below the above-mentioned threshold, drinking rarely induced liver damage (Xiao et al., 2004)³¹. The present stud found same observations regarding risk factors of having daily alcohol consumption i.e. more than 20 g /day at least for 5 years. It was also found that the daily ingestion of alcohol more than 40 g and longer than 5 years, leads the liver damage easily. However, with a daily consumption more than 160 g, the frequency of alcoholic liver disease was only 18.7%. So, there is a significant difference in exposure among different individuals (Diehl 2002)⁵. It is normally believed that occurrence of ALD in general population is up to about 15% and increases with increased alcoholic consumption. One of the study showed the increased percentage due to only male patients in their study (Xiao et al., 2004)³¹. Same results are reported in present study. The forms of alcoholic drink and the different drinking and eating habits are closely related with ALD.

Conclusion

The present data concluded that the prevalence of alcoholic liver diseases is directly associated with the quantity of alcohol consumption and the frequency of alcohol. The dose related pattern and quantity of alcohol consumption also proves to be an important indicator for susceptibility to alcoholic liver. Consumption of hard liquors or multiple types of alcoholic drinks without food, in spite of the amount, is also related to increased incidence of alcohol-related liver diseases. In addition to above risk factors, there are many other factors involved like obesity, age, gender etc. Therefore, the study recommends to reduce the alcohol consumption, avoiding alcohol intake without meal times.

Conflict of Interest: None

Source of Funding: Self

Ethical Clearance: Ethical clearance were taken from hospital authorities, concerned doctor. Consent was also taken from individual patients.

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Study of Facial Index in Andhrapradesh Population

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Abstract

130 patients (65 males and 65 females) facial Index of adults aged between 18 to 25 Andhra Pradesh populations were studied. The maximum facial height divided with maximum Breadth of zygomatic arch and multiplied with 100. The instruments used for measurement were spreading caliper and sliding caliper. The mean value of facial index in adult males was 91.5cm (SD ± 05) and in females 88cm (SD ± 0.3) + test value was 8.2 and statistically highly significant ($P < 0.01$) The Obtained Facial Index was classifications leptoprosopic (In males 88 to 92.9 and in females 85 to 89.9.) This study of facial Index is quite useful to oral and maxillo facial surgeon to differentiate from congenital, under developed or post traumatized facial index, moreover this facial index has anthropological and medico –legal importance.

Key words: Spreading caliper, sliding caliper, Andhra Pradesh

Introduction

Study of facial Index has always has always has an interesting topic for anatomist, plastics surgeons, oral and maxillo facial surgeon and artist. Physical anthropologist have been measuring the skull for years and obtained the results enabled them to trace the relationship between the races as they believe that, the form of skull remain the same in each race and different facial index⁽¹⁾, the indices express the ratio of landmarks of an individual facial index is measurement related to the morpho-metric study of skull⁽²⁾, moreover age, sex, geographical representation can be studied from facial index⁽³⁾⁽⁴⁾. In addition to this congenital, post traumatic facial disfigures can be rectified by the maxillofacial surgeon with the help of regional facial Index. Hence attempt was made to the facial Index in both sexes of adults in Andhrapradesh to know the difference between genders and compare with North Indian and Abroad Facial indices

Material and Method

65 males 65 females of adult healthy volunteers

aged between 18-25 were selected for study. The facial Index was studied with help of spreading caliper and sliding caliper

$$\text{Facial Index} = \frac{\text{Facial height}}{\text{Breadth of zygomatic arch}} \times 100$$

Facial measurement were as under

1-Nasion = point at the nasal root intersected by mid sagittal plane Nasal root is the depression of the nose but at the naso frontal suture which can be felt by slightly probing the root of the nose

2- Gnathion – It is the lowest point on the lower margin of lower jaw intersected by the mid-sagittal plane. This point can be palpated on the lower jaw slightly another to chin

3-Zygion –It is the most laterally placed point on zygomatic arch

4-Total Facial Height –It measure the straight distance between Nasion to Gnathion (measured by sliding caliper)

5- Breadth of Bizygomatic Arch –It measure straight distance between two zygion (measured by spreading caliper). The facial Index of the both sexes was studied and compared statistically. The duration of study was

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about two years

Observation and Results

Table-1 Comparative study of Facial Index between both sexes mean value of facial Index in males was 91.5 cm(SD=0.5) and in mean value in females was 88 cm (SD $\pm$ 0.3) of test value was 8.2 value was highly signification ($P < 0.01$) statistically

Table-2 Classification of facial Index anthropologically. The present obtained values of Facial Index was classified into leptoprosopic (Males 88 to 92.9 and females 85 to 89.9)

Table-3 Comparison of present value of facial index values with previous studied ethnic groups of India and Abroad.

Discussion

In the present study of facial Index in Andhra Pradesh population mean value of Facial Index in males adult was 91.5cm (SD $\pm$ 0.5) and in females adult was 88 cm (SD $\pm$ 0.3) and 't' test + value was 8.2 and statically highly significant ($P < 0.01$) (Table-1) and obtained value of facial Index was classified as leptoprosopic in both sexes in males 88 to 92-9cm and in females 85 to 89-9cm (Table-2) These finding were more or less in agreement with previous studies⁽⁵⁾⁽⁶⁾⁽⁷⁾.

The study of sexual dimorphism is an important concern for the forensic anthropologist as it is a key to

individual identification; Assessing sexual dimorphism eliminates approximately half of the population from further consideration in cases of missing persons or unknown identity. Many morphological differences are sex is specific. The specificity is due to genetic factors, nutritional growth and habitat ⁽⁸⁾. This difference leads to ethnic determination.

In North Indian and Punjab population has mesoprosopic facial Index this variation is due to migration of Iran population to India⁽⁹⁾ and west Bengal population has eurysopic type of facial Index and Andman Nicobar population has hypereuryprosopic type of facial Index ⁽¹⁰⁾. These variations in the facial Index represents various ethnic origins migrated to India.

Summary and Conclusion

The present study of Facial Index in both sexes of adults Andhra Pradesh population which has leptoprosopic Facial Index. This Index is of great importance in medico legal anthropological and oral maxillofacial surgery, but this study demands further genetic anthropological nutritional study because as bony skull is mesodermal origin and bone is most plastic tissue which adopts with environmental, nutritional status.

This research work is approved by ethical committee of Nimra institute of medical Sciences Ibrahimpatnam Jupudi Vijayawada Andhrapradesh – 521456

Table-1: Comparative study of Facial Index in both sexes Male-65, Female-65

Sl.No	Particulars	Male Facial Index	Female Facial Index
1	Mean Value	91.5	88.1
2	SD	0.5	0.3
3	Test statistic	t=8.2	P<0.01

Male Facial Index in more than female facial Index is highly significant ($P < 0.01$)

Table-2: Classification of Facial Index

Sl. No	Facial Type	Rase of Index	
		Male	Female
1	Hypereuryprosopic	78.9	76.9
2	Eury prosopic	79 to 83.9	77 to 80.9
3	Meso Prosopic	84 to 87.9	81 to 84.9
4	Lepto prosopic	88 to 92.9	85 to 89.9
5	Hyperlepto prosopic	93	90.-

In the present study of Andhra Pradesh male facial 91.5cm (SD $\pm$ 0.5) and female 88.1cm (SD $\pm$ 0.3) belong to leptoprosopic

Table-3: Present study of Facial Index in both sexes is compared with previous studies

Sl. No	Author & Year	Ethnic Groups	Male Facial Index	Female Facial Index
1	Mahesh Kumar -2013	Hariyanvi	68.09	84.84
2	Zohre abatabae- 2010	Yazd	108.3	106.9
3	Agron Rexhepi-2008	Kosov	90.38	90.27
4	Vaishali Shetti -2011	a)North Indian b) Malaysian	87.19 87.71	86.75 85.72
5	Present Study -2018	South Indian	91.5	88.1

The present study findings were more less in agreement with previous study

No Conflict of Interest

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An Analysis of Socio-Economic Profile of Working Professionals in Chennai, Tamil Nadu, South India

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Abstract

To know the socio-economic profile of working professionals in Chennai, Tamil Nadu, South India, were collected with structured format among 500 working professionals in all type of categories. The data were collected during the period 2017-18 and have been reviewed. In order to understand the socio-economic profile of working professionals, the frequency and percentage have been analyzed according to their need. The socio-economic profile of professionals was analyzed and the results are showed.

Keyword: Working Professionals, Urban, Sub-Urban, Semi-Urban, Socio-Economic Profile.

Introduction

India is one of the growing countries in this world; In the past five years, there has been a 70 per cent increase in specialized analytic professionals in all streams; whereas India has shown a higher growth at 77 per cent according to “The Rise of Analytics in HR; An era of Talent Intelligence” report published by LinkedIn. As per the review the professionals are doing excellence service do developing the country with their excellence. To know the socio-economic of profile of working professionals in Chennai, Tamil Nadu, South India, were collected with structured format among 500 working professionals. This paper were analysis the socio-economic of professionals and more impact of professionals such as gender wise, age, type of professionals, marital status, monthly income, work experience and their location.

Professionals

A professional is a member of a profession or any person who earns their living from a specified professional activity. The term also describes the standards of education and training that prepare members

of the profession with the particular knowledge and skills necessary to perform their specific role with that profession. In addition, most professionals are subject to strict codes of conduct, enshrining rigorous ethical and moral obligations.¹ Professional standards of practice and ethics for a particular field are typically agreed upon and maintained through widely recognized professional associations, such as IEEE.² Some definitions of “professional” limit this term to that profession that serves some important aspect of public interest³ and the general good of society.^{4,5} In some cultures, the term is used as shorthand to describe a particular social stratum of well-educated workers who enjoy considerable work autonomy and who are commonly engaged in creative and intellectually challenging work.^{6,7,8} Webster’s Dictionary defines amateur in one sense as “one that engages in a particular pursuit, study, or science as a pastime rather than as a professional”.⁹

DESIGN: Sampling procedure: Among the different cities in Tamil Nadu, the Chennai city has been considered for analysis since it’s a metropolitan hi-tech city in India. Here the analysis almost 500 professionals have been reviewed. The data was collected during the period 2017-18. **Analytical Framework:** In order to understand the socio-economic profile of working professionals, the frequency and percentage analysis have been carried out. **The socio-economic professionals were analyzed as following:** Gender, Age, Type of

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professionals, Marital status, monthly income, work experience, and Location.

Analysis

The socio-economic profile of professionals was analyzed and the results are hereunder presented in Table 1.

Table 1: Gender, Age, Type of Professions, Marital Status wise Distribution among working professionals:

Particulars	Classifications	Number among working professionals	Per cent
Gender	Male	285	57.00
	Female	215	43.00
	Total	500	100.00
Age	15 - 25 years	49	9.80
	25 – 35 years	92	18.40
	35 – 45 years	216	43.20
	45 – 55 years	106	21.20
	Above 55 years	37	7.40
	Total	500	100.00
Type of Professionals	Health care	66	13.20
	Engineering	146	29.20
	Software	140	28.00
	Teaching	45	9.00
	Self employed	78	15.60
	Others	25	5.00
	Total	500	100.00
Marital Status	Unmarried	82	16.40
	Married	418	83.60
	Total	500	100.00

GENDER: The gender wise distribution of professionals was analyzed and the result has been presented in Table 1. The results show 57.00% of professionals are males, while, the rest of 43.00% of professionals are females. It is inferred that the majority of the professionals are males.

AGE: The age wise distribution of professionals was analyzed and the result has been presented in Table 1. The results 43.20 % of professionals the age group

belongs 35 – 45 years followed by 45 – 55 years (21.20 %), 25 – 35 years (18.40 %), 15 - 25 years (9.80 %) and above 55 years (7.40 %). It reveals that the most of the professionals belong to the 35 – 45 years age group.

TYPE OF PROFESSION: The type of profession wise distribution of professionals was analysed and the result has been presented in Table 1. It is observed that 29.20 % of professionals are Engineers followed by IT (28.00 %), Self Employed (15.60 %), Health care

professionals (13.20 %), Teachers (9.00 %) and Others (5.00 %). It is inferred that the majority of the professionals are Engineers.

MARITAL STATUS: The marital status wise distribution of professionals was analyzed and the result has been presented in Table 1. It is clear that about 83.60 % of professionals are married, while, the rest of 16.40 % of professionals are unmarried. It reveals that the most of the professionals are married.

Table 2: Monthly Income, Work Experience and Location wise Distribution among working professionals:

Particulars	Classifications	Number among working professionals	Per cent
Monthly Income	Less than Rs. 20,000	30	6.00
	Rs.20,000 – 30,000	20	4.00
	Rs.30,000 – 40,000	118	23.60
	Rs.40,000 – 50,000	208	41.60
	More than Rs. 50,000	124	24.80
	Total	500	100.00
Work Experience	Below 5 years	83	16.60
	5 – 10 years	68	13.60
	10 – 15 years	206	41.20
	15 – 20 years	59	11.80
	Above 20 years	84	16.80
	Total	500	100.00
Location	Urban	218	43.60
	Semi Urban	125	25.00
	Sub Urban	157	31.40
	Total	500	100.00

MONTHLY INCOME: The monthly income wise distribution of professionals was analyzed and the result has been presented in Table 2. It is apparent that about 41.60 % of professionals belong to the monthly income group of Rs.40,000 – 50,000 followed by more than Rs. 50000(24.80 %), Rs.30,000 – 40,000(23.60 %), less than Rs. 20000(6.00 %) and Rs.20,000 – 30,000(4.00 %). It is inferred that the majority of the professionals belong to the monthly income group of Rs.40,000 – 50,000.

WORK EXPERIENCE: The work experience wise distribution of professionals was analyzed and the result has been presented in Table 2. The results show

that 41.20 % of professionals have work experience of 10 – 15 years followed by above 20 years (16.80 %), below five years (16.60 %), 5 – 10 years (13.60 %) and 15 – 20 years (11.80 %). It reveals that the most of the professionals have work experience of 10 – 15 years.

LOCATION: The location wise distribution of professionals was analyzed and the result has been presented in Table 2. The results indicate that 43.60 % of professionals are located in urban area followed by sub urban area (31.40 %) and semi urban area (25.00 %). It is inferred that the majority of the professionals are located in urban area.

Results and Discussion

From the data analysis the following information were found and carried. More than half of (57.00 per cent) professionals are males. More than two fifth of (43.20 per cent) professionals are in the age group of 35 – 45 years. Nearly one third of (29.20 per cent) professionals are engineers. More than four fifth of (83.60 per cent) professionals are married. More than two fifth of (41.60 per cent) professionals are in the monthly income group of Rs.40,000 – 50,000. More than two fifth of (41.20 per cent) professionals have work experience of 10 – 15 years. More than two fifth of (43.60 per cent) professionals are located in urban area.

Conclusion

The above results indicate that the majority of working professionals are males and most of the working professionals belong to the age group of 35 – 45 years. Majority of the working professionals are engineers and most of the working professionals are married. Majority of the working professionals belong to the monthly income group of Rs.40,000 – 50,000 and most of the working professionals have work experience of 10 – 15 years. Majority of the working professionals are located in urban area

Ethical Clearance: Taken from committee.

Source of Funding: Self

Conflict of Interest: Nil

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Cheiloscopy in Transgenders

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Abstract

Most transgenders in India reside in secluded or in outskirts of society with very low status; they are often addressed in a very derogatory manner by the society. The Indian sub-continent displays a variety of studies undertaken by the cheiloscopic experts and most researchers could differentiate the two genders due to their characteristic lip pattern. Many of them carried out double blind study in order to identify the gender on the basis of lip-patterns identified by them. But the “third gender” was left out and never taken into consideration.

Present cheiloscopic study throws light on various lip-patterns present in them and whether they have characteristic patterns. The paper also reviews the relevance of various studies undertaken in Indian Subcontinent, social problems existing in transgenders and further explains cheiloscopic relevance in forensics

Keywords: transgender, eunuchs, lip-prints, cheiloscopy, Suzuki's classification

Introduction & Background

Magnus Hirschfeld (1868-1935) the famous German sexologist had coined the words transvestites and transsexuals at the beginning of the 20th century. Virginia Prince coined the word transgenderism which includes both transsexualism and transvestism ^[1] Transgenders, in general are genetically, biologically and physiologically men who may or may not have undergone sex-change surgeries or self-inflicted castration. They are also called eunuchs, transgenders, transsexuals and transvestites in English and colloquially hijras, alis, kothis, double deckers and panthis in India ^[2,3]. In India they are considered as the “third gender,” - neither male nor female. As quoted by Saxena et al., in their article, eunuchs are physiological males who have a feminine gender identity, adopt feminine gender roles and wear women's clothing^[4]. Hence, a eunuch (noun/Greek: Eunoukhos) is defined as a man who has been castrated (especially in the past), and is employed

to guard the women's living areas at an oriental court^[5] A transgender (adjective) relates to people who have a sexual identity that is neither clearly male nor clearly female or relating to or being a person (as a transsexual or transvestite) who identifies with or expresses a gender identity that differs from the one that corresponds to the person's sex at birth^[6]

Scenario of Transgenders in India: Most transgenders in India reside in secluded or on outskirts of society with very low status; they are often addressed in a very in a very derogatory manner by the society. The Indian lawyer and author Rajesh Talwar has written a book highlighting the human rights abuses suffered by the community titled, ‘The Third Sex and Human Rights ^[7]. Few employment opportunities are available to them.

In 2014, Justice KS Radhakrishnan ^[8] declared transgender to be the third gender in Indian law, in a case brought by the National Legal Services Authority (Nalsa) against Union of India and others. The ruling said: *Seldom, our society realises or cares to realize the trauma, agony and pain which the members of Transgender community undergo, nor appreciates the innate feelings of the members of the Transgender*

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community, especially of those whose mind and body disown their biological sex. Our society often ridicules and abuses the Transgender community and in public places like railway stations, bus stands, schools, workplaces, malls, theatres, hospitals, they are sidelined and treated as untouchables, forgetting the fact that the moral failure lies in the society's unwillingness to contain or embrace different gender identities and expressions, a mindset which we have to change.

Justice Radhakrishnan ^[9] also mentioned that transgender people should be treated consistently with other minorities under the law, enabling them to access jobs, healthcare and education. He framed the issue as one of human rights, saying that, "These TGs, even though insignificant in numbers, are still human beings and therefore they have every right to enjoy their human rights", concluding by declaring that:

*Hijras, Eunuchs, apart from binary gender, be treated as "third gender" for the purpose of safeguarding their rights under Part III of our Constitution and the laws made by the Parliament and the State Legislature.

*Transgender persons' right to decide their self-identified gender is also upheld and the Centre and State Governments are directed to grant legal recognition of their gender identity such as male, female or as third gender.

Sensitized by all the above landmark orders to protect this sect, we decided to carry out a cheiloscopy study of this particular population.

Studies on lip-prints: Cheiloscopy was first suggested in 1950 and studies were carried out on lip prints in 1960's and early 1970's. Lip-print identification has been utilized in court and last 20 years has seen lot of research all over world attempted in the field of forensics. ^[10, 11, 12, 13, 14, 15, 16,17, 18, 19, 20]. Most of the studies were based on Suzuki's Classification, though few of them described as wrinkles/grooves with their peculiar shapes. It did show a property of uniqueness and did not change over the life-span of an individual, thus beholding a potential for personal identification similar to the finger-prints. The studies appeared to be popular as it was non-invasive to procure the prints from the lip. The prints obtained could be identified and classified with great ease using a magnifying lens. Many studies were carried out to evaluate intra-researcher difference of opinion too. The studies generated great interest that a study undertaken to evaluate the differences of lip prints even in uniovular twins ^[20].

Some of them took up studies to distinguish between the males and females in a given population. Studies carried out for gender determination among the Indians which are expressed in Table 1.

Table 1: Showing the studies done in Indian sub-continent to differentiate gender with cheiloscopy:

Researcher	Year	Population of study	Pattern Dominant in females ♀	Pattern dominant in males ♂
Sivapathasundaram ^[21]	2001	Tamil Nadu	Type III	Type III
Manipady ^[22]	2001	Karnataka	Type II	Type II
Vahanwala et al ^[23]	2005	Maharashtra	Type II	Type III
Gondivkar ^[24]	2009	Maharashtra	Type II	Type III
Sharma P et al ^[25]	2009	Uttar Pradesh	Type I Type I'	Type IV
Verghese A.J. et al ^[26]	2010	Kerala	Type IV	Type IV
S.Patel, Ish Paul ^[27]	2010	Rajasthan	Type II	Type I
Rohit M et ^[28]	2011	Uttar Pradesh	Type I Type I'	Type IV Type V
P.Rastogi ^[29]	2013	Mangalore	Type I Type I'	Type II, III, IV, Type V
Dongarwar et al ^[30]	2013	Maharashtra	Type I Type I'	Type IV Type V
Koneru A ^[31]	2013	Kerala & Manipuri	Type I Type I'	Type IV Type V

Cont... Table 1: Showing the studies done in Indian sub-continent to differentiate gender with cheiloscopy:

M.Kinra, Ramalingam ^[32]	2014	Rajasthan	Type I Type I' Type II	Type III Type IV
Kaul Rachna ^[33]	2015	Karnataka	Type I	Type I
S.Bharathi et al ^[34]	2015	Tamil Nadu	Type I A	Type II
P Kesarwani ^[35]	2017	Hazaribagh	Type I Type I'	Type IV Type V

The Indian sub-continent displays a variety of studies undertaken by the cheiloscopy experts. Table I, as marked in colored boxes reveals that most researchers could differentiate the two genders due to their characteristic lip pattern. Many of them carried out double blind study in order to identify the gender on the basis of lip-patterns identified by them. But the “third gender” was left out and never taken into consideration. Since various Bills have been provided for the establishment of welfare boards at the Centre and state level and for transgender Rights Courts- we have to accept these individuals as part and parcel of our society and hence studies need to be done on them. Using the lip-print pattern for identification of a person is one of the unique practices that can be used as a weapon for personal identification of an individual, have unique pattern combinations and do not change during the life of a person. The present study is an attempt to identify the dominant patterns on the basis of Suzuki's Classification, seen in the transgender population. Inclusion of this sect in our population study will give a proper direction in the field of forensics.

Aims and Objectives:

1. To classify the obtained lip-prints according to Suzuki's classification.
2. To identify which type is pre-dominant among this population.
3. To gauge whether they have patterns more like males or more like females.
4. To estimate whether cheiloscopy proves to be a tool for identification of this population

Materials and Method

Fifty self-identified eunuchs residing in the city Mumbai and Navi Mumbai were a part of this study. The lip-prints were acquired by dabbing a cellophane tape

against the lips which were applied with glossy, single-use lipstick which was bright color. Care was taken no lesion active or passive were present in the vicinity of the lips. The lip-prints on cellophane tape, was then stuck to a bond paper to facilitate analysis. Each pattern was evaluated using magnifying lens quadrant-wise by two observers, so that no pattern is missed out. Suzuki's Classification adopted by most researchers was used by us to assign the type of lip pattern.

Observation and Results: Fifty evaluated lip-patterns analyzed using Suzuki's classification revealed:

LIP PATTERNS IN TRANSGENDER POPULATION

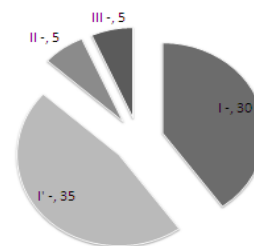


Figure1:

Figure1 shows vertical complete and incomplete grooves, Type I and I' were commonly observed in the upper anterior region i.e. in first and second quadrant which were distinctly identified [60%]. Type II was observed commonly in the second quadrant occurred sparingly [5%]. Type IV was not observed at all. Some patterns were confusing as the observer many times could not differentiate between two lip-patterns- the type could not be ascertained

Other than the lip-prints it was observed that this population thrive in very poor conditions, may contract various diseases due to varied sexual practices and poor means to sustain a decent livelihood. The oral hygiene

was in general poor. Most of them had stained teeth and reported of drug, tobacco or alcohol abuse.

Discussion

Contemporarily the Government of India introduced so many welfare policy and schemes such as census, documentation, issuing of the citizenship ID Cards, issuing passports, socio-economical development and constitutional safeguards for the transgender people. The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) is a major initiative of the 11th Five Year Plan period which brought employment opportunities for transgender people. The Ministry of Housing and Urban Poverty Alleviation takes care of the National Urban Livelihood Mission and Healthcare facilities for them. The social, economic, political transformation, housing, legal measures, police reforms, legal and constitutional safeguards to prevent human rights violations of the transgender community and institutional mechanisms to address specific concerns of transgender individuals.

The effects of their lifestyle on various dental diseases such as dental caries and periodontal disease can be studied. Such studies would provide baseline data on which the government can implement future plans to improve their oral health in particular and their general well-being. In the present study, I and I' were common lip-patterns observed. Type II was observed sparingly, but in the lower lip. Type IV was not observed at all. Vahanwala S.P. et al ^[23] observed that the patterns dominant in female are Type I, I' and II. Type III is the signature pattern observed in males. On the whole, male patterns are complicated and one can make an error or stay undecided about the gender determination by cheiloscopy method. Hence the result is expressed as such. Observing the Table I closely, most researchers have identified Type I and I' as the commonly occurring pattern in the population. Maximum studies reveal that the patterns are such that the genders can be gauged by assessing the lip pattern types

In forensic science, the effect of their sexual behavior on oral tissues, their past violent experiences, trauma and injuries in relation to their face and oral cavity could be investigated. Peeran & Ramalingam^[36] have expressed that: Being a eunuch is a dispositionally acquired characteristic behavioral pattern seen uncommonly in biologically born men much later in their lives. To the

best of our knowledge, no true transgender survives. Hence, the comparison of genetic characteristics such as rugae patterns, finger prints, or lip prints among men and eunuchs-castrated men or men who behave in a feminine way does not have a scientific rationale, as both are physiologically men in nature. The present study suggests that the transgender population has to be still studied in depth with a greater sample size.

Conclusion

The patterns in cheiloscopy sometimes mimic each type which may lead to allocating a wrong pattern to the groove. The combination occurring in each region appears to be unique and at the same time the inter-pattern distance would vary. All these parameters make the theory of uniqueness make Cheiloscopy crucial in forensics. The present study carried out on transgender population shows that they do not show any unique pattern from others. Comparative evaluation of rugae patterns, finger prints, or lip prints among men and eunuchs-castrated men or men who behave in a feminine way does not have a scientific rationale since both are physiologically men and hence showed Type I and I' predominant in nature.

Conflict of Interest- NIL

Source of Funding - Self-funded.

Ethical Clearance – Taken from Institutional Review Board.

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Original Article

Pattern and Prevalence of Congenital Malformation of fetus- Autopsy Based Study in BTGH (Basaweshwara Teaching and General Hospital) Mahadevappa Rampure Medical College(MRMCK). Kalaburgi. From Jan 2016- Jan 2017

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Abstract

Introduction: Autopsy is an important aspect of clinical service, providing clinicians with critical feedback regarding diagnostic accuracy, therapeutic efficacy, and medical complication¹

Among the Dravidian populations of the four southern states of India, Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu, consanguineous marriages are⁵ strongly favored which is one of the known cause of congenital malformation. Congenital malformation is emerging as an important component in the perinatal mortality and morbidity with considerable repercussion on the families' affected. Early diagnosis of life threatening congenital malformation can pave the way for surgical correction or palliation of these infants¹.

Material and Method : We studied 217 cases of fetal autopsies from January 2016 to January 2017 duration of one-year retrospective study. Purpose of study is pathological and legal correlation in aspect of M: F ratio, age of termination of pregnancy, fetal anomalies & its pattern in Btgh Mrmck.Karnataka.

Results: Total fetal autopsies done are 217, out of which 51 are anomalous. Among them 22 are male and 28 are female babies and 1 sex is not determined {ambiguous}. In our study M: F ratio is 1:1.35. Most common cause of death found in autopsy examination is meconium aspiration in male fetus and placental insufficiency in female fetus. And mean age of gestation is 29 week and 30 weeks resp. Mean age of the mother is 29 years.

Conclusion: Fetal autopsies provide us an important information about pattern of anomalies, their incidence and cause of death in relation with sex and age of fetus, maternal age, along with socio-economic status. Legal implications regarding fetal autopsies is still a field of interest.

Keywords – *Fetal autopsy, fetal anomalies, Legal aspects.*

Introduction

Fetal autopsy includes external, internal and histo-pathological examination of dead fetus along with placental examination².

There are **two types** of fetal autopsy.

1. Medico-legal autopsy
2. Academic autopsy

Medico legal Autopsy –

Is conducted on requisition of police under section Crpc -174 to know the cause of death, age, sex and

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viability of fetus for which police inquest & panchnama is required²

Academic Autopsy / Clinico-pathological Autopsy

Is conducted on request of obstetrician, pediatrician, radiologist or family members of fetus to know the cause of congenital malformation and cause of repeated abortions, where in the detail pre and postnatal history of mother and consent of parent /relative with the collaboration of concerned department is necessary².

In our study we conducted 217 fetal autopsies to rule out cause of death and associated anomalies which is helpful in future family planning for couples and improvement of management of anomalous babies

Etiological diagnosis in unexplained fetal deaths is possible with detailed evaluation of fetus. Fetal autopsy is confirmative in 28.6-89%, diagnostic in 10-38%; it provided additional information in 3.9-24% cases; it changed the predicted probability in 18% cases in addition, the data pertaining to demography, socio-economic status, and maternal health is helpful to pinpoint the factors behind the occurrence of fetal loss. At the Census of India conducted in 1981, the combined population of the four southern states exceeded 164 million, and consanguineous marriages are also common in the contiguous portion of Maharashtra.⁷

Congenital anomalies were estimated to be the fifth largest cause of neonatal deaths in India after preterm births (34.7%), intrapartum complications (19.6%), pneumonia (16.3%) and neonatal sepsis (15%) Despite this ranking, in absolute numbers, congenital anomalies were estimated to contribute to 60699 neonatal deaths in India in 2013, which accounted for the highest global burden of neonatal mortality due to congenital anomalies India lacks national birth defects surveillance, indicating that there is no data on the magnitude of congenital anomalies in the country.^{7,8} Thus, systematic data on the magnitude of congenital anomalies, the most prevalent types of congenital anomalies, their healthcare impact and their impact on neonatal health are required, especially as India has announced a program for the management of children born with selected birth defects like cleft palate lips etc.

Material and Method

We studied 217 cases. The present study of congenital anomalies in fetal and neonatal deaths was done at Mrmk. Study conducted over a time period of 1 year from January 2016 to January 2017. Consent for autopsy in requested compassionately, respectfully and was fully informed. Autopsy was within the scope of the autopsy permit and all the legal requirements are met before it is conducted. The autopsy protocol was including space for recording specific measurements and norms for particular gestational ages.

Measurements:

The crown head length (CHL) and crown rump (CRL) length determined to the nearest 0.5 cm. Chest and abdominal circumferences were taken at the level of the nipple and umbilicus resp. Both limb measurement taken. The distances between the inner canthi and outer canthi, nasal height and width, philtrum height, mouth width and ear length are obtained and compared with published norms. All major organs weighed Photographs were taken

Inclusion and exclusion criteria:

The present study included dead fetus and neonates with gestational age 18 to 40 weeks of intra uterine life. All fetuses of gestational age <12 weeks and all neonates above 7 days of age were excluded from the study. Autopsy were performed by standard technique adopted by Edith L. Potter.

External examination

Done for inspection of cyanosis, injuries and maceration, skin lesions, all major and minor developmental anomalies. The Y shaped incision was taken. Umbilical vein examined for signs of inflammation, vernix, rupture (or) thrombus. The two umbilical arteries are examined and inspected in their entirety. The arteries and urachus examined for patency and arteries for hemorrhage (or) thrombosis. Single umbilical artery was an important anomaly noted. The autopsy protocol included the removal of thoracic, cervical, abdominal and pelvic organs en block and subsequently dissected into organ blocks³.

Internal examination:

All internal organs position and size and weight

were noted. The internal genitalia are inspected. As the testis will be undescended in younger fetuses, are removed with abdominal contents. Prior to opening of the pleural cavities the possibility of pneumothorax is ruled out. on entering the chest each cavity inspected for fluid. each lung was examined for developmental changes carefully. The integrity and tension of the pericardium are ascertained and the pericardial cavity is looked for the presence of free gas (or) fluid and fibrinous deposition. Heart examined in situ. All major veins and arteries examined. The diagnosis of premature closure of foramen ovale if any are noted. The configuration of tricuspid valve, right ventricle, and main pulmonary artery were studied. The endocardium, myocardium, and configuration of trabeculae, pectinate and papillary muscles and chordae tendineae were examined. After opening the left part of heart, the interior of the left atrium³pulmonary venous orifices, mitral valve and left ventricle were inspected, followed by examination of the aortic valve and ascending aorta. Neck structures trachea and esophagus were examined. The scalp, fontanels, and cranial sutures were examined by palpation and changes documented. The fontanels, sutures, and glia were examined and changes documented. brain examined in situ. Then the brain was removed and examined and placed in fixative. Attention to the cranial base and dural sinuses was given³

Dissecting the viscera

Examination begins with the most posterior structures and moved anteriorly layer by layer. Aorta, inferior vena cava, adrenal glands and posterior surface of the urinary system exposed and examined. Adrenal glands, kidneys, ureters and urinary bladder are examined. The vagina and uterus are opened in the anterior midline and examined. The liver, gallbladder and structures of the porta hepatis, portal vein, hepatic artery and common bile duct are identified and dissected as indicated³.

The esophagus was opened in the posterior midline while intact with trachea. In this way a trachea-esophageal fistula can be identified and opened. Next the incision carried into the stomach. After major hilar structures of the lungs have been opened and inspected, attention was given to the lungs. Lobation and condition of the visceral pleura were presumably ascertained. In case of bladder outlet obstruction, the entire urethra is examined for posterior urethral valves (or) other abnormalities (i.e., anterior urethral valves, mega urethra). Placenta was

available in only few cases³.

Histo-pathological examination:

The organs after evisceration and external examination were fixed in 10% formalin. Blocks of tissues for microscopic examination were taken, one block from each lobe of both lungs. One block each from thymus, heart, stomach, liver, spleen, pancreas, small intestine, large intestine, kidneys, adrenals, and any doubtful lesions were taken. Sections were studied in the routine way with Hematoxylin and Eosin (H&E) stains. Special stains were done whenever necessary and studied. Autopsy findings were compared with ultrasound findings whenever available

Results

Table.-1. Percentage of fetal deaths (FD) early neonatal death (ND).

Classification	No of cases	Percentage (%)
Fetal Death (FD)	213	98
Neonatal death (ND)	04	02
Total	217	

Table. – 2. Relation of maternal age (yrs.) with No of Fetal/Neonatal deaths.

Maternal age (yrs.)	Fetal death	Neonatal death
No	No %	No %
19	3 1.38	
20 – 24	99 45.6	
25 – 29	81 37.3	3 1.38
30 – 34	23 10.5	1 0.5
35 – 39	07 3.22	
Total	213	

Table – 3. External and Internal congenital anomalies.

External congenital anomalies System affected	Type of anomaly	No	%
Neural and Spinal malformation.	Anencephaly	5	28
	Omphalocele	1	5.5
	Meningocele	5	28
	Hydrocephalous	2	11
	Acephalous	1	5.5
Lymphatic system	Hamartoma nape of neck	1	5.5
Skeletal system	Achondroplasia	2	11
Circulatory system	Single umbilical artery	1	5.5
Total		18	
Internal congenital anomalies.			
Respiratory system	Atelectasis of lungs	5	33
Genitourinary system	Polycystic kidney	2	13
Cardiac system	Tetralogy of Fallot	1	6.6
	Hypo-plastic heart	1	6.6
Others	Diaphragmatic hernia	6	40
Total		15	

Table 4 - Fetal anomaly pattern according to sex distribution: In male fetus-22 cases (study of 217cases)

S.No	Neural & spinal malformation. 8 cases	Cardiac malformn 3 cases	Pulmonary malformation 6 cases	Genitourinary Renal malform 1 case	Miscellaneous 4 cases
1	Anencephaly.	Myocarditis	Atelectasis	Poly cystic Kidney	Hydrops Fetalis.
2.	Anencephaly with Spinabifida	Tetralogy Of Fallot	Atelectasis		Chlongiomatous placenta
3.	Omphalocele.	Hypo-plastic Heart	Atelectasis		Edward syndrome (Trisomy – 18)
4.	Meningocele		Diaphragmatic Hernia		Edward syndrome (Trisomy – 18)
5.	Meningocele-Myelocele		Congenital Adenoid Cystic Malformn		
6.	Meningocele-Encephocele		Congenital Adenoid Cystic Malformn		
7.	Hydrocephalus				
8.	Hydrocephalus with spina bifida				

Table 5 - Fetal anomaly pattern: In female fetus - 28cases (study of 217cases)

S.No	Neural & spinal malformation. 8 cases	Cardiac malform 1 case	Pulmonary malformation 7 cases	Pulmonary malformation 6 cases	Miscellaneous 6 cases
1	Anencephaly – 3cases	Ebstein Anomaly	Partial Atelectasis – 2cases	Urethral Stenosis	Sacroccygeal teratoma
2	Anencephaly with Spinabifida- 2case		Diaphragmatic Hernia – 2cases	Extrophy Bladder	Hamartoma of Nape of neck
3	Anencephaly with spinal deformity		Diaphragmatic Hernia with CCAM Type II– 2cases	Winters-syndrom Renal Dysplasia	Achondrodysplasia – 2cases
4	Acephalous		Congenital Adenoid Cystic Malformation TYPE III	Bilateral Renal Cystic Diseases	Klipilfel-Syndrom 2 cases.
5	Meningocele-occipital			Mermaid – Renal Agenesis	
6				Renal – Hepatic Splenic Dysplasia	

* **THANATROPIC DYSPLASIA 1 case (Sex not Determined), M: F- 1:1.3, Total anomalous–51 cases.**

Table 6 -Internal congenital anomalies – Relation between maternal age, fetal weight and fetal anomaly.

Total anomaly	Mother Age (Yr.)	Fetal anomaly	Fetal weight (Mean wt.)
			Total 47cases 04 cases
51 cases	25-29 30-34 35-39	20 24 07	1000 gms 800 gms 2.8 kgs 750 gms

Discussion

Fetal autopsy significantly contributes to the diagnosis of intrauterine fetal death and congenital anomalies as a major cause of perinatal death. Congenital malformations in fetal and neonatal deaths vary in different studies. The study of malformations greatly helpful in genetic counseling and prenatal diagnosis in successive pregnancies¹.

In the present study 217 fetal and neonatal autopsies were carried out among 213fetal and 04 neonatal deaths that occurred in Btgh , during the period from JAN 2016 to JAN 2017. Prevalence of Congenital malformations account for 23.5% of fetal and neonatal deaths. This incidence matches with the study by Rabah M. Shawky

, Nermine S. Elsayed

MATERNAL FACTORS: In present study, the incidence of congenital malformations was higher in mother's age group of 25 to 39 years. In 25 to 29 years out of 217 fetal and neonatal deaths 20 (9.2%) cases got anomalies. In 30 to 34 years of maternal age group, 24 (11.05%) cases got anomalies. In 35-39 years of maternal age group, 07 (3.2%)cases got anomalies Many authors have shown higher incidence of malformations in the babies born to maternal age betn 20 to 35 years. The observations in the present study is that 90% of the cases belong to multigravida and 10% cases belong to primigravida. In our study the incidence of congenital anomalies are increased with the increase in maternal age

FETAL FACTORS: -In present study, the incidence of congenital malformations were higher among the low birth weight infants (<1500 gm) in comparison to the normal weight accounting for 04 cases. The association of low birth weight and malformations has been well documented. Many studies have documented male predominance amongst congenital malformed babies. However, in the present study we observe 22 male babies and 28 female babies with congenital malformation. In a five year study on major congenital anomalies in Turkey by Tomtair et al.,¹⁴ there were 183 cases (2.9/1000) of single (or) multiple congenital Anomalies among 63,159 live births. The most common anomalies were related to the nervous system (31.1%), cleft palate and lip (18.6%), musculoskeletal system disorder (14.2%) and chromosomal anomalies (13.1%). Both genders were found to have greater anomalies related to the nervous system (34.9% of girls and 28.3% of boys) while amongst.

In present study CNS malformation is the most common. (17cases 8%) in 217 cases. that follows the order Meningocele > Anencephaly > Hydrocephalus. Second most common malformation is pulmonary malformation (13cases 6%) in 217 cases, most common is Diaphragmatic hernia than Atelectasis of Lung. Urogenital malformation (7cases 3.2%) in 217 cases. – With female predominance.

BENEFITS OF AUTOPSY:

The direct benefits of autopsy to parents are not limited to refining the risk of recurrence. Even after autopsy, sometimes a definitive final diagnosis cannot be made and information given to parents may cover a range of possible diagnoses. In such cases the storage of fetal samples for possible future genetic analysis provides the hope of an accurate diagnosis (which may have ramifications for the wider family) at a much later date. In most cases in which the scan findings are confirmed parents can gain comfort that their baby had the prenatally suspected condition. The finding of additional malformations, as well as in some cases changing the diagnosis, may be helpful in targeting tests in a subsequent pregnancy. A wider importance of autopsy is in its value for quality control for prenatal diagnosis, teaching, and research⁵.

The decline in autopsy rate and issues surrounding the retention of tissues and organs for diagnostic studies,

teaching, and research has been the subject of much debate since the adverse publicity concerning autopsies and organ retention. Parents should be provided with full information and not be coerced into accepting an autopsy examination. It is important that those advising them at such a sensitive time do not take what may be the superficially kinder route of avoiding detailed discussion about the autopsy. Parents need full information about the potential benefits of the examination, including details both about the procedures involved and about the benefits in providing information about risks of recurrence if they are to make a truly informed decision. This discussion should be with an appropriately trained professional⁵.

Our study provides important information for parents. If a termination has been carried out because of anomalies detected by ultrasound scan, by declining an autopsy, parents will remain ignorant of information of recurrence risk.

Conclusion

The study of dead is to save the livings. Congenital malformations have become important cause of fetal and neonatal mortality in developed countries and would very soon be increasingly important determinants of fetal and neonatal mortality in developing countries like India and of various states- like Karnataka where consensual marriage is common and is known cause of congenital malformation. This study was undertaken with the purpose of finding out cause of death during the perinatal & neonatal period at Btgh, mrmc kalaburagi, Karnataka, to see pattern and prevalence of congenital anomalies and implication of legal aspects of fetal autopsy.

Conflict of Interest- No

Source of Funding- Personal

Ethical Clearance: Not necessary

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Orofacial Granulomatosis: A Review

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Abstract

Orofacial Granulomatosis (OFG) is an uncommon clinicopathological entity characterized clinically by the presence of persistent enlargement of the soft tissues of the oral and maxillofacial region and histologically by non-caseating and non-necrotizing granulomatous inflammation. The term 'orofacial granulomatosis' has been introduced to denote the group of various disorders, including Melkersson-Rosenthal syndrome and granulomatous cheilitis and has been noted to be associated with Crohn's disease, Sarcoidosis and infectious diseases such as Tuberculosis. Although, various etiological agents such as dental materials, food additives and microbial agents have been recommended in the disease process. Treatment of orofacial granulomatosis is by corticosteroids but it's not so efficient. It is more important to identify the pathogen first to specify the appropriate treatment line.

Keywords— orofacial granulomatosis, Melkersson Rosenthal syndrome, crohn,s disease.

Introduction

Orofacial granulomatosis term was introduced by Wiesenfeld in 1985¹. Granulomatosis is any condition characterized by the formation of multiple nodules or granulomas in soft tissues. It encompasses Melkersson Rosenthal syndrome and Cheilitis granulomatosa¹. The true prevalence of this disease is unknown but is suggested to be 0.8% (Mahler and Kiesewetter, 1996)³. it is principally a condition of children and young adults, common in both genders² with slight female predilection. It is also associated with oral ulceration, gingival overgrowth and a cobblestone appearance of the buccal mucosa⁴. The diagnosis can be confirmed by histopathological identification of non-caseating granulomas⁵. The precise etiology of Orofacial granulomatosis is unknown. Genetics, allergies (food, dental materials), microbial agents or immunology were suggested as potential causative agents^{6,7}.

Definition and its associated to other granulomatous disorders

Orofacial granulomatosis is an uncommon disorder¹ but is increasingly recognized. Orofacial granulomatosis (as defined by Wiesenfeld in 1985) is the specific histological finding of granulomas in mucosal or skin biopsies taken from the mouth or face in the absence of a recognised systemic condition known to cause granulomas.

Orofacial granulomatosis includes a group of disorders showing chronic, non-caseating granulomatous lesions involving the perioral tissue of face and oral mucosa and whose diagnosis is based on exclusion of possible systemic diseases such as Tuberculosis, Sarcoidosis^{4,8,9}. It can cause significant cosmetic and functional problems but can be prevented if diagnosed early and treated promptly.¹⁰ Most common diseases of orofacial granulomatosis involving head and neck region⁸ are

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1. Melkersson Rosenthal syndrome
2. Sarcoidosis
3. Crohn's disease
4. Midline lethal granuloma

5. Wegener's granulomatosis

MELKERSSON ROSENTHAL SYNDROME (MRS)

It is a neuro-muco-cutaneous disorder involving both the intermittent orofacial innervations and mucocutaneous tissues in a pathosis of complex origin characterized by recurrent oedema, facial palsies and nerve dysfunctions frequently associated with plicated tongue^{11,12}. However, many patients did not manifest all signs of this triad. Monosymptomatic or oligosymptomatic are two forms in which only one or two features of the triad are present commonly.^{13,14}

Melkersson reported a case describing facial palsy and orofacial oedema in 1928 with symptoms of facial palsy and orofacial swelling. Subsequently, Rosenthal in 1932 described the triad of persistent lip or facial swelling, recurrent facial oedema, swelling and fissured tongue.¹⁵ Thus, the term Melkersson Rosenthal syndrome was derived by Hornstein et al and Worsae et al and reported forms of Melkersson Rosenthal syndrome as monosymptomatic/ oligosymptomatic which was described by Miescher in 1945 as Cheilitis granulomatosis.¹⁶

It is manifested as orofacial oedema which affects the face, lips, gingiva, buccal mucosa or tongue.¹⁴ Upper lip swelling begins as the first symptom and follows lower lip swelling involving one or both cheeks.¹⁷ The enlarged lip appears cracked and fissured with reddish brown discoloration and scaling.¹⁸

SARCOIDOSIS

Sarcoidosis is described as a multisystem granulomatous disease of unknown origin characterized by the formation of uniform, discrete, compact, non-caseating epithelioid granulomas¹⁹. It is also known as Boeck sarcoid and Besnier-Boeck-Schaumann disease²⁰. Jonathan Hutchinson, an English surgeon- dermatologist, reported the first case of sarcoidosis in 1875, but this term sarcoidosis was introduced later by Boeck in 1899, which in Greek means, "flesh-like" condition. The etiology is unknown. Most common feature is pulmonary infiltration like dry cough, dyspnoea and Lofgren syndrome.²⁵ On the palate and buccal mucosa, the lesions are bleb like, containing a clear yellowish fluid or as solid nodules²¹. It also appears that Sarcoidosis may produce diffuse destruction of bone.

CROHN'S DISEASE (CD)

It encompasses a group of disorder with specific clinical and pathological features, characterized by focal asymmetric, trans mural and occasionally granulomatous inflammation primarily affecting the gastrointestinal tract.³⁶ It has now been described as a pan-electric disease that can affect any part of the gastrointestinal tract, from mouth to anus²². Idiopathic inflammatory bowel disease affecting the small intestine was first reported in 1932 by Crohn and his workers. The first report of Crohn's disease affecting mouth was made by Dudeney in 1969, describing a tag on the buccal mucosa of a 36 year old patient.

Young patients with recurrent painful intraoral ulcerative lesions with no signs of systemic disease, apart from weight loss are affected. Clinical manifestations of non-specific and specific lesions include²³

- Cobblestone appearance of buccal mucosa.
- Epithelial tags and folds.
- Full thickening and swelling of the gingiva.
- Linear aphthous ulceration.
- Redness of attached gingiva extending to mucosal margins.
- Persistent enlarged rubbery lip swelling.²³

MIDLINE LETHAL GRANULOMA

It is the ulcerative process that occurs in the nose characterized by epithelium and cartilage loss with crusting resulting in loss of nasal structure, support and ultimately causing cosmetic and functional deformity.¹¹ Midline destructive lesions of the face were first reported in 1897. Stewart et al reported 10 cases of a chronic destructive midfacial process in 1922 and named as Midline lethal granuloma.²⁴ The common presenting symptoms include chronic rhinosinusitis refractory to treatment and midline lesion destroy normal sinonasal anatomy.²⁴

WEGENER GRANULOMATOSIS

It is a condition associated with generalised vasculitis and was reported by Heinz Klinger and Frederick Wegener in 1936²⁵. The classical tissue abnormality in all organs affected by Wegener granulomatosis is

inflammation with granuloma formation against a non-specific inflammatory background.²⁶ Hyperplastic granular gingivitis or “strawberry gingivitis” is a rare manifestation of Wegener’s granulomatosis, but it is nearly pathognomic for this multisystem autoimmune vasculitis²⁶.

AETIOPATHOGENESIS

Although a number of possible causative agents have been associated to orofacial granulomatosis²¹, the actual etiopathogenesis remains unknown.

HEREDITARY AND GENETIC PREDISPOSITION

According to the available literature, there is no adequate data that shows that orofacial granulomatosis has a definite genetic background.^{4,27} An association between orofacial granulomatosis and human leukocyte antigen (HLA) has been seen and the two studies present do not depict a strong link between HLA and pathogenesis of orofacial granulomatosis.²⁷

FOOD ALLERGY AND ALLERGY TO DENTAL MATERIALS

Various food substances and food additives²⁴ have been suggested to be either the cause or the predisposing even in orofacial granulomatosis. A wide range of hypersensitivities have been recorded in orofacial granulomatosis patients including dental restorative materials²⁸, toothpastes and other dental hygiene products²⁹, cocoa and chocolate²⁹, cinnamon compounds, carvone, carbonyl piperitone, aspartate^{29,30,31}, carnosine and sun yellow dye³⁰, monosodium glutamate³⁰, benzonates^{30,31} and tartrazine. Cinnamon and benzonate compounds have been suggested to be most common triggers^{29,30,31}

INFLAMMATORY/IMMUNOLOGICAL FACTORS

Description of granulomatous inflammation of orofacial granulomatosis has led to contrary and incongruous results. It is uncertain whether lesional T cells of orofacial granulomatosis depict clonal expansion as an outcome of chronic antigen stimulation²⁷. Studies on the expression of cytokines and chemokines in orofacial granulomatosis lesions have found a predominant Th1-mediated immune response²⁷.

INFECTIONS AND MICROBIAL FACTORS

The significance of microbiological factors in the

causation of orofacial granulomatosis follows notation of infective agents associated with chronic granulomatous conditions such as Crohn’s disease, sarcoidosis and tuberculosis. Several authors have inspected the probable role of microbial factors in initiating the immune response of orofacial granulomatosis, involving *M. Tuberculosis*, *Saccharomyces cerevisiae*, *M. Paratuberculosis*, *Candida albicans* and *Streptococcus Mutans*.

CLINICAL FEATURES

Labial enlargement and sometimes oral ulcers are primarily the clinical manifestations of orofacial granulomatosis, but numerous other features can also be seen.

LABIAL ENLARGEMENT

It involves upper or lower lip or both^{10,32}. The swelling is often persistent but can be recurrent also—each episode taking weeks to months³³. Non-tender on palpation, non-pitting at pressure and in consistency it may vary from soft to rubbery, labial mucosa can be erythematous and have granular appearance^{10,32,33}. Affected individuals may develop a lip licking habit that gives rise to consequential cheilitis with swelling, redness and drying of perioral skin³⁴.

ORAL ULCERS

The three preeminent forms of ulcer can be encountered in orofacial granulomatosis.³⁵ The major ulcers are linear and longitudinal at the depth of buccal or labial vestibule with raised borders. The less common second type of ulcer are superficial aphthous like ulcers with well circumscribed borders. These can appear on any oral mucosal surface. Lastly, the unusual type of ulcer associated with orofacial granulomatosis are described as pustules on the labial vestibule, anterior gingiva or at soft palate. They have similar appearance as pyostomatitis vegetans and are not clinically purulent.

MUCOSAL TAGS

In labial or buccal vestibule or in the retromolar region, pink or red painless tags of mucosa, akin to the raised borders of the chronic ulcers have been seen.

MUCOSAL SWELLING

The swollen and folded buccal and labial mucosa gives rise to cobblestoned appearance. It sometimes gives rise to highly noticeable folds with an overlying normal

mucosa in the posterior area of buccal mucosa.

CERVICAL LYMPHADENOPATHY

In patient with severe orofacial granulomatosis tender or non-tender lymphadenopathy of variable size and rubbery consistency at later stages is seen. It can be localized or generalized.

GINGIVAL ENLARGEMENT

Diffuse or local painless enlargement of attached and or free gingiva can arise, sometimes preceding other facial and/or mucosal features by several weeks⁸. The gingiva appears granular with normal salmon pink to red in colour.

FISSURING OF TONGUE

Fissured tongue at dorsal surface can be seen. The fissures commonly are more pronounced on lateral aspect of dorsum.

FACIAL ERYTHEMA AND SWELLING

There can be persistent and/or recurrent swellings mainly in genial, zygomatic, perioral, periorbital and palpebral areas of face. These swellings are often soft in consistency and non-pitting at pressure.

FACIAL NERVE PALSY

Rarely paralysis of lower motor neuron of facial nerve may arise in orofacial granulomatosis. This apparently shows the formation of granuloma within the course of main stem of nerve. It is accompanied with fissured tongue and labial swelling indicative of Melkersson-Rosenthal syndrome.

DIAGNOSIS

The diagnosis of orofacial granulomatosis depends on the presence of relevant orofacial clinical findings, histopathologic evaluation of non-caseating granulomatous inflammation and the exclusion of systemic disorders causing similar manifestations. Endoscopy, blood chemistry and radiological evaluation are used to differentiate orofacial granulomatosis from crohn's disease, sarcoidosis, tuberculosis and foreign body reactions. Allergy testing in form of skin testing to various food stuffs and additives may also be carried out. There is no accord with respect the most appropriate measure or instrument to assess orofacial granulomatosis

disease severity/activity and monitor response to treatment.

TREATMENT

Spontaneous remission of orofacial granulomatosis is rare¹⁶. The main aim of orofacial granulomatosis treatment is to lessen cosmetically unwanted orofacial swelling and control painful mucosal ulceration, however treatment may not be always required if symptoms and/or signs are mild. The most reliable treatment of the disease remains to be explained cause of its unknown aetiology and the current approach is based upon symptomatic treatment.³³

Topical corticosteroids and immunosuppressant like tacrolimus applied directly onto the lips and oral mucosa have been reported to induce reduction of oral ulceration and labial swelling in small number of patients. Systemic corticosteroids and immunosuppressant, anti-tumour necrosis factor (TNF) agents like thalidomide, infliximab and adalimumab and other agents like anti leprotic agents, as well as surgical cheiloplasty and low-level laser therapy have been used as single or combined therapy with some positive, although overall inconsistent, results in a variety of cases. Intralesional injections of corticosteroid in the treatment of orofacial swelling were introduced in 1971. Initially low concentration triamcinolone acetonide (10mg/ml) was used, requiring multiple sessions (12 to20) of injections at approximately 2 week intervals in order to obtain a favourable clinical response. Similarly, the supporting results of diet modification like benzoate- and cinnamon- free diet reported by White et al. Miscellaneous drugs like methotrexate, minocycline, metronidazole, hydroxychloroquine and psychological support and counselling may be beneficial in developing coping mechanism and improving life quality.

Conclusion

Orofacial granulomatosis, being increasingly recognized nowadays, has become a topic of interest to all professionals and poses a great challenge to us at all levels starting from its diagnosis to the prognosis and treatment.

Regular clinical review is necessary to determine if there is any development of gastrointestinal involvement, and limited use of systemic steroids on long-term patient outcome are highlighted in literature. Current therapies available remain unsatisfactory. It seems that wide range

of patients on therapy would eventually experience a variable degree of reduction in orofacial swelling.

Ethical Clearance: Taken By The Committee

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Conflict of Interest : Nil

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Original Article

Pattern of Visceral and Peritoneal Injuries in Fatal Blunt Abdominal Trauma at a Tertiary Care Teaching Hospital in South India

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Abstract

The present prospective study aims to establish the pattern of visceral and peritoneal injuries in cases with blunt abdominal trauma subjected to post-mortem examination in a tertiary care teaching hospital in Hyderabad, Telangana for two years period between June 2010 and May 2012. Details pertaining to Cause of injury, pattern of injuries and cause of death were obtained from post mortem examination reports. The study revealed that among 150 cases in the study period, existence of both liver and spleen injuries (n=35; 23.33%) was most common followed by liver injury (n=23; 15.33%). The most frequent visceral and peritoneal injury reported was liver in 72 cases (48%), followed by mesentery in 54 cases (36%), spleen in 52 (34.67%) and intestine in 47 cases (31.33%). Abdominal injury was found associated with other injuries like head, chest, limb injuries in 36% cases.

Keywords: Blunt trauma, Abdominal injury, Fatal, Pattern of injury, Autopsy cases

Introduction

Abdominal viscera and peritoneum are quite vulnerable to trauma, unlike thoracic and cranial cavities which is well protected by rib cage and skull, there is no protection of abdomen by any bony cage.¹ According to World Health Organization (WHO), trauma kill more than five million worldwide annually, accounting for 9% of global mortality.² The recognized aetiology of blunt abdominal injury involves road traffic accidents, fall

from height, assault, industrial accidents, animal hits etc.³ Traumas involve a wide spectrum ranging from a mild to severe injuries of several organs. The underlying mechanisms for blunt abdominal trauma is either or both tensile and shear strain. Tensile injuries indicate direct compression or stretching of tissue, as seen usually in liver, spleen, and pancreas from frontal impact, and the kidney from impact to the flank. It results from direct blow, such as a punch or kick, or compression against a rigid object such as steering wheel. When the blunt force surpasses the elasticity and tensile strength of an internal organ, laceration may occur in the absence of any surface tear. Associated pelvic fractures or diaphragmatic rupture or hollow organ rupture may also result from increase of intra-abdominal pressure subsequent to direct abdominal compression. During abrupt acceleration or deceleration, shear injuries occur at a point of attachment of an organ. For instance, during rapid deceleration, the liver may continue to traverse relative to ligamentum

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teres resulting in liver laceration from shear forces acting around point of the attachment. Similarly, the organs like spleen, kidneys, and intestines are also all susceptible to injuries.^{4,5,6} Here, we determine the pattern of visceral and peritoneal injuries, its frequencies and associations in fatal blunt abdominal trauma.

Materials and Method

This prospective study involves cases of blunt injury abdomen subjected for post mortem examination at Gandhi hospital Mortuary, Secunderabad, Telangana during June 2010 to May 2012. The study constituted 150 cases of fatal abdominal trauma. Preliminary details and history of the cases and cause of injury was gathered from the inquest report. Pattern of injuries and cause of death were obtained from post mortem examination reports. All data was collected on a proforma, and data prepared was analysed under discussed objectives.

Observation

The study shown that among autopsies conducted on deceased with blunt abdominal trauma for a period of two years from June 2010 and May 2012, the causes of injury were road traffic accident, accidental fall from height like fall from trees, roof tops, and during walking, industrial accidents, homicide, and fall from bullock carts and being run over by the bullock cartwheel. In the study population of 150 cases of fatal blunt abdominal trauma, the most common injury observed was combination of both liver and spleen (n=35; 23.33%), followed by liver alone (n=23; 15.33%), spleen alone (n=12; 8%), and combination of intestine and mesentery (n=12; 8%). (Table 1) Based on the frequency of individual visceral (solid or hollow organ) injury or peritoneal injury in cases of fatal blunt abdominal trauma, it was noticed that liver injury was most common (n=71; 48%), followed by mesentery (n=54; 36%), spleen (n=52; 34.67%) and intestine (n=47; 31.33%). (Table 2) In the present study, association of blunt abdominal trauma with trauma in other regions like head, chest, extremities was also considered. It was detected that only 36% cases had shown association, and 111 cases (72%) had shown no association i.e. abdominal trauma alone. The associations in the study population were seen with chest injury (n=9; 6%) and limb injury with fractures (n=9; 6%), head injury (n=6; 4%), and multiple injuries with association

of more than one region (n=15; 10%).

Table 1: Distribution of study population based on viscera and peritoneum injured.

Viscera and peritoneum injured	No. of cases (n=150)
Liver	23 (15.33%)
Spleen	12 (8%)
Mesentery	9 (6%)
Intestine	6 (4%)
Kidneys	6 (4%)
Stomach	3 (2%)
Liver & Spleen	35 (23.33%)
Intestine & Mesentery	12 (8%)
Liver, Intestine & Mesentery	10 (6.67%)
Bladder, Intestine & Mesentery	6 (4%)
Kidney & Retroperitoneum	6 (4%)
Spleen, Stomach & Omentum	5 (3.33%)
Intestine, Mesentery, Stomach & Omentum	5 (3.33%)
Bladder, Intestine, Mesentery, Kidney & Retroperitoneum	4 (2.67%)
Intestine, Mesentery & Retroperitoneum	4 (2.67%)
Liver, Mesentery, Kidney & Retroperitoneum	4 (2.67%)

Table 2: Frequency of viscera and peritoneum injury in the study population.

Viscera and peritoneum injured	Frequency
Liver	72 (48%)
Mesentery	54 (36%)
Spleen	52 (34.67%)
Intestine	47 (31.33%)
Kidneys	20 (13.33%)
Retroperitoneum	18 (12%)
Bladder	10 (6.67%)
Stomach	13 (8.67%)
Omentum	10 (6.67%)

Table 3: Frequency of visceral and peritoneal injury in the study population.

Study	L	M	S	K	R	B	St	I
Present (n=150)	48%	36%	34.67%	13.33%	12%	6.67%	8.67%	31.33%
Singh M et al ⁷ (n=55)	67.27%	-	30.91%	10.91%	-	-	9.09%	18.18%
Panchal HA et al ⁹ (n=37)	35.13%	-	40.54%	13.51%	29.72%	2.7%	-	24.32%
Singh SP et al ¹⁰ (n=100)	18%	4%	28%	-	2%	2%	4%	20%
Sah D et al ¹¹ (n=61%)	34.4%	52.4%	46%	11.4%	-	-		70.5%
Gushinge M et al ¹² (n=114)	58.77%	10.52%	36.84%	35.08%	-	-	9.64%	13.15%
Kannan RR et al ¹³ (n=26)	26.9%	34.61%	34.6%	-	57.6%	-	-	57.69%

L=Liver; M=Mesentery; S=Spleen, K=Kidney; R=Retroperitoneum; B=Bladder; St=Stomach; I=Intestine

Discussion

Among 150 cases of fatal blunt abdominal trauma, the most common injury observed was combination of liver and spleen (23.33%), followed by liver (15.33%), spleen (12; 8%), and combination of intestine and mesentery (n=12; 8%). In study conducted by Singh M et al, the most common visceral injury noted was liver alone (40%); and spleen injury alone was observed in 12.73% cases and combination of liver and spleen was seen in 5.45% cases.⁷ More studies demonstrating the existence of either single or combination of visceral injuries in cases of blunt abdominal trauma could not be traced.

Based on the frequency of individual (visceral) or peritoneal injury in the cases of fatal blunt abdominal trauma, it was noticed that liver injury was most frequent (48%), followed by mesentery (36%), spleen (34.67%) and intestine (31.33%). Santhosh CS study reported hollow viscous and mesenteric injury was most common (81.81%) followed by liver (63.63%) and splenic injury (9.09%).⁸ We could not any study which presented the frequency of omentum injury. Studies of Singh M et al,⁷ Panchal HA et al,⁹ Singh SP et al,¹⁰ Sah D et al,¹¹ Gushinge M et al¹² and Kannan RR et al¹³ which presented the individual frequency of solid visceral or hollow visceral

or peritoneal injury have been described in Table 3. The findings in the present study was supported by Singh M et al⁷ and Gushinge M et al¹² with liver injury is more common. In Sah D et al¹¹ and Kannan RR et al¹³ studies, mesentery injury was most commonly noted. In other studies, spleen injury was more frequent.^{9,10}

In the present study, it was detected that only 36% cases had shown association, and no association i.e. abdominal trauma alone was seen in 111 cases (72%). The associations in the study population were chest injury (6%) and limb injury with fractures (6%), head injury (4%), and multiple injuries with association of more than one region (10%). Shubhendu K et al study negate with findings in present study, by showing 8.78% cases of abdominal injury alone, i.e. without an associations. Association of abdominal injury was seen with head (160/296; 54.05%), chest (198/296; 66.89%), and limbs (107/296; 36.15%).¹⁴ Similarly, the study of Ravikanth J et al showed association seen in 46% cases. Commonly associated extra-abdominal injuries were chest (28%), head injury (15%), and limb bone fractures (20%).¹⁵ Naik BV et al study revealed no association in 47% cases and association with head (7%), chest (17%), limb (11%) and multiple injuries (18%).¹⁶

Conclusion

The study revealed that among 150 cases of fatal blunt abdominal trauma, combination of liver and spleen injuries (23.33%) was common observation, followed by liver injury (15.33%). The visceral and peritoneal injury frequently perceived was liver in 72 cases (48%), followed by mesentery in 54 cases (36%), spleen in 52 (34.67%) and intestine in 47 cases (31.33%). Abdominal injury was associated with other injuries like head, chest and limb injuries in 36% cases.

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Awareness of Medico-Legal Aspects and Documentation amongst Health Professionals in a Tertiary Care Hospital

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Abstract

Background: The professionals working in a hospital, especially the clinical staff will have to deal with many medical cases which have legal implications. Health care providers are at high risk for litigations. Being aware about medico legal aspects and importance of documentation and performing their duties ethically can safeguard themselves against risks of litigation. **Objective:** To assess the awareness among health professionals about legal practices and medical documentation in patient care. **Method:** A cross-sectional study was carried out with the help of a validated and pre-tested questionnaire involving 219 health professionals belonging to different disciplines of allied health sciences and nursing at a tertiary care hospital in south India. **Result:** The study showed that the professionals who were involved indirectly, such as pharmacists and health information management professionals scored less than 50% of the total knowledge score while those involved in direct clinical care such as physiotherapists and nurses scored more than 50% of the total knowledge score, and hence better. Similarly professional with three or more years of experience scored above 50% and hence better than professionals with lesser experience. The responses indicated that, the respondents were only able to attain a score around 50% of the maximum attainable. **Conclusion:** The findings indicate there is a need of bringing on the awareness about the various aspects of medico-legal cases in patient care. This is not only for professional safety but also for the safety of patients at large. Hospital and their administrators should regularly conduct sensitisation programs on medico legal aspects in patient care and importance of documentation

Keywords: Medico-legal case, Consent, Confidentiality, Medico-legal documentation.

Introduction

Over the centuries, the medical care given to people were subjected to many legal, religious and social restrictions. At present times, the medical care shall be given and practiced by only qualified healthcare professionals in most countries, if not all⁽¹⁾.

There can be instances where the professional discretion of a physician or other healthcare professional may contradict with autonomy of the patients. This puts forth a fundamental need for professionals involved in patient care to learn the skill and acquire knowledge related to ethics and legal requirements of their practice. This can be argued to be as fundamental as knowledge in basic sciences or clinical skills⁽²⁾. The healthcare professionals of a hospital have several lawful commitments in the execution of their duties. It is hence,

vital that healthcare professionals be vary and in full understanding of their obligations and fulfil them to the best of their capacity.

Like physicians, the legal responsibilities of the nurses also begin with their professional practice. Their license bears out that they are capable and qualified under the law to practice their profession. It is the proof that they are now able to give holistic and quality care to their clients as a professional nurse. The same applies for other allied health professionals, there are certain standards and codes of practice that is expected of them while they are at work. Their ignorance, much as a physician's or nurses' may have serious implication on the health and well-being of the patient. Hence, apart from the physicians, the nurses and allied health professionals should also take liability and accountability for their actions. In recent past there has been increasing

pressure on hospital facilities due to the media attention it receives. In addition to this, the ever increasing complexity of therapeutic and diagnostic methods and lack of competency thereof, has together been responsible for many medico-legal battle the hospitals had to face and be accused of medical negligence in providing the care⁽³⁾.

The tendency to neglect dealing with MLC by the hospitals and the healthcare professionals maybe due to many inconveniences such as dispute, and contact with the court of law etc. This will only further complicate things. Due to such inconveniences, the hospitals may have a reluctance to deal with MLC, and avoid such cases, or 'get rid of' them as fast as possible⁽⁴⁾. There aren't many legal suits that happened because of malpractice or negligence of nurses in India. This is believed to be largely due to the perception of the patients in India that the medical liability lays completely on doctors^{(5) (6)}.

But, with ever-increasing availability of information regarding health over the internet as well as increased accessibility to internet for the consumers, such cases of negligence come to light more often. To keep in pace with such advancements and to confront to the changing situation in healthcare, it is important that the nurses and all healthcare professionals are trained and prepared with refreshed knowledge on laws with regards to health care. This will improve safety of health care delivery in an impartial and institutionalised way⁽⁷⁾.

Method

This is a cross-sectional study carried out between January and June 2017, in a tertiary care hospital in

South India. A pilot study was conducted amongst the 20 potential participants of the target population of nurses and allied health professionals of the hospital. The sample size was determined to be a minimum of 182 professionals ((N) =). The sampling method used was convenience sampling method and data was collected using a validated, self-administered questionnaire which assessed the awareness on medico legal aspects and documentation. The study, including the questionnaire, was approved by the Institutional Research Committee. The questionnaire contained two sections, the first section contained demographic data such as profession, qualification and years of professional experience.

The second section contained questions to measure the awareness of medico-legal aspects and documentation. The questions in the questionnaire were divided into five domains: Confidentiality, Negligence, Consent, Medico-legal practice, and Medico-legal documentation. The questionnaire was obtained from the respondents after they were briefed about the study and a written informed consent of the same obtained from each respondent. Mean and frequency was calculated for each group of professionals based on their given demographic data. The data was analysed using SPSS version 20. Chi-square test was used as test of significance done to correlate results with demographic data.

Results

A total of 219 professionals participated in the study from various disciplines of allied health and nurses. Their scores with respective scores are given in the table below. (table 1)

Table 1: Scores w.r.t Demographic Data of the Respondents

Item	Category	Frequency	Percentage (%)	Mean score (Maximum 19)	Percentage (%)
Profession	Nurse	173	79	9.7	51
	Physiotherapists	7	3.2	10.4	54.9
	Pharmacists	8	3.65	9.6	50.5
	Medical Imaging Technicians	21	9.59	7.6	40.1
	HIM Professionals	10	4.57	9.4	49.5
	Total	219	100	N/A	N/A
Experience	1-3 years	59	26.94	8.6	45.3
	4-6 years	54	24.66	10.4	54.7

Cont... Table 1: Scores w.r.t Demographic Data of the Respondents

	7-9 years	40	18.26	10.5	55.3
	10 or more years	66	30.14	9.4	49.5
	Total	219	100	N/A	N/A
Qualification	Diploma	171	78.08	9	47.4
	Undergraduate	41	18.72	9.7	51.1
	Postgraduate	7	3.2	10	52.6
	Total	219	100	N/A	N/A

Aspects Related to Confidentiality:

Of the two questions asked related confidentiality, the question on who can access patient information from medical record was found to be statistically significant in terms of profession ($p=0.020$), while question on sharing patient information to a third party was found to be statistically significant terms of qualification ($p=0.005$).

Table 2: Confidentiality (* $p \leq 0.005$)

Serial No.	Item	Percentage		p-Value		
		Right	Wrong	Profession	Qualification	Experience
1	Who can access the patient information from the medical record?	58.0	42.0	0.020*	0.127	0.055
	Answer: All the healthcare professionals relating to the care of a particular patient					
2	In which of these cases can MLC patient's health information can be given to a third party:	46.6	53.4	0.090	0.005*	0.104
	Answer: Injury resulting from a suspected criminal act, risk to public safety, Notifiable diseases					

Aspects Related to negligence:

Of all the questions asked related to the medical negligence, all of them varied significantly in terms of profession ($p<0.001$).

Table 3: Negligence (* $p \leq 0.005$)

Serial No.	Negligence	Percentage		p-Value		
		Right	Wrong	Profession	Qualification	Experience
1	Which of following laws does medical negligence come Under?	53.0	47.0	<0.001*	0.143	0.001*
	Answer: Civil laws, Criminal laws, Consumer Protection Act					
2	When can a nurse be attributed to negligence:	62.1	37.9	<0.001*	0.000*	0.298
	Answer: Their own acts which could be acts of commission or omission.					
3	Which of these can be criminal negligence by the healthcare provider?	57.1	42.9	<0.001*	0.012*	0.068
	Answer: Giving wrong blood					

Aspects Related to consent:

In aspects related to consents, the answers varied statistically significantly over across all the questions in terms of profession ($p < 0.001$).

Table 4: Consent (*p ≤ 0.005)						
Serial No.	Consent	Percentage		p-Value		
		Right	Wrong	Profession	Qualification	Experience
1	Which of these circumstances require no consent?	43.8	56.2	<0.001*	0.938	0.144
	Answer: While treating a patient on court order OR Medical emergency					
2	The informed consent of the patient or the legal guardian is required to do any procedure on the patient, except if the patient is under the custody of police for a criminal offence:	51.1	48.9	<0.001*	0.581	0.032
	Answer: True in all cases					
3	In cases of children under 12 years of age admitted as MLC, the treatment/ procedure/examination should be treated with consent.	56.2	43.8	<0.001*	0.008*	0.005
	Answer: True, except in emergency					

Aspects Related to medico-legal practice:

All the questions related to medico-legal practice was statistically significant in terms of profession ($p < 0.005$).

Table 5: Medico-legal Practice (*p ≤ 0.005)						
Serial No.	Medico-legal practice	Percentage		p-Value		
		Right	Wrong	Profession	Qualification	Experience
1	If a patient or his relative does not let the MLC to be registered, then:	37.2	62.8	<0.001*	0.080	0.002*
	Answer: The police should be informed.					
2	Legal action when an MLC patient dies:	52.5	47.5	<0.010*	0.841	0.168
	Answer: The body should be handed over to the police.					
3	When are collection and preservation of exhibits relevant to a case?	84.0	16.0	<0.001*	0.001*	0.518
	Answer: All the cases including suicide cases, road accident cases and murder cases					
4	For how long should a MLC record be stored in a hospital?	64.0	36.0	<0.001*	0.222	0.004*
	Answer: For indefinite period					
5	The legal action if an MLC patient absconds hospital should be:	58.9	41.1	<0.001*	0.078	0.09
	Answer: The police should be informed.					
6	Legal action when an MLC patient decides to leave the hospital:	35.6	64.4	<0.001*	0.376	0.113
	Answer: The police should be informed.					

Aspects Related to documentation:

In questions related to medical documentation, awareness regarding procedure for discharging of an MLC patient was found to be statistically significant in terms of profession ($p=0.014$) and qualification

($p=0.017$). Awareness regarding the procedure for documenting dying declaration by the patient was also found to be statistically significant in terms of profession ($p=0.002$), while years of experience was significantly associated with awareness regarding safe storage of medico-legal register ($p<0.001$).

Table 6: Documentation (* $p \leq 0.005$)

Serial No.	Medical Documentation	Percentage		p-Value		
		Right	Wrong	Profession	Qualification	Experience
1	Procedure while discharging an MLC patient:	57.5	42.5	0.014*	0.017*	0.219
	Answer: Intimation should be sent to police and also the patient should be discharged with discharge documents.					
2	What is procedure to be done in case of dying declaration by the patient?	47.9	52.1	0.002*	0.366	0.124
	The dying declaration is recorded in the presence of magistrate or a medical officer in the presence of two independent witnesses.					
3	When shall a medico-legal register be kept safe and secure under the lock and key?	76.7	23.3	0.236	0.585	<0.001*
	Answer: Always					

Discussion

In Confidentiality aspect, only 40 to 50 percent of the participants were able to answer correctly. This clearly shows a lack of awareness in terms of respecting the confidentiality of the patients. This result was in contrast with the another similar study “patient communication, confidentiality and consent: radiology policy and practice in Europe”, where the result showed that more than three quarters of the national society was aware and indicated about the national policy about confidentiality of the patient information⁽⁸⁾. This study was again in contrast with another study titled “Medical and legal professionals’ attitudes towards confidentiality and disclosure of clinical information in forensic settings: a survey using case vignettes”, where the medical professionals, on the whole, tend to respect the patient confidentiality⁽⁹⁾.

In consents, all of the responses was found to be statistically significant in terms of profession and in terms of years of professional experience. In a similar study conducted in Europe with relation to practice and policy regarding consent in patient-care, it was found

that a that the professionals were aware and had routinely obtained a consent 72% of the time which was in contrast to the mixed response of 40-60 percent obtained in this study for questions related to consent⁽⁸⁾. In another survey conducted in the UK, regarding the consent law in medical practice, 64% of the surgeons were “a little uncertain” that their consenting process meets the legal requirements⁽¹⁰⁾.

In case of questions which focused on the legal practices in patient care. The results were again varying across questions. Secondly, 86% of questions focused on this area was statistically significant in terms of profession. The lack of awareness is evident in these answers.

It is necessary that the professionals are made aware of the rules and legislation of the country they practice in, both during the course of their professional degree and through the continual education in the institutions/hospitals they work.

In a similar study carried out on the knowledge of staff nurse regarding legal and ethical responsibilities in

the field of psychiatric nursing in SMS Medical College Jaipur, Rajasthan⁽¹¹⁾. The study revealed that lion's share 90% of the nurses' had only moderate level of knowledge in the legal and ethical responsibility in the field of psychiatric nursing. The 10% of the nurses had high level of knowledge while none of the nurses fall into the class of low level of knowledge.

In a survey conducted in the UK, more than 92% of surgeons surveyed believe that landmark cases and changes in law etc. regarding legal practice should be discussed through professional bodies and circulated locally ⁽¹⁰⁾. In another survey conducted amongst junior doctors in three UK hospitals, the majority were unfamiliar with medico-legal and ethical terms relevant to daily practice. They also felt their postgraduate training in these areas was inadequate⁽¹²⁾.

In another study done by Sharmil et al., in Malaysia, revealed that just 11.7% nurses had the normal or expected adequate level of knowledge on Legal Aspects of Healthcare, while remaining 88.3% nurses had a moderate level of knowledge. The study presumed that they require greater enhancement of knowledge through continuing nursing education ⁽⁷⁾.

The results showed that there was high frequency of the responses being significant with respect to profession. It is evident from the result that professionals such as nurses and physiotherapists who were involved in directly involved in the clinical care showed more awareness than the professionals who were involved indirectly.

Conclusion

This study and similar studies in this field have shown that the professionals lack awareness in many aspects of medico-legal practice in healthcare such as confidentiality, medical negligence and medico-legal documentation et cetara. Such indication of lack of awareness is alarming and coupled with the trend of increased informed patients, it calls for bring major changes in how these professionals are trained as well as how the legislation and legal procedures are put to practice ⁽²⁾.

Conflict of Interest: The authors had no conflict of interest.

Limitation:

This study cannot be generalized because this study was done with a limited number of professionals in a particular hospital. Many allied health professionals who responded believed that it was not part of their routine job to know about MLC.

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Study of Cephalic Index among the Tamil Population

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Abstract

Various cephalofacial measurements are helpful to establish human identity with respect to sex, race, stature etc. The objective of this study is documenting the craniofacial traits and sex differences with respect to Cephalic Index of Tamil population. Maximum breadth and length of human head are measured in subjects comprising of 100 males and 100 females in the age group of 18-23 years. The mean Cephalic Index calculated based on above metric data for males and females comes to 77.93 ± 5.10 and 75.22 ± 2.92 respectively. As per our findings, the predominant head shape of the study subjects in Tamil population is Mesocephalic for both sexes.

Keywords: Cephalic Index, Head breadth, Head length, Mesocephalic, Tamil population, Race.

Introduction

Identification is defined as the determination of the personality of an individual. Race is one criterion that is used to determine the identity of a person. Anthropometry consists of systematic measurements with respect to human physical properties particularly analyzing different dimensions such as size, shape, height, body proportions etc. These anthropometric data thus collected will be helpful to differentiate human beings of different ethnic groups, economic strata, nutritional status as well as gender. Cephalometric measurements can be used as a tool to establish the race and ethnicity with respect to specific geographical distribution.¹

Cephalometry is a scientific measurement of the dimensions of the human head. One of the most important indices used in cephalometry is the Cephalic Index (C.I.) or Breadth Index. The use of Cephalic Index was first advocated by Swedish professor of Anatomy, Anders Retzius (1796-1860).² It is the ratio of the maximum breadth of the skull to the maximum antero-posterior

length of the skull multiplied by hundred. Cephalic Index is race and population specific and hence there exists a clear racial variation. This index is used to assist in forensic investigations in which the identity of a dead individual has to be established.

In scenarios such as air crash accidents, ship wreckage, bomb explosions, multi-storied building collapse, train accidents etc., where facial features are unrecognizable, the application of cephalic index therefore plays a major role in determination of identity of individuals belonging to different races. In certain unfortunate situations such as genocides followed by mass burials, anthropometric assessments and their applications pertaining to race based segregation of decomposed, mutilated, burnt, skeletonized bodies are imperative for determining the preliminary partial or total identity which in turn helps to establish corpus delicti to proceed with further investigations. Due to global shrinkage and diversity of populations all over the world, compiling of topography based database of cephalic index has become very essential. Based on cephalic index, human head shapes can be grouped as dolichocephalic, mesocephalic, brachycephalic and hyperbrachycephalic with Cephalic Index 70-74.9, 75-79.9, 80-84.9 and 85-89.9 respectively.

So it has become the need of the hour to create population and geography based Cephalic Indices which can be compiled to create an authentic database

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for a specific population. Likewise within the same population, the data can be split on the basis of gender and various sub-groups.

Materials and Method

This study was carried on 200 individuals (100 Males and 100 Females) of Tamil ethnicity. Students residing in Kelambakkam region of Chennai were selected for this study. The corresponding age group of the subjects ranged from 18 to 23 years. The subjects chosen for this study were apparently healthy and well nourished, while those with craniofacial deformities, prior history of craniofacial trauma and plastic or reconstructive surgeries were carefully excluded. Before taking measurements, the necessary individual informed written consent was obtained.

Measurements were taken as per the Hrdlicka's method³, i.e. the subject was made to sit on a chair in the relaxed posture with head kept in the anatomical position. The anatomical landmarks required for calculating the Cephalic Index are four in number viz. Glabella (the mid-point between the eyebrows in the mid-sagittal plane situated just above the root of nose), Ophisthocranion (posterior-most point of the external occipital protuberance along the mid-sagittal plane) and both sides Euryon (lateral most point of the parietal eminence on either side of the head). The measurements were made using a spreading caliper with rounded tips procured from a reliable standard company. Measurement of the maximum head breadth was done by extending the tips of the caliper in such a way that they reached

the maximum lateral point of the parietal bone on either side of the head. In a similar fashion, the maximum head length was estimated by placing one tip over the glabella and the other tip on the most distal point of the external occipital protuberance along the mid-sagittal plane. All the measurements were taken by a single investigator to avoid possible inter-observer variations.

Depending upon the cephalic index, the head shapes are classified as shown in Table 1.^{4,5}

Table 1

S. No.	Head Shape	Cephalic Index
1.	Dolicocephalic	70.0-74.9
2.	Mesocephalic	75.0-79.9
3.	Brachycephalic	80.0-84.9
4.	Hyperbrachycephalic	85.0-89.9

Results

The head breadth and head length were measured in centimetres with the help of caliper and the cephalic index was calculated.

Computational and statistical analysis of the results was done using the SPSS software version 21 through which the mean and standard deviation were calculated. The results are shown in tables 2 and 3.

Table 2: Mean head breadth, head length and Cephalic Index in sample study group

No.	Gender	Total subjects examined	Mean Head Breadth	Mean Head Length	Cephalic Index
1.	Male	100	14.15 ± 0.83	18.18 ± 0.63	77.93 ± 5.10
2.	Female	100	13.04 ± 0.56	17.33 ± 0.38	75.22 ± 2.92

The mean breadth for the male head was 14.15 ± 0.83 and the mean length for the male head was 18.18 ± 0.63. The mean breadth for the female head was 13.04 ± 0.56 and the mean length for the female head was 17.33 ± 0.38. The mean cephalic index for male subjects was

77.93 ± 5.10 and for female subjects it was 75.22 ± 2.92. The study shows a statistically significant difference in the cephalic index between the male and female skulls with a p value of <0.001 i.e. highly significant.

Table 3: Sex wise distribution of head shape in sample study population

S.No.	Head Shape	C.I.	Male	%	Female	%
1.	Hyperdolicocephalic	65.0-69.9	9	9%	5	5%
2.	Dolicocephalic	70.0-74.9	20	20%	36	36%
3.	Mesocephalic	75.0-79.9	36	36%	58	58%
4.	Brachycephalic	80.0-84.9	29	29%	1	1%
5.	Hyperbrachycephalic	85.0-89.9	6	6%	-	-

In the current study it was found that 36% of the males and 58% of the females belong to the mesocephalic range, 29% of the males and 1% of the females lie within the brachycephalic range, 20% of the males and 36% of the females show dolicocephalic range, 9% of males and 5% of females are of hyperdolicocephalic range and 6% of males and none of the females fall within the hyperbrachycephalic range.

Discussion

A large number of studies have been done on cephalic index on other ethnic groups in the Indian subcontinent. We compared the results of our study with that of other investigators and the results are shown in table 4.

Table 4: Comparison of the mean Cephalic Index in our study with that of other populations:

S. No.	Name of the Researcher	Year	Population for study	Cephalic Index	
				Male	Female
1	Present Study	2018	Tamil Nadu	77.93	75.22
2	S. I. Sultan et al ⁶	2017	Maharashtra	79.12	78.67
3	L. K. Kumari et al ⁷	2015	Vizag	80.21	79.25
4	S. Patro et al ⁸	2014	South Odisha	77.28	78.38
5	M. Mishra et al ⁹	2014	Madhya Pradesh	75.84	79.05
6	S. Nair et al ¹⁰	2014	Central India	81.24	80.31
7	K. Uttekar et al ¹¹	2013	South Gujarat	80.88	82.48
8	S. Khair et al ¹²	2013	Mumbai	81.28	75.22
9	V. K. Yagain et al ¹³	2012	Manipal	77.92	80.85
10	V. Salve et al ¹⁴	2011	Andhra Pradesh	75.68	78.2
11	A. Mahajan et al ¹⁵	2009	Punjab	81.34	85.75

As per our study, with respect to mesocephalic and dolicocephalic types of head, the proportion of females outnumbers the males within their respective groups. As far as the other head types are concerned, the proportion of males outnumbers the females within their respective groups. But the mean cephalic index for the male and female heads was 77.93 and 75.22 respectively. The value of the cephalic index is higher for males compared to females in our study. This is consistent with studies done by S. I. Sultan et al.⁶, L. K. Kumari et al.⁷, S. Nair

et al.¹⁰ and S. Khair et al.¹² Other groups report a higher value in the female sex.

The mean cephalic index of 77.93 for the male heads was found to be lower than the study done by S. I. Sultan⁶, L. K. Kumari⁷, S. Nair¹⁰, K. Uttekar¹¹, S. Khair¹² and A. Mahajan¹⁵ and their groups, while the mean cephalic index for the female heads was 75.22, a figure lower than that reported in the study done by all the groups except S. Khair et al.¹² with whom our Cephalic Index matches.

In our study we find the occurrence of a rather rare head shape, hyperdolicocephalic i.e. a Cephalic Index between 65.00-69.99 in 9% of the males and 5% of the females. The occurrence of such a head shape is not reported in similar studies done on other ethnic groups in the Indian subcontinent.

The distribution of various head shapes and the predominance of a particular type is determined by genetic factors, environmental, dietary factors etc.¹⁶

Conclusion

The present study provides valuable new data pertaining to cephalic indices and the shapes of the head in individuals between 18-23 years of age in Tamilians.

From the present study we can classify Tamil population as Mesocephalic heads. The mean Cephalic Index of Tamil population for males and females came around 77.93 ± 5.10 and 75.22 ± 2.92 respectively. As there is no data published on Cephalic Index of Tamil population, the metric data provided in the present study can be an important tool to the forensic experts for establishing identity of human subjects with respect to Race.

Conflict of Interest: None declared

Source of Funding: Nil

Informed Consent: Informed consent was obtained from all subjects

Ethical Clearance: Necessary ethical approval was obtained from the Institutional Ethics Committee, Chettinad Academy of Research and Education.

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A Model for Stature Prediction from Percutaneous Ulnar Length in Adult Males of Tamil Population

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Abstract

The objective of this study was to derive a linear regression formula for determination of stature from right and left ulnar length in males belonging to Tamil population. The subjects consisted of 112 adult Tamil males in the age group of 21 to 30 years. With the help of digital sliding caliper, length of each side ulna was measured between tip of olecranon process and tip of styloid process and for stature, using the stadiometer, the subject was asked to stand barefooted in anatomical position and distance from heel to vertex measured. The data thus collected was statistically analyzed with SPSS software (version 23) and a population specific regression equation for stature pertaining to length of right and left ulna derived respectively and statistically compared with that of other Indian populations and found to be unique for this study population group and therefore, this will be a tool of much significance for anthropologists, forensic experts and archaeologists when dealing with mutilated forearm remains from deceased Tamil males where necessity of stature estimation for identification arises.

Keywords: Ulna, Stature, Regression formula, Males, Tamil population.

Introduction

Identification implies fixation of personality of an individual. Establishing identity of unknown victims from skeletonized, dismembered or mutilated parts of human body remains a paramount challenging task for forensic experts in circumstances like natural disasters, aircraft or rail accidents, terrorist attacks and wars. Determination of stature is one of the many vital physical parameters applied in ascertaining the identity of unknown human corpses. On many occasions, only human limbs are available for establishing identification where determination of stature is a significant factor. There exists a mutual relationship between a person's stature and dimensions of various body parts, particularly length of long bones, which provides the basis for

estimation of stature.¹ Of all the metric methods applied, regression formula for stature derived from length of long bones yield most reliable results. Estimates based on upper limb long bones are as reliable as that of lower limb long bones.

Length of ulna is commonly used for stature determination. Many researchers have provided various regression formulae based on ulnar length, nevertheless it is well established that a formula that applies to one particular population often does not give precise estimates for other populations. Researchers like Pearson (1889), Stevenson (1929) confirmed the presence of inter-population variations with respect to height estimation. Since that time, most studies have emphasized that regression equation for stature determination must be population specific.

Trotter and Gleser regression equations for stature derivation from long bones have been employed frequently. This research offers a regression equation based on ulnar length for estimation of stature in adult males belonging to Tamil population. Various parameters derived from this study were compared with those

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provided by similar studies done on different populations in India and found to be statistically significant.

Materials and Method

A total of 112 anatomically healthy adult males of Tamil population were randomly chosen and study conducted in Chennai. Those with obvious nutritional deficiencies, congenital or acquired defects in musculoskeletal development were not included. The age range of subjects was between 21 and 30 years. After brief explanation, written consent with signature was taken from every subject and prior institutional human ethical committee approval for this study also obtained. To exclude possible diurnal variation of stature, data was collected during 2 to 4 pm every day and by the same investigator to avoid inter-observer estimation errors if any.

To estimate the standing height, subject was made to stand on stadiometer platform with his arms hanging loosely on the sides of the body while the head being held in Frankfort plane and distance from the heel to vertex was noted with accuracy of up to 0.1 cm. The length of each ulna was measured by asking the subject to rest his palm over the contralateral shoulder and using digital sliding caliper with precision of measuring up to 0.01 cm., distance from the apex of styloid process to the apex of olecranon process recorded after highlighting these landmarks with the help of skin marking pencil.

The collected data was analyzed with the SPSS software (version 23) and various significant parameters such as mean, standard deviation, correlation coefficient, coefficient of determination, standard error of mean etc. were tabulated and linear regression equation for stature derived.

Results

In Table 1, various parameters derived from the analysis of stature and ulnar length of each side are exhibited for comparative interpretation. The estimated mean lengths of right and left ulna were 27.4 cm. (with standard deviation of 1.05 cm.) and 27.04 cm. (with standard deviation of 1.03 cm.) respectively. Similarly, the calculated mean stature of male subjects was 170.5 cm. with standard deviation of 4.3 cm. Pearson's correlation coefficient (r) for stature to the right ulnar length was 0.822 ($p < 0.001$) with regression coefficient of 3.3889 ($p < 0.001$). The similar correlation coefficient

(r) with respect to left ulnar length was 0.832 ($p < 0.001$) with regression coefficient of 3.5148 ($p < 0.001$).

Table 1: Various statistical parameters for Right and Left Ulna in Males

Parameter	Dependent Variable	
Mean Stature (cm.)	170.5	
	Independent Variable	
	Right Ulna	Left Ulna
Mean Length (cm.)	27.40	27.04
Standard Deviation	1.05	1.03
Correlation coefficient (r)	0.822 [$p < 0.001$]	0.832 [$p < 0.001$]
Coefficient of Determination (R^2)	0.675	0.692
Regression Constant	77.623	75.459
Regression Coefficient	3.3889	3.5148
Standard Error of Mean	0.09971	0.09734

Scatter diagrams (Fig. 1 and 2) were made by plotting the data of stature against the length of right and left ulna from male subjects and the linear regression formulae for stature with respect to each ulna were derived (Table 2).

Table 2: Regression formula for Stature in Males

	Regression formula for Stature (y)
Right Ulna	$y_1 = 3.3889 \times \text{Right Ulnar length (cm.)} + 77.623$
Left Ulna	$y_2 = 3.5148 \times \text{Left Ulnar length (cm.)} + 75.459$

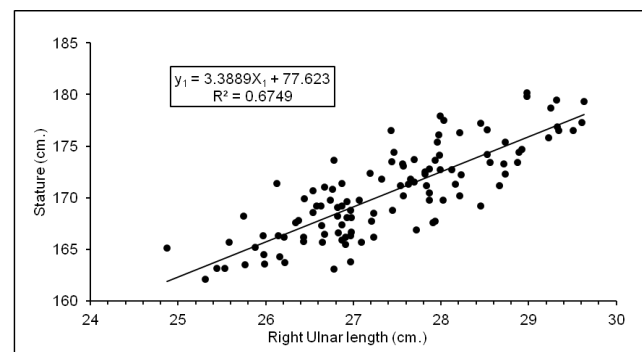


Fig. 1: Correlation between Right Ulnar length (X_1) and Stature (y_1) in Males

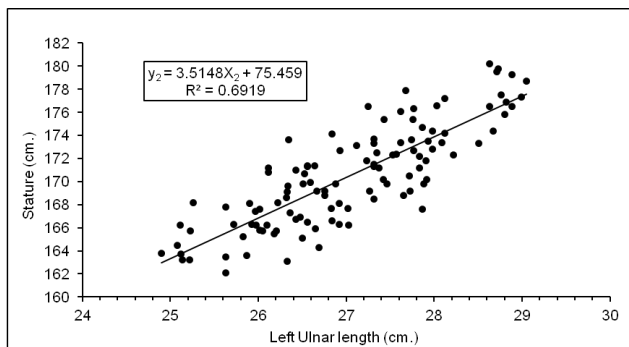


Fig. 2: Correlation between Left Ulnar length (X_2) and Stature (Y_2) in Males

Discussion

Determination of stature from the length of long bones of upper limb has been studied extensively by many researchers whose observations have all clearly attested that the length of upper extremity bones are dependable and precise determinants of human height²⁻⁷. The current study was done to present a database for the male adults by contributing regression formulae that are specific to Tamil population. This database can be used whenever reconstruction of stature is required as an essential tool of identification of victims of various disasters as well as for biological profiling.^{8,9}

Need for development of regression formula for stature estimation specific for a population has been advocated by Trotter and Gleser.¹⁰ The basic reason for this should be proportions of various human body portions with respect to height vary in different populations because these proportions are known to

be influenced by race, environmental factors, secular trends¹¹, nutrition, socio-economic status etc.¹² This emphasizes the need for creation of population specific nomograms.^{13,14} Identification of race, gender and age are the prerequisites before applying regression equation to determine stature specific to a particular region.¹⁰ In addition, the results from this present study involving adult males of Tamil population, because of various influencing factors modifying body proportions as mentioned earlier, indicate the requirement of developing various population specific regression formulae for stature determination in India.

From Table 3, it is obvious that notable variations exist involving mean stature and mean right and left ulnar length with respect to various population groups in our country and it can be presumed to be due to multiple modifying factors like heredity, dietary habits influencing nutritional status, physical stress affecting lifestyle, geographical, environmental factors etc. Therefore, if these inter-population differences in stature and ulnar length are presumed to be due to racial, genetic or geographical factors, then it can be said that there cannot be any change with these and results will remain constant at any given period of time. However, if the variations are supposed to be secondary to influences of plastic ones like nutrition, lifestyle, physical stress etc., then it can be safely suggested that the various anthropometric data reference standards must be collected and analyzed in regular time intervals in a specific population so that they can be applied with authenticity.

Table 3: Comparison of Mean Stature and Mean Ulnar length in Males

Name of the Researcher	Year	Population for study	Mean Stature (cm)	Mean Ulnar length (cm)	
				Right	Left
Present Study	2019	Tamil Nadu	170.5	27.40	27.04
Anuj Jain ¹⁵	2019	Uttar Pradesh	168.92	27.95	27.68
Chintala Durga Sukumar ¹⁶	2017	Vijayawada	165.72	29.84	29.78
Acharya Veena Anand ¹⁷	2016	Gulbarga	172.13	28.1	27.69
Avantika Bamne ¹⁸	2015	Maharashtra	172.31	27.9	27.75
Balkrishna Thummar ¹⁹	2011	Gujarat	169.87	28.48	28.39
Malay Kumar Mondal ²⁰	2009	West Bengal	164.31	27.13	27.01

Table 4: Comparison of Regression Formula for Stature (y) in Males from length of Right Ulna (X_1) and Left Ulna (X_2)

Name of the Researcher	Year	Population for study	Regression Formula	
			Right Ulna	Left Ulna
Present Study	2019	Tamil Nadu	$Y_1 = 3.3889X_1 + 77.623$	$Y_2 = 3.5148X_2 + 75.459$
Anuj Jain ¹⁵	2019	Uttar Pradesh	$Y_1 = 2.92X_1 + 87.22$	$Y_2 = 2.85X_2 + 89.98$
Chintala Durga Sukumar ¹⁶	2017	Vijayawada	$Y_1 = 1.80X_1 + 111.8$	$Y_2 = 1.79X_2 + 112.13$
Acharya Veena Anand ¹⁷	2016	Gulbarga	$Y_1 = 3.65X_1 + 69.4$	$Y_2 = 3.90X_2 + 64.1$
Avantika Bamne ¹⁸	2015	Maharashtra	$Y_1 = 3.81 X_1 + 65.77$	$Y_2 = 3.89 X_2 + 64.17$
Balkrishna Thummar ¹⁹	2011	Gujarat	$Y_1 = 3.117X_1 + 81.11$	$Y_2 = 3.667X_2 + 64.1$
Malay Kumar Mondal ²⁰	2009	West Bengal	$Y_1 = 4.19X_1 + 50.642$	$Y_2 = 3.26X_2 + 76.289$

Based on the various regression formulae derived from different Indian populations that were tabulated in Table 4, it is certain that all these researchers have found out a positive correlation between stature and right and left ulnar length which ascertains there is existence of strong and dependable relationship between stature and ulnar length.

Conclusion

Determining identification of a dead individual is a vital component of Corpus delicti i.e. facts that are helpful to prove a crime, for example, murder. Regression formulae deduced from this study are fairly accurate and can be confidently applied to estimate the stature from right or left ulnar length of deceased adult males belonging to Tamil population especially in cases where amputated or mutilated extremities alone are provided for establishing identification which will certainly be a demanding task for forensic experts and anthropologists. We would like to advocate for conduction of similar studies in future comprising larger samples in males of various age groups belonging to Tamil population, to boost the accountability of the regression formula

for stature estimation based on the length of ulna bone and therefore can be reliably employed for determining identity in mass disasters and similar medico-legal situations.

Conflict of Interest: None

Source of Funding: None

Informed Consent: Obtained

Ethical Clearance: Necessary ethical approval was obtained from the Institutional Ethics Committee, Chettinad Academy of Research and Education, Kelambakkam – 603103.

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*Original Article***Deaths Due to Electrocution- A Retrospective Study****Mohd Kaleem Khan¹, Umar Bin Abdul Aziz², Faiz Ahmad³**¹*Assistant Professor, Dept. of Forensic Medicine and Toxicology, J.N.M.C., A.M.U., Aligarh,*²*Associate Professor, Dept. of Forensic Medicine, F. H. M. C., Etmadpur, Agra, ³Senior Resident Dept. of Forensic Medicine and Toxicology, J.N.M.C., A.M.U., Aligarh***Abstract**

Retrospective analysis of deaths because of electric shock from the medico-legal death records our college i.e. J.N.M.C., A.M.U., Aligarh, Uttar Pradesh, India. Most of the deaths were of men having the age in between 11-50 years. All deaths were inadvertent and most part of them were during the time of monsoon as compared to the deaths in western countries where, baths, warmers or hair dryers were the source of electric shocks. The death rate reported because of electric shock was 0.34 per lakhs (100000) of the population in the present study as against the figures of 0.94 and 0.14 from Bulgaria and Canada respectively. A large portion of the deaths were either prompt or quick. It implies that individuals living at home did not have basic knowledge of dangers of electric shock. In this way mindfulness about utilization of good quality electric machines is the need of great importance.

Key words: *Electrocution, Accidental Deaths, Burns***Introduction**

Invention of electricity is about 300 years old and also the mortality related to it.¹ With time, the inventions driven by electricity made the human life dependent on it. Ever increasing dependency on industry and domestic requirement of electricity is also exposing man to the injury by electric current itself and appliances running on it. The other source of such injury is lightning, which is life threatening due to the very high voltage content. An injury due to high voltage is morbid in nature due to instantaneous high energy production.²

National crime records bureau data showed 10218 deaths from electrocution and that constitute 2.6% of all the accidental deaths, of which 0.7% were by lightening, which forms about 2833 cases.³ Self electrocution in

India accounts for 0.7% of the total suicides, that is 952 out of 134799 suicide deaths in the year 2013.³

Materials and Method

The present investigation involves an examination of the Medico-Legal cases recorded during June 2015 to May 2018 (three years). A total of 62 cases of death due to electrocution were recorded in in the Emergency Section of J.N.M.C., A.M.U., Aligarh, Uttar Pradesh, India. We gathered the general data about these cases from the history, the police papers and death certificate. This data was then entered in a proforma made for this reason and there after examined.

Results

Males formed the most number of cases, 43 (69.35 %) and the remaining were females 19 (30.64 %). (Table 1)

On an average, we got 21 cases for each year. A large number of these cases, 30 (48.39 %), were found in the summer and rainy season i.e. during the months June, July and August. (Table2)

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The age of death due to electrocution was spread over the year of 1 to 80 years, however the majority of them were in the age group of 11-50 years. (Table 3)

Most of the casualties occurred due to electric shock while they were working in their homes, 43 (69.35%) cases followed by on road cases i.e. 9 (14.51%) and industrial and other cases 5 (8.06%) each (Table 4).

In 24 cases (38.71 %), just entry marks were seen, while 18 cases (29.03 %) indicated both the entry and exit marks. In 6 cases (9.86 %), no marks were seen. In 7 cases (11.29 %), there were extra marks (non-electric shock wounds) were found. 7 cases (11.29 %) indicated burn on the body and clothes. (Table 5).

In 43 (69.35%) cases the surroundings were observed to be sodden or wet, while it was dry in 19 cases (30.65 %). (Table 6)

Table-1: Cases according to Sex

Sex	No.	%
Male	43	69.35
Female	19	30.65
Total	62	100

Table- 2: Cases according to Months / Year

Month	2015	2016	2017	No.	%
Jan	1	1	1	3	4.84
Feb	1	1	0	2	3.23
Mar	1	1	1	3	4.84
April	1	2	1	4	6.45
May	0	1	2	3	4.84
Jun	4	3	6	13	20.97
July	3	2	3	8	12.90
Aug	2	3	4	9	14.51
Sep	1	2	1	4	6.45
Oct	2	2	1	5	8.06
Nov	0	2	1	3	4.84
Dec	2	1	2	5	8.06
Total	18	21	23	62	100

Table 3: Cases according to Age

Age (Yr.)	No.	%
1-10	4	6.45
11-20	12	19.35
21-30	18	29.03
31-40	13	20.97
41-50	9	14.1
51-60	4	6.45
61-70	1	1.61
71-80	1	1.61
Total	62	100

Table 4: Cases according to Place of Incident

Place	No.	%
Domestic	43	69.35
Industrial	5	8.06
On road	9	14.51
Others	5	8.06
Total	62	100

Table- 5: Cases according to Types of Mark Present over the Body

Type of marks	No.	%
Entry mark	43	38.71
Entry and exit	18	29.03
Without marks	6	9.68
Additional marks	7	11.29
Burns	7	11.29
Total	62	100

Table- 6: Cases according to Surrounding of the Place of Incident

Surrounding	No	%
Wet	43	69.35
Dry	19	30.65

Discussion

Men formed the major junk of fatalities i.e. 43 cases (69.35%). This is in consistency with study 4, 5, 6, and 7. Most of our cases fell in the age range of 11-50 years

(83.87%). This is in consistency with other studies 4, 5, 6, and 7 however Rautji et al ⁶ and Dokov ⁷ have limited the age window period 21-40 and 25-44 years respectively. Age group between 0-10 years showed 4 (6.45%) cases. Few researchers have reported in this age group. Tirasci et al ⁴ reported 31.7%. In 0-10 years' age cases which are too high from our study.

In our study 24 (38.71 %) cases showed just entry marks, whereas both entry and exit marks were seen in 18 (29.03 %) cases. This is in contrast to the study done by Rautji et al ⁶ in India, which has very high incidence on entry wound mark 86.27 % where as they reported no case without an electrocution mark in caparison we have 9.68% cases without the mark. This could be as the result of wet skin with low resistance in rainy season, and such cases may result in negative autopsy. Flame burn or dry burn consisted about 11.29 % of cases and these are mainly due to high voltage burn.

The cases in in wet and moist condition are about 43 (69.35%) in the current study and most of the cases are in monsoon season. This may be attributed to poor maintenance and electric supply and poor housing infrastructure. This is consistent with the study 5 and 6. Study 4 and 8 mentioned more accident to home appliances and in bathroom settings where as in our set up it seems that faulty wiring and poor housing infrastructure have an effect on electrical injuries.

Conclusion

1. Most of the deaths were accidental,
2. Males were the predominant victims.
3. In the rainy season, more than 50 per cent deaths occurred.
4. Most of the deaths were either instantaneous or immediate.
5. Rate of fatality is significantly higher.

6. More deaths occurred in domestic surroundings. It signifies that people living at home did not have elementary knowledge of risks of electrocution.
- There is no conflict of interest among authors and funding source involved.
 - This paper has got all ethical clearance from the existing body of the college

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Ancient Drug Standardization Versus Modern Technology

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Abstract

A demonstrated truth established after several examinations and reasoning thousands of years ago which is known as Siddhant does not require any certification from reductionist modern technology for standardization of Ayurvedic drugs. Discoveries were possible during Vedic period not with the large sophisticated equipment developed by linear scientist but with the highly advanced intuitive spirit and the sixth sense by meditation and concentration.

Keywords: Drugs, Standardization, Non linear laws, Modern technology, Basic principles.

Introduction

Poly herbal, herbomineral and single herbal formulations of Indian System of Medicine are to be studied based on Rasa, Guna, Veerya, Vipak, Prabhava and karma to understand their unique nature. Study of dravyaguna principles with linear system gives unripe and incomplete information. Standardization of drugs should be based on their nature, qualities, specific actions, place of growth, season of collection, mode of collection, method of preservation, and method of preparation as it is told by Acharya's to achieve nonlinear results.

Technology versus epistemology

Modern hi-tech technology has impressed developed and developing countries to believe that human being can not survive without the help of hi-tech technology. But Vedic and other literatures confirm existence of human being on this planet since thousands of years in many generations before birth of linear system based

modern medicine.^{1A,2} Hi-tech modern medicine has been there for less than half a century.³ If human existence on this planet was dependent only on hi-tech technology, mankind would have been burnt out long ago. Even today more than 4.5 billion global populations do not have any touch with modern medicine.

Oxford Advanced Learner's Dictionary of Current English defines Standard as "Unit of Measurement",⁴ which quantifies the quality and purity of a material. The quality and purity of synthetic drug depends on active chemical ingredient present in it which is capable of producing therapeutic effect. But this is not true with natural drugs which are derived from plant, animal and mineral sources because of their panchabhoutik^{1B} complex chemical structure and composition⁵ than synthetic drugs.

Acharya Charaka supporting this view explains limitations of human being or technologies in understanding of nature complexity by saying that "Pratyaksham Alpam Analpam Apratyaksham"^{1C} means it is impossible to study completely including quantification of quality and action of a drug because of other hidden qualities which are not possible to be detected by available hi-tech modern technologies. All the studies including clinical studies carried out about the drugs with present day thinking and hi-tech technologies are incomplete because of which adverse drug reactions are seen. Example is Sarpagandha drug.

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Majority of Indian System of Medicines are poly herbal⁶ or herbo mineral⁷ preparations containing a large number of balanced active chemical principles^{1D} (Samanya and Vishesh Guna's) in different concentrations. So no one can imagine or no hi-tech technology can detect or explain the interactions between these chemical constituents present in them. It is scientifically difficult task to standardize single or poly herbal preparations according to present day reductionist modern science and with devices of money making device manufacturers^{8,9} because majority of the formulations are complex materials of the natural origin.

The unique theory of Samanya and Visheshha "Pravratirubhayasya tu"^{1D} says that Ahara and Oushadhi dravya's are naturally chemically balanced. Acharya Chkrapani further substantiating same theory says that "The maintenance of the Dhatusamyata is the effect of Samanya and Visheshha. Thus taken separately, either of them will not be able to maintain the Dhatusamyata. It is only when they simultaneously have their effect of Vraddhi and Hrasa that the Samyata of Dhatu is properly maintained". This theory does not agree with isolation of active component of a drug. A world famous cardiologist with heart Professor B.M. Hegde Sir always says that "Nature has its reasons always, but our reason can not explore them many a time".

Poverty of medical evidence

Indian System of Medicine is based on "A demonstrated truth established after several examinations and reasoning", which is known as Siddhanth^{1E}. And which does not require any certification from reductionist modern science / technology. A Dutch scientist so beautifully put the simple truth that science is what scientist do in his own language thus: "Watenchap is wot watenchap doen". Ayurvedic community always tries to understand unique system by modern science but the fact is that there are 40,000 biomedical journals out of which only 1% of medical publications represent "good science" which has been estimated by Stephen Lock, the former editor of British Medical Journal. Acharaya Sushruta says^{10A} to take help of other sciences to come to a scientific conclusion but some times it is difficult to find truths in articles published by suspected research frauds¹¹. The editorial of The Lancet gives a clue to Ayurvedic community to follow "Siddanta's" of our Acharya's by writing an article on "Drug –company influence on medical education in USA"¹². Unethical

Bio-Medical Research^{13,14} might have influenced on the content of Medical text books which is followed by other researchers in under developed and developing countries and taught to the medical students.

Not to end in self destruction it is wise not to study the Ayurvedic Siddhant based drugs by short-sighted modern scientific science. Study and standardize the drugs as they are not as we are, by their nature, qualities, and specific actions, place of growth, season of collection, mode of collection, method of preservation, and method of preparation as it is told by Acharya Charaka^{1F}. There is planet difference in drug research of modern medicine / science and Ayurvedic system, highlighting example is that action of modern drug is explained or understood based on its active chemical¹⁵ but Ayurvedic drugs act by their own nature or naturally balanced qualities or both on a proper occasion, in a given location, in a appropriate condition and situations as it is mentioned by Vedasindu^{1G}. Example to be quoted here is Mahatiktaka Ghrata does Dosha Shamana and Dosha Utklesh when it is given as Shamananga and Shodhananga Snehapana respectively.¹⁶

Acharaya Sushruta has classified Bhoomi into 6 types based on Gandha, Varna and Rasa's; similarly the drugs are also of 6 types. And also properties of a drug vary from Desha to Desha and season to season^{10B}, then how can modern science be able to come to a same conclusion about a drug grown in different areas? Can modern science explain why the drug "Suryabhakta" (*Helianthus annuus* Linn) moves according to the movement of the sun? Why the drug Lavali (*Gicea acida* Merrill)^{1H} gets fruits just on hearing the sound of the thunder? How does the universe run?

In one of the prestigious Journal 'Journal of American Medical Association', August 23/30, 2006 reported that the discovery of new medications, Devices and techniques is funded primarily by for-profit of companies. There is now considerable evidence that researchers with ties to drug companies are more likely to report results that are favorable to the products of those companies than researchers without such ties as reported in editorial of the New England Journal of Medicine, May 18, 2000. King Bhoja highlights the less importance of equipments in discoveries by saying that "Kriyasiddissatve bhavati mahatam nopakarane" – "It is not with the highly sophisticated equipment that we can make outstanding discoveries but with the innate power

inside”¹⁷

There is no ethical standardization for bio-medical research including clinical studies, invention of devices¹⁸ and diagnostic criteria¹⁹. When selling sickness and disease mongering programmes are well planned in the medical field how can bio-medical research reports or devices be taken as scientific base for standardization of Siddhant based drugs?

A science beyond science

Indian Vedic Sciences including Ayurveda are based on Non-linear laws. Non linear systems generally can not be solved and can not be added. But modern medicine / technology is based on linear systems. Linear equations are solvable, which makes them suitable for textbooks. Linear mathematics does not always work in this dynamic universe. Let us take very simple and more meaning full example and explanation given by Professor B.M.Hegde Sir that “Hydrogen is a very volatile atom while oxygen abets volatility. The two atoms combined together, the resulting molecule must be terribly! Let us take water (H₂O) as a good example and set fire to it. Does not it burn? Moral of the story is that the whole need not be the sum total of the bits always”. This is essence of Indian Vedic non-linear laws of the universe.

Some one wrote the correct history of Medicine thus: (Author not known), *2000 BC- Here, eat this root, 1000 AD- That root is heathen, say this prayer. 1850 AD - That prayer is superstition. Here, drink potion. 1940 AD- That potion is snake oil. Here, swallow this pill, 1985 AD- That pill is ineffective. Here, take this antibiotic, 2000 AD – That antibiotic is dangerous. Here, eat this root.¹⁹ This history can be again substantiated with following report- A Large study in Canada of the effects of antioxidant vitamins versus an extra intake of fruits and vegetables in large cohort of postmenopausal women showed a marked benefit in the later group. In an editorial, the BMJ went on to say that there could be many other antioxidant factors in the whole fruits and vegetables, in addition to the known A, C and E vitamins in the tablets.^{20,21}

Conclusion

This is need of the hour to rethink classical standardization of drugs based on existing principles but not based on modern methodology which is linear system based and keeps on changing its principles.

Dear linear friends, the author has expressed his opinion about Siddhant based Ayurvedic drugs with suitable references. It does not mean that he is against modern technology by which mankind is survived in emergency clinical conditions and would never have stepped into other planets.

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Conflict of Interest: None

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Sentiment Ontology Analysis for Adverse Drug Effect

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Abstract

Adverse drug reactions (ADR) are happen more frequently based on different drugs. ADR should be monitored by Pharmacovigilance. Due to drug usage of single dose or combine dose ADR are happen. ADR can't be monitored in INDIA because of not follow the physician direction and also self-medication. Most of the Indians used drug store or online to purchase drugs. The proposed method utilised different websites and online drugs reviews with sentiment analysis and conjugate gradient method in neural network. In output, we propose the best way to monitor the ADR and drug harmfulness.

Keywords: Pharmacovigilance, dosage, physician, online drug reviews, conjugate gradient.

Introduction

Adverse Drug Reactions monitoring is an operation of continuously monitoring of unsuitable effect distrusted to be associated with the use of medicinal products. It encourages the collection of fair safety data observed aimed clinical practice in 'real life' conditions. The rules have been created to help similar professionals on understanding the significance of ADRs monitoring, methods of detailing ADR and the four fundamental parts of a ADRs case report to enhance drug safety. The basic parts include data about the patient, explanation of the adverse drug reactions, distrusted drug(s) and the reporter.

In modern countries, ADR is the fourth important cause of the death because of poor reporting of side effect after having drugs. The cause for poor reporting is insensitivity and carelessness in the patient. Moreover, the nurse in the hospital to observe patient ache from side effect and describing to the treating physician is less. The doctor orders the excess dose and unwarranted mix of the drug. The doctor invests a small amount of time in diagnosis patient's symptoms and never clarifies about the drug regimen. In india ADR is barely report to the ADR observing centre of Pharmacovigilance Programme of India (PvPI). Reporting of ADR to PvPI is moderate since a large portion of the population of patients looks at the drug stores. Moreover, the doctor holds another medicine qualification and suggest for the allopathic drugs.

Compared association assess utilising the percentage of false positive signals between a given numbers of the most extremely ranked drug-case combinations concurring to the values of the association assess. By regarding 150 drugs and 100 adverse cases, the percentages of false positives, between the 500 most extremely ranked drug-case couples; changes from 1.1% to 53.4% (mean over 1000 simulated datasets). As the calculation guided to very different outputs, we could name which calculates seem to be the most applicable for pharmacovigilance ^[1]. Reviews of prescription drugs and those evaluated to be medium-risk will probably be identified utilising search query data. These determinations recommend that amassed internet search engine data can be utilised to help in early warning of faulty bunches of pharmaceuticals ^[2]. Reviews of prescription drugs and those evaluated to be medium-risk will probably be identified utilising search query data. These determinations recommend that amassed internet search engine data can be utilised to help in early warning of faulty bunches of pharmaceuticals ^[3]. It dependably shortlists not only six referred to ADRs, as well as another ADR, flucloxacillin potentially causing hepatitis, which our algorithm originators and examination runners have not known before the tests. The MUTARC execute substantially more effectively than existing methods. Here, shows the considerable potential along the new direction of ADR signal propagation from healthcare regulatory databases ^[4]. Broad investigation on medical forums dataset shows

that constrained information entropy (CIE) results from the state-of-the art co-occurrence based techniques, particularly in rare ADRs detection^[5]. A similar study between the evaluated frequencies has the similar dissemination trend. These outputs recommend that the naive Bayesian model based on gene-ADR connection network can assist as an economical and efficient tool in quick ADRs appraisal^[6]. Drug-target association studies are predicted adverse side effects or drugs unexpected therapeutic. In silico prevision of potential association are important and can concentrate effort on in vitro tests.^[7] The next phase demonstrates the use of FMECA to the process, to identify the vital problem and measure the risk decreases obtained utilising a specific IT tool, contrasted with the utilisation of current resources^[8]. The literal adverse drug effects on a handed dataset cannot be completely decided; we make utilisation of the simulated observational medical outcomes partnership (OMOP) dataset built with the determined adverse drug effects to assess our strategies. Experimental outcomes

demonstrate the convenience of the developed pattern discovery technique on the simulated OMOP dataset by enhancing the standard baseline algorithm-chi-square-by 23.83%^[9]. A PHARMA 2.0 telematics integrated telematics system proposed at decreasing Adverse Drug Events (ADEs) in the phases of drug provision, distribution, transcription and administration. The developed system is grounded on three sub-systems: an RFID-based drug container and dispenser, a CPOE (computerised Prescription Order Entry), and middleware system. The perception and management of prevision and administration data are covered through a web application planned to conform by international usability regulation^[10].

Methodology

The methodology of the Pharmacovigilance is integrated the orderly manner. The below diagram describes the methodology adopted in the Pharmacovigilance.

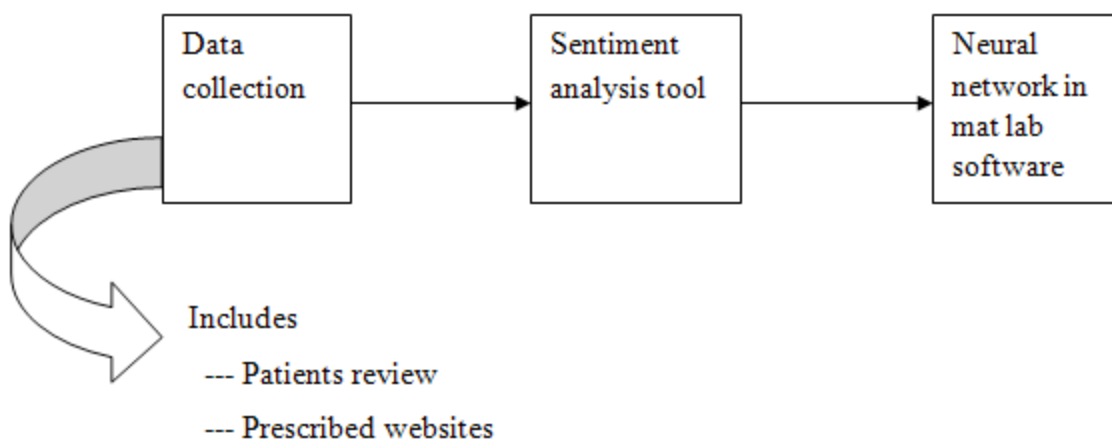


Figure 1. Methodology block diagram

Through the help of online modes, the data collections are done. In the online mode, the data collections are processed through the prescribed websites like as Webmd.com, drugs.com, druglib.com. emedicine.com and so on. The patient's reviews are collected from the website and processed through the online sentiment analysis tool.

The prescribed websites like WebMD.com and Drugs.com. The websites give information on drugs for healthcare professionals and consumers. The drugs which have utilised for the analysis is namely as

Benadryl, Vicodin, Adderall, amoxicillin, cetirizine and naproxen.

In Naproxen drug, the data are collected concerning the different filter conditions such as Pain, A disorder characterised by Stiff, Tender and painful, Rheumatoid Arthritis, Joint Damage making Pain and loss of function, inflammation of the tendon, A migraine headache, Inflammation of the lining of a joint, others, and All reviews, conditions and overall ratings. In such a way the data are collected to the other drugs concerning the filter conditions.

Sentiment Analysis

Sentiment analysis is contextual mining of content which recognises and extracts subjective data in the source material. To understand the customer's sentiment of your item, service or brand while monitoring online conversations. Parallel Dots Text Analytics APIs give convenient and various set of Natural Language Understanding (NLU) algorithms to detect emotion or sentiment of any document, find high entities in them or remove profane from them.

Text analysis is the procedure of filtration of high-end data through accomplished patterns and courses in a piece of text. Our parallel dots text analysis APIs execute importantly better than traditional NLP methods.

Online conversations of the reviewer text have been taken as input and gives the structured image as the output by conquering the meaning of that text. Our parallel dots text analysis APIs shows the sentiment analysis as positive, neutral and negative in Sentiment Analysis Tool . The text analysis calculates the high-quality data from the unstructured content collection from online posts such as WebMD.com and drugs.com. Once the output percentage comes out for the drug obtain from various website and the percentage values state-of-the-art dataset and then the data is analysed with conjugate gradient neural network through Matlab software.

Conjugate Gradient Neural Network

We assume a single-hidden-layer training network with a linear output. With the size of $L \times ML \times M$, an input weights matrix is $W^{in}W^{in}$, with M non-linear hidden units individual with the similar non-linear function $f(x)$, and N is a size of the linear output layer. The input data is held in the matrix X of size $K \times L$ $K \times L$. If a bias condition is needed in $W^{in}W^{in}$, a column of ones is considered in X. For a bunch of K input samples, individual of size $1 \times L1 \times L$, the reaction of the input linear addition stage matrix $Z^{in}Z^{in}$ of size $K \times MK \times M$ is measured using

$$Z^{in} = XW^{in}Z^{in} = XW^{in} \text{ ---- (1)}$$

The reaction of the hidden layer is produced by the matrix A of size $K \times MK \times M$ and measured using

$$A=f(Z)\text{----- (2)}$$

Where $f(Z)$ is a non-linear function. Example functions utilised by practician combines

the relu (rectified linear), tanh, logistic and square functions. The reaction of the output layer is linear and produced by the matrix Y of size $K \times NK \times N$ utilising

$$Y = AW^{out}Y = AW^{out} \text{(3)}$$

Where the output weight matrix $W^{out}W^{out}$ has the size as $M \times NM \times N$.

For the function of training an N-class classifier, we produce a $K \times NK \times N$ indicator matrix T with components $t_{k,n}t_{k,n}$ to represent the desired label or the target for the associated input data X. If the desired label of kth input data is in class n then $t_{k,n}t_{k,n}$ is 1 and other N-1 components of the kth row of T are 0.

For the conjugate gradient, the $W^{in}W^{in}$ is set to random numbers, and the $W^{out}W^{out}$ are calculated utilising linear regression. The cost function for the network is the sum square error of the output and is produced by

$$E = \sum_{all \text{ elements}} (Y - T)^2 = \sum_{all \text{ elements}} (AW^{out} - T)^2 \text{ -----(4)}$$

Where square indicates the element by element.

Regression analysis is a method for simulating the relationship among two or more variables. Regression method quantitatively explains the variability between the observations by dividing an observation into two parts. The first part of this decay is the predicted portion having the feature that can be assigned to all the observations believed as a group in a parametric system. The other portion is called as residual, is the difference between the predicted values and observed values must be assigned to unknown sources.

Simulated Results and Discussions

Table 1. Sentiment Analysis for Naproxen drug

S.NO	Naproxen drug by filter conditions	Positive	Neutral	Negative
1	Pain	28.20%	6.90%	64.90%
2	A disorder characterised by Stiff, Tender and painful	3.90%	4.50%	91.60%
3	Rheumatoid Arthritis	5.60%	7.50%	86.80%
4	Joint Damage making Pain and loss of function	5.60%	7.50%	86.80%
5	inflammation of the tendon	59.40%	6.90%	33.80%
6	painful periods	8.30%	2.40%	89.30%
7	A migraine headache	14.90%	37.00%	48.10%
8	Inflammation of the lining of a joint	26.50%	7.30%	66.20%
9	Inflammation of the covering of the Tendon	19.00%	4.70%	76.30%
10	Inflammation of the Sac surrounding the joint-Bursitis	5.70%	4.00%	90.30%
11	Rheumatic Disease-Causing Pain and stiffness in Backbone	2.00%	2.70%	95.30%
12	Gout	64.70%	15.80%	19.50%
13	Head pain	9.00%	2.40%	88.70%
14	Joint Inflammatory Disease in children and young adults	65.20%	4.50%	30.30%
15	Fever	51.10	16.60	32.30
16	Others	54.50%	3.90%	41.70%
17	All reviews, conditions and overall ratings	28.20%	6.90%	64.90%

Naproxen is utilised to relieve pain from different conditions such as dental pain, menstrual cramps, headaches, tendonitis, and muscle aches. It also decreases swelling, pain, and joint stiffness caused by bursitis, arthritis and gout attacks. The patients give their feeling as reviews by the intake of Naproxen drug. The sentiment analysis produces the result in the percentage as positive, neutral and negative respectively. According to the percentage value, we justify that the drug is good or bad to health. The results of Naproxen drug has shown in table 1.

Table 2. Sentiment Analysis for Vicodin drug

S.NO	Vicodin drug by filter conditions	Positive	Neutral	Negative
1	Pain	8.20%	11.50%	80.30%
2	Others	5.30%	1.80%	92.90%
3	All reviews, conditions and overall ratings	29.70%	11.50%	58.80%

Vicodin is a costless drug utilised to treat moderate to severe pain. The drug is more popular than the other drugs in the market. The patients give their feeling as reviews by the intake of Vicodin drug. The sentiment analysis produces the result in the percentage as positive, neutral and negative respectively. According to the percentage value, we justify that the drug is good or bad to health. The results of Vicodin drug have shown in table 2.

Regression value (R) foregrounds the correlation between the outputs and the targets. A value of R equals to one or zero suggests a closer relationship or a random relationship respectively. Based on the regression curve received (from fig.2 to fig.3), for various cases under the comparison of conjugate gradient methods to produce a statistical report. Figure 2 shows the regression value of social post in website, from the output R-value, is about 0.99801 proves that the reviews are matched between the drugs used at different conditions. Figure 3 demonstrates the regression value of social post in website, from the output R-value is about 0.76441 proves that the reviews are mismatched between the drugs used at different conditions. If the R value is negative, which demonstrate that the reviewer's comments are weak in feelings.

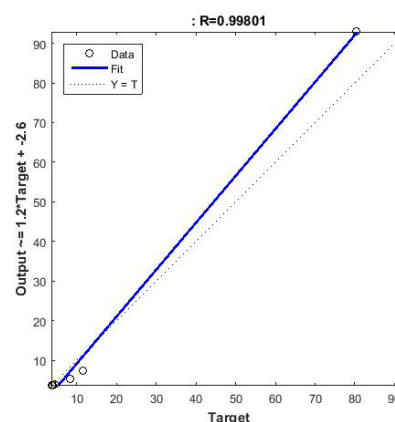


Fig. 2 Regression analysis for Vicodin drug

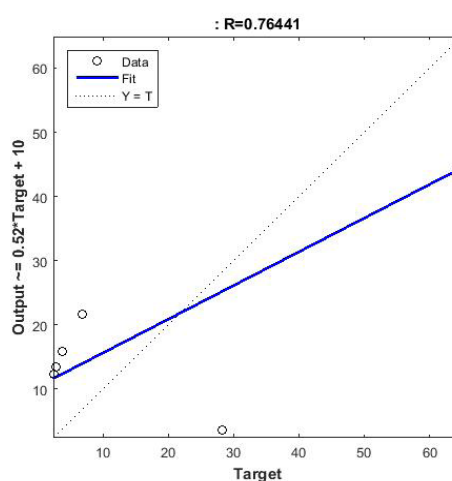


Fig 3. Regression analysis for naproxen drug

Table 3. Regression analysis for Naproxen drug

S.NO	Compared with the different conditions	Regression analysis
1	Pain vs Disorder characterised by Stiff, Tender and painful	0.99441
2	Pain vs Rheumatoid Arthritis	0.85411
3	Pain vs Joint Damage causing Pain and loss of function	0.93409
4	Pain vs inflammation of the tendon	0.94092
5	Pain vs painful periods	0.93793
6	Pain vs Migraine headache	0.74667
7	Pain vs Inflammation of the lining of a joint	0.99926
8	Pain vs Inflammation of the covering of the Tendon	0.99676
9	Pain vs Inflammation of the Sac Surrounding the joint-Bursitis	0.92407
10	Pain vs Rheumatic Disease-Causing Pain and stiffness in Backbone	0.89618
11	Pain vs Gout	0.76441

Cont... Table 3. Regression analysis for Naproxen drug

12	Pain vs Head pain	0.94551
13	Pain vs Joint Inflammatory Disease in children and young adults	0.69352
14	Pain vs Fever	0.78022
15	Pain vs others	0.79028
16	Pain vs all reviews, conditions and overall rating	0.99973

Conclusion

The reviews are collected from the prescribed websites like WebMD.com and drugs.com reports are processed for sentiment analysis. These processed sentiment analysis output are analysed in conjugate gradient neural network in MATLAB, and the regression value is determined and presented in the graph. This analysis gives an efficient way to detect the toxicity of the drug. Furthermore, the result demonstrates that the data collection from the websites proves to be more effective for the adverse drug reaction.

Ethical Clearance: VISTAS – Editorial Board, Chennai

Mode of Payment : Self

Conflict of Interest : Nil

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A Study of Asphyxial Deaths

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Abstract

An increasing death rate as a result of violence constitutes a large group in medicolegal autopsies. Specially, deaths due to asphyxia are one of the most important causes in violence deaths.

During the 5-year period from January 2013 to October 2018, there were 134 asphyxial deaths autopsied by the Department of Forensic Medicine, ACSR Government Medical College, Nellore. Asphyxial deaths comprise 15.7% of all forensic autopsies; 20.8% of the cases are aged between 30 and 39 years, and the average age was 41.9 years. Males constitute 79.8% of all the cases.

The most frequent method of asphyxiation death is hanging (56 cases, 61.8%), followed by drowning (32.6%) and More violent methods, such as ligature or manual strangulations, constitute 3.1% and 2.5% of all asphyxial deaths, respectively. Although it was varying according to the methods of asphyxiation, suicide was found to be the manner of death in the majority of the cases.

Keywords: *method of asphyxiation, manner of death, cause of death, autopsy*

Asphyxial death is a common incident in forensic practice, and determination of the manner of death is very important. The manners of death can be accidental, suicidal, homicidal, or natural due to main methods of asphyxia. In such deaths, autopsy plays a major role to solve the case; the scene investigation and collection of samples are also of importance.¹

Asphyxial deaths are divided into different methods, such as strangulations (hanging, manual, ligature), suffocations (environmental, smothering, choking, mechanical, suf-focating gases), chemical asphyxia (carbon monoxide CO, hydrogen cyanide, hydrogen sulfide), and drownings.¹ Additionally, in some cases, the victim dies as a result of the combination of different mechanisms of asphyxia. A case study from Romania² indicates that a victim was killed by 3 different mechanisms of asphyxia: smothering with the hand, manual strangulation³ with the other hand, and traumatic asphyxia by thoracic compression with the knees.

Autoerotic asphyxial deaths, positional asphyxial deaths, and neck holds are some other reported unusual forms of asphyxial deaths in forensic practice.

Materials and Method

This study is based on a retrospective investigation of asphyxial deaths that were autopsied by the Department of Forensic Medicine, ACSR Government Medical College, Nellore. In the period between January 2013 and January 2018, 4250 autopsies were performed all are of medicolegal autopsies.

Results

General Findings

During the period of 5 years, between January 2013 and January 2018, 4250 autopsies were performed; 852 (70.6%) of those 1206 cases were forensic cases. For the study group, 134 (15.7%) cases of asphyxial deaths were separated from all forensic autopsy records.

In this group, there were 107 males (79.8%) and 27 females (20.2%). The ratio of male to female was found to be 3.9:1.

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The ages of the cases in this study include children from day 6 after birth to adults aged 97 years. The mean age of the cases is 41.9 years. The age group of 30–39 years accounts for 20.8% of the cases, followed by those 20–29 years (19.4%) and 40–49 years (14.1%); 53.2% of the cases constitute the age group of 20–49 years.

Table 1 shows the detailed distribution of the cases according to the methods of asphyxiation, the manners of deaths, and gender. In the study period between 2013 and 2018.

Methods of Asphyxiation in Detail Hanging Deaths

In this study, the most common method of asphyxiation was hanging² (56 cases, 41.8%); 83.9% of those cases were male. The age ranged from 14 to 97 years, with a mean of 41.6 years. Most of the cases were in the age group of 25–30 years.. According to STA, Alcohol was detected in 5 cases (8.9%), plasma concentration being between 29 mg/dL and 93 mg/dL. There was

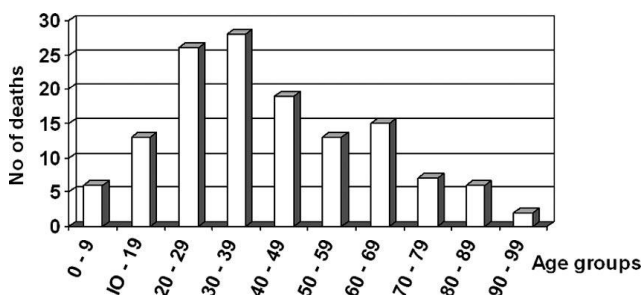


FIGURE 1. Age distribution of asphyxia-related deaths.

No evidence of violence occurring before the cases hanged themselves. Only 2 cases had small bruises. Seventy-six percent of the cases hanged themselves indoors, mostly at home.

In the records, a ligature mark on the neck was well described for all cases, and the knot of the loops was found to be tightly placed under the chin in 85.7% (n 48) of the cases. In 37 of 56 cases (66%), the suspension point was occipitally, 14 of 56 cases were laterally (right, left), and 5 of 56 cases were frontally localized. In these series, 26 of 56 victims (46.4%) had hyoid bone fractures, 10 of 56 victims (17.8%) had thyroid cartilage fractures, and 7 of 56 cases

(12.5%) had both hyoid bone and thyroid cartilage fractures. Gross bleeding in the neck muscles and other soft tissues was seen in 51.7% of the cases (n 29). Fifty-

four victims were found to be suspended freely, and the remaining 2 were incompletely suspended. All of the cases accepted suicide, according to the knowledge of the scene investigation files and autopsies.

Drowning Deaths

The second largest method of asphyxiation was drowning (41 cases, 30.5%); 90.2% of the cases were male. The age ranged from 6 to 94 years, with a mean of 42.7 years. Most of the deaths occurred in the summer months. STA was performed on only 8 cases, and Alcohol⁴ was detected in 2 cases, plasma concentration being 196 mg/dL and 242 mg/dL.

Of 41 cases, 30 cases (73.1%) were found in the river, 5 cases (12.1%) in the sea, 3 cases (7.3%) in a well, 2 cases in a dam, and 1 case in a small ditch.

The distributions according to the manner of death show that accidents accounted for 78.1% (n 32) of all cases, suicides such as jumping from a bridge to the river accounted for 17.1% (n 7), and homicidal cases accounted for 4.8%. Of the 32 accidental drowning cases, Autopsy and prosecution findings indicate that the perpetrators applied severe blunt force to the decedents, who then inhaled water in one case from a river and from the sea in another. In these 2 cases, the death was attributed to the combined effects of drowning and severe blunt-force injuries.

Ligature Strangulation Deaths

In this category, there were 4 cases (3.1%), 3 of which were females. The age ranged from 1.5 to 58 years. Fifty percent of the cases were homicide, and 1 of the female case had vaginal sexual assault⁶. Intravaginal swab samples were positive for the presence of spermatozoa by microscopic examination, and there were acute injuries involving hymenal tears and bruises.

Manual Strangulation Deaths

During a 21-year period, there were only 3 manual strangulation deaths, 2 of which were females. One male case had severe body trauma that was antemortem. The manner of death was homicide in all cases. Table 6 shows the descriptions of manual strangulation deaths in detail.

Choking and Aspiration Deaths

There were 4 cases (2.5%) in this category. The age ranged from 5 days after birth to the age of 36 years.

Three of them were male. One case, known as an epilepsy patient, died of aspiration of gastric contents during an epilepsy attack. The other case, a baby 5 days old, died of aspiration of milk while suckling. The manner of death is accident in all cases. Table 4 shows the descriptions of choking deaths in detail and aspirated materials.

Discussion

Asphyxial deaths are caused by the failure of cells to receive and/or use oxygen. Brain is most sensitive to oxygen deprivation, and it is the organ mostly affected in all types of asphyxial deaths. However, cardiac function usually continues for several minutes after respiratory arrest.

Autopsy plays an important role for the investigation, and the collection of samples is of value in the reconstruction of the cases.

In Table 1, the methods of asphyxiation and the manners of death are shown in detail. In this region, hanging is the most common method of asphyxiation (41.8%), followed by drowning (30.5%), CO poisoning (8.2%), and compressive asphyxia (5.3%). The other rare methods are environmental suffocation⁵(forced depletion of oxygen), choking and aspiration of gastric contents, ligature and manual strangulations, and smothering, which constitute 2.3%–3.8% of asphyxial deaths.

The distribution according to manners of death showed that suicides accounted for 47% of asphyxial deaths and accidents 44%, while homicides were 9% of all cases.

Conclusion

Asphyxial deaths constitute 15.7% of all forensic autopsies in the total autopsies. It has been the fourth or

fifth leading cause of death, changing over the years. Asphyxial death rates in forensic autopsy series from other cities in Nellore were between 6.7% and 14.7%.

Most deaths are hangings are suicidal, being 100% of cases in this study. There is only 1 case defined as an adolescent suicide at the age of 14 years, who hanged himself at home.

Accidental hangings are uncommon and constitute nearly 5% of all hangings. Deaths due to accidental hanging. Around 5% cases are strangulation and remaining are 0 to 1 % prevalent.

Ethical Clearance- Taken from Ethical committee

Source of Funding- Self

Conflict of Interest - Nil

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Deaths Due to Electrocution in Central India: A Study of Two Years

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Abstract

This study has been carried out to find out the incidence of deaths due to electrocution in Nagpur with special emphasis on finding out the circumstances along with pattern of injuries sustained by the victims. Medico legal autopsy cases with history of electrocution over period of 2012 to 2013 were included in this study.

A total of 74 deaths due to electrocution were studied in which male's outnumbered females. Approximately half of cases was observed in the age group of 21-30 years (36 cases i.e 48.64%) which included 05 females. More than 2/3rd i.e 56 victims (71.6%) were electrocuted by low tension domestic supply, out of which 38 were electrocuted at home. 18 victims (24.4%) were electrocuted by high tension current. Only 03 victims survived for period of 24-48 hours whereas 71(95.9%) victims died on the spot. In half i.e 52.4% of the cases only entry wound was present, followed by presence of both entry and exit wound in 36.4% cases. Information gathered from police documents and history by relatives revealed that almost all of the electrocution deaths were because of accidental electrocution, only two suicidal cases were observed. Most common histo-pathological finding was focal separation of dermis and epidermis, epidermal nuclear elongation and palisading. The risk of getting electrocuted in domestic surroundings from the haphazardly installed electric wires without proper maintenance is indeed a matter of concern. Adoption of proper insulation safety measures are important factors required for prevention of fatal electrocution.

Keywords: Electrocution; Domestic supply; Accidental; Suicide; High tension wire.

Introduction

Electricity is such an integral part of modern life, that it is hard to imagine life without it. But, with the advantages and convenience of electricity come the hazards as well.¹

Electricity is a ubiquitous energy agent to which many workers in different occupations and industries are exposed daily in the performance of their duties. In addition, many people in different daily activities deal with it.²

The use of electricity may result in cases of morbidity or mortality¹ which are usually preventable with simple safety measures. Almost all fatalities by electrocution are accidental, while homicides and suicides from electricity are rare or uncommon.³

The National Electrical Code describes highvoltage as greater than 600 V AC. Most utilization circuits and equipment operate at voltages lower than 600 V, including common household circuits (220/240 V).⁴

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Death due to electrocution involves both low- and high-voltage currents, however, most deaths are due to low-voltage currents used in houses and minor industrial settings. The type of power system employed in India is an AC 220–240 V, 50 A.⁵

A distinct pattern is seen in deaths due to electrocution all over the world. In the Western world, accidental deaths caused by electrocution are not common owing to the good safety measures and high level of awareness. However, many cases of suicides are reported. As against this, in developing countries like India, accidental deaths caused by electrocution are far more common than suicidal deaths.¹

Fatal injuries caused by electricity do occur and can present a challenge for the forensic pathologist performing the autopsy. One of the crucial signs on the body of a person who suffered a fatal injury from electric current is an electrical mark, which is often the only evidence of contact with electricity. There is a great diversity in the prevalence and appearance of electrical marks. Due to possible absence of distinctive morphological findings on the body, electrocution as a cause of death is often established by exclusion of other possible causes and supported by circumstantial evidence collected at the scene of the incident.⁵

In this study, we analyzed the prevalence of electrical marks on examined victims of electrocution and other available information about the fatal event in Nagpur which is a rapidly developing and expanding city of Maharashtra leading to increased use and dependence of population of Nagpur on electric appliances. This study: highlights the magnitude of the problem of home and occupational accidental electrocutions in Nagpur, and provides recommendations for developing effective safety programs to reduce the risk of electrocution. It is hoped that this study will serve as a valuable resource for safety and public health professionals, trainers, researchers, and others who can affect the prevention of accidental electrocutions.

Material and Method

An observational prospective study was done on unnatural deaths from Nagpur, which were autopsied at Dept. of Forensic Medicine & Toxicology, Indira Gandhi Govt. Medical College, Nagpur, India. Of the 3435 cases performed on all types of unnatural deaths between 1 January 2012 and 31 December 2013, 74 deaths (2.15%)

were due to electrocution. These 74 electrocuted cases form the material of this study

For the purposes of this study, electrocution deaths were divided into two categories i.e due to low-voltage (<600 V) and high-voltage (>600 V). Lightning-related deaths were excluded from this study. General information about these cases was collected from the history, the police papers and post mortem reports. This information was then entered in a proforma made for this purpose and there after analysed. The cases were evaluated in terms of age, sex, type of electric mark, body region distribution, place and season of occurrence, contact details, the duration of hospitalization before death, the manner of death and potential risk factors for fatal injury.

Results

Out of total 3435 cases 74 deaths (2.15%) were due to electrocution in which male's outnumbered females (62 males:12 females, ration 5.17:1). The highest number of cases was observed in the age group of 21-30 years (36 cases i.e 48.64%) in which only 5 were females. 56 victims (71.6%) were electrocuted by low tensions domestic supply out of which 38(67.8%) were electrocuted at home by iron, switches, cooler and other household appliances. 18 victims (24.4%) were electrocuted by high tension current. 03 victims survived for period of 24-48 hours while 71(95.9%) victims died on the spot. 59 (79.73%) victims were electrocuted in dry conditions. In most of the cases i.e 52.4% only entry wound was present, followed by presence of both entry and exit wound in 36.4%. In 01 case there was no entry or exit wound. Most common part of body involved was upper limbs. As per police documents and history by relatives most of the electrocution deaths in the present series were accidental cases and two suicidal cases were noted. Most common histopathological finding was focal separation of dermis and epidermis, epidermal nuclear elongation and palisading. Metallic residues was present in 02 cases.

Discussion

In this study males accounted for a major number of fatalities (83.8%), similar result was observed with the work of other researchers¹⁻¹⁶.

Most of our cases fell in the age group of 21 – 30 years (48.65%). This finding is also in consistency

with the work of others^{6,7,8,11,13,14,15,16} though Rautji et al⁸ narrowed down the range to 21-40 years and Dokov classified age group as 25-44 years similar to work of other researchers^{1,2,3,4,5,12}. Surprisingly, the age group of 0-10 years was also not spared. In our study there were 4.05% cases in this group while in another studies from India Bharat et al¹⁴ reported 4.8%, Ananda Reddy et al¹⁶ reported 18 per cent and from the one in Turkey it was 31.7%.³

In the present study, electrocution deaths accounted for 2.02% of total, while Rautji et al⁸ reported the figure of 1.98 per cent and Tirasci et al⁶ reported 3.3%. In terms of deaths due to electrocution per one lakhs population the figure turns out to be 4.4. This is significantly higher when compared to studies done by Dokov et al¹⁰ in Bulgaria and Laupland et al¹² in Canada who reported the figures of 0.94 and 0.14 respectively. The average number of fatalities reported by Dokov et al¹⁰ was 35 in the span of 22 years, while in our study it was about 37 per year. Obviously many factors like more population, more illiteracy amongst the general public, lack of awareness about the hazards of electricity, poor maintenance of equipments and wire linings etc. must have been responsible for this difference.

We observed that most common part of body involved was upper limbs which is consistent with findings of other researchers^{1,2,3,4,5,6,13,14,16}.

In our study, in 33(43.33%) cases, only entry marks were seen and both entry and exit marks were seen in 22(30 %) cases. In contrast to the findings of the other worker^{1,2,6,11,13,16} who had figures as high as 72 % for cases with both entry and exit marks. In our study there was 01 (1.67%) cases lacking a mark of electrocution. Such cases were seen in the rainy season, first being the easy passing of current in damp material and second the lowered resistance of skin of the victims due to wetness or dampness. In such cases the cause of death was ascertained by inference after full legal and medical investigations.

Tirasci et al³ reported wet cases of electrocution using bathtubs, heaters and hair dryers. However, we did get cases of electrocution due to involvement of water by way of the effects. In fact, the wet surrounding was responsible for 15 (20.27 %) cases in the present study while in 79.73% cases surroundings were dry. This observation is in contrast with findings of B.D Gupta

et al¹ who observed 75% deaths in wet surroundings. Approximately 1/3rd deaths i.e 28 (37.84%), were concentrated in three months of the year, namely June, July and August. These are the months of monsoon in this part of the world. These findings are consistent with the findings of other worker^{1-6, 10,11,15,16} however Biradar Gururaj et al⁸ reported more deaths in months of September to december. Tirasci et al³ also report maximum number of cases in the months of June, July and August but the season during this period in Turkey is summer rather than monsoon.

Most of our victims 51.35 % suffered electrocution in the surroundings of home similar to observations of many researchers^{1,3,5,6,8,10,11,15,16}. Few other researchers^{2,6,7,13} observed contrasting results of more electrocution at other locations like workplace. Similar to the observation of researchers^{1,2,3,5,6,8,11,13,15} it was observed that 71(95.9%) victims died on the spot.

All deaths, except 02 cases in our study were accidental, the exception was suicidal. This observation is in similarity with that most of other researchers^{1-8,13,16}. The suicide cases comprised of one case electrocuted by climbing an train engine and other by putting his hand in main power distribution box situated near his house, in both cases eye witness were available.

Most common histo-pathological finding was focal separation of dermis and epidermis, epidermal nuclear elongation and palisading which are similar findings have been reported by Manish Shrigiriwar et al⁷.

Table-1 : Distribution of cases according to age

Age in years	No. of subjects	Percentage
0-10	3	4.05
11- 20	9	12.16
21- 30	36	48.65
31- 40	13	17.57
41- 50	9	12.16
51- 60	3	4.05
61- 70	1	1.35
Total	74	

Table no. 1 shows distribution of cases according to age. Most common age group was 21-30 years followed by 31-40 years

Table-2: Distribution of cases according to place of incident

PLACE	No. of subjects	Percentage
HOUSE	38	51.35
WORKPLACE	15	20.27
INDUSTRIAL	1	1.35
ROAD	6	8.11
OTHER	14	18.92

Table no. 2 shows distribution of cases according to place of incident. Commonest place of incidence was house followed by workplace.

Table -3: Distribution of cases according to surrounding of place of incident

CONDITIONS	No. of subjects	Percentage
DRY	59	79.73%
WET	15	20.27

Table no. 3 shows distribution of cases according to surrounding of place of incident. More than 3/4th cases were reported in dry surroundings.

Table-4: Distribution of cases according to voltage

VOLTAGE	No. of subjects	Percentage
HIGH	18	24.32
LOW	56	75.68

Table no. 4 shows distribution of cases according to voltage involved. In 3/4th cases low voltage was the cause of electrocution.

Table-5: Distribution of cases according to site of electrocution mark

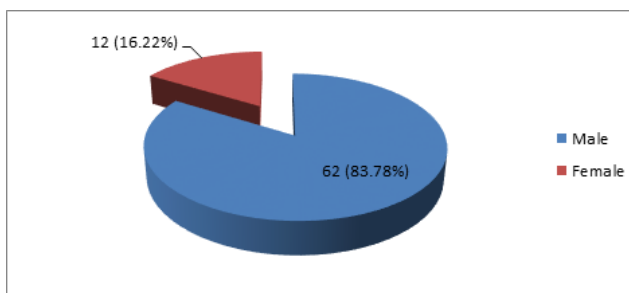
SITE	No. of subjects
HEAD NECK FACE	13
CHEST	8
ABDOMEN	11
BACK	13
UPPER LIMBS	RIGHT 27 LEFT 26
LOWER LIMBS	RIGHT 13 LEFT 13
GENITALS	6

Table no.5 shows distribution of cases according to site of electrocution mark. Most common part involved was upper limbs > lower limbs. Table contents injuries present over multiple parts of body.

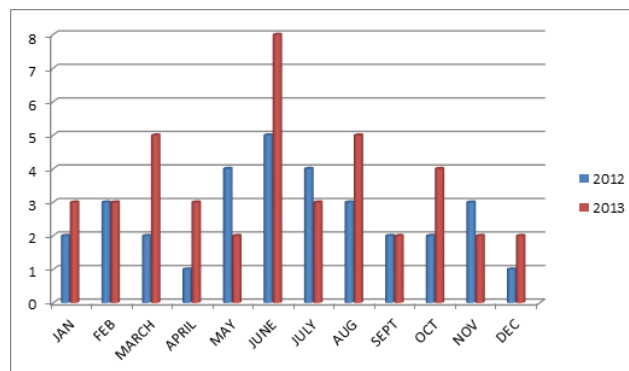
Table-6: Distribution of cases according to type of injuries present over body

TYPE OF INJURY	No. of subjects	Percentage
NO INJURY	01	1.68
ENTERY WOUND	33	43.33
BOTH ENTERY AND EXIT WOUND	22	30.00
FLASH BURNS	06	8.33
CHARRING	12	16.68

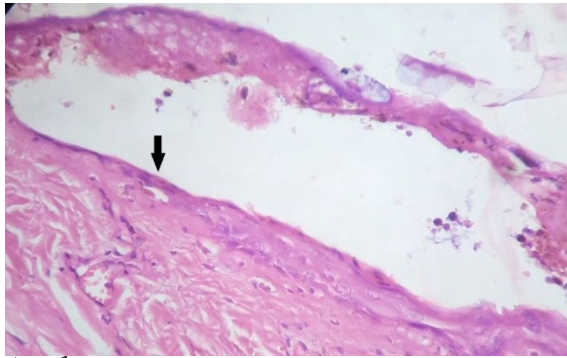
Table no. 6 shows distribution of cases according to type of injuries present over body. Only entry wound was observed in maximum number of cases.

**Graph -1: Distribution of cases according to gender**

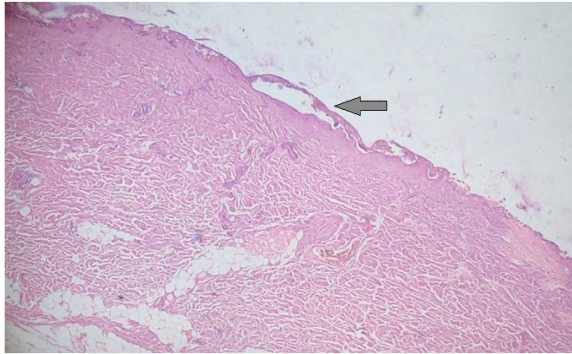
Graph 1 shows gender wise distribution of cases, 83.78% cases were males.

**Graph 2: Month wise distribution of study cases.**

Graph 2 shows month wise distribution of cases. Maximum deaths occurred in month of June (17.57%) followed by August (10.8%).



Picture 1:



Picture 2:

Most common histopathological findings was focal separation of dermis and epidermis (pic 1), epidermal nuclear elongation and palisading (pic 2).

Conclusion

- Most of the electrocution deaths were accidental,
- Males were the predominant victims.
- In the rainy season, more than 1/3rd deaths occurred.
- Most of the deaths were either instantaneous or immediate.
- Rate of fatality is significantly higher in India as compared to western part of the world
- More than 73.54 per cent deaths occurred in domestic surroundings. It signifies that people living at home did not have elementary knowledge of risks of electrocution.
- Most of the deaths were preventable.

Conflict of Interest – no conflict of interest

Source of Funding- self

Ethical Clearance– approval taken from institutional ethical committee.

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Effect of an Aggression Management and Violence Prevention (AMVP) Training Programme among Nurses Working in Psychiatric and Emergency Settings

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Abstract

Introduction: Aggression is a professional hazard for those who are employed in the psychiatric setting. There is evidence that 52% of the nurses working in the emergency department experience physical or other violence from clients. There are not many studies conducted in India regarding the application of aggression management training in a psychiatric setting. **Material and Method:** A quantitative method was used for implementing a participatory training programme. There were 44 trainer group nurses and 138 trainee group nurses from psychiatric, emergency and intensive care settings. The trainer group nurses were trained by the investigator and the trainee group nurses were trained by the trainer group nurses. An interpretive exercise was developed and validated to assess the competency of the nurses on aggression management and violence prevention. There were two posttests for the trainer group nurses and there was one posttest for the trainee group nurses. **Results:** Among the trainer group nurses, majority (93.2%) of the nurses were non-competent during the pre-test. But all the nurses (100%) were competent during the post-test one and the post-test two. Among the trainee group nurses, majority (97.1%) of the nurses were non-competent during the pre-test and all the nurses (100%) were competent during the post-test. Majority of the key personnel (82%) opined that, their staff perform better aggression management practices after the training programme. **Conclusion:** An aggression management and violence prevention (AMVP) training programme based on participatory approach was found to be more effective to empower the nurses to work in psychiatric and emergency settings.

Keywords: participatory training programme, aggression management, violence prevention, nurses from psychiatry and emergency settings.

Introduction

Aggression is a professional hazard for those who are working in the mental healthcare setting¹.

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It is the responsibility of the nurses to arrange a safe environment for the clients, caregivers and other healthcare providers working in a psychiatric setting. During the last decade, the research on violence has increased and knowledge about different aspects of violent behaviour by clients in a psychiatric unit has grown. The concept of AMVP training programme for nurses working in the psychiatry, emergency and intensive care departments is not well implemented in the Indian setting.

Client related aggression is an enduring problem in psychiatric setting. It is a multidimensional problem

with serious concerns. These aggressions are verbal or physical and most of the time towards healthcare providers. Around 20-45% of hospitalized clients with psychiatric disorder shows violent behaviour. It has been reported that the prevalence of violence experienced by the mental healthcare workers due to aggressive client behaviour is between 14% and 61%². There is considerable evidence to show that training the nurses in psychiatric setting leads to minimization of aggressive behaviour in the clients. The client directed violence in psychiatric-mental healthcare setting may be reduced by providing violence prevention training for nurses and other healthcare providers.

There are not many studies conducted in India regarding the application of aggression management training in a psychiatric setting. There is a need in the Indian setting to develop an eco-system for the nurses and the clients to deliver safe and secure psychiatric nursing care. As per the new Mental Healthcare Act of 2017; healthcare providers need to be trained in order to safeguard the rights of the clients³. There is a need for training the nurses regarding the safety processes to be followed while restraining a patient. Therefore, an AMVP training programme was planned among nurses working in psychiatric facilities, emergency room, and intensive care units, who are dealing with aggressive and violent patients.

Material and Method

A quantitative approach was used for implementing a participatory training programme on aggression management and violence prevention. The training programme was implemented in 10 selected hospitals of Udupi and Dakshina Kannada districts of Karnataka. The sample size was calculated based on the findings of the pilot study. There were 44 trainer group nurses and 138 trainee group nurses for the AMVP training programme. Among the trainer group nurses, 24 were from psychiatric setting, 13 were from emergency setting and 7 were from intensive care unit. Among the trainee group nurses, 78 were from a psychiatric setting, 32 were from an emergency setting, and 28 were from the intensive care unit. The trainer group nurses were trained by the investigator and the trainee group nurses were trained by the trainer group nurses. There were

two posttests for the trainer group nurses at an interval of 7 days and 3 months and there was only one posttest for the trainee group nurses after 7 days of the training programme.

The present study used purposive and convenient sampling techniques. Trainer group nurses were selected based on the suggestion given by the nurse administrators of respective hospital. Nurses having minimum 6 months of experience in psychiatric, emergency or intensive care unit were selected as trainee group nurses. Nurse administrators who were actively involved in supervising the trainer and trainee group nurses were selected as key personnel to collect the overall opinion about the AMVP training programme.

The data collection instruments comprised of demographic proforma, interpretive exercise to assess the competency of nurses on violence prevention and aggression management, and opinionnaire to assess the impact of AMVP training programme. Validity, pretesting, reliability and pilot study were carried out prior to the data collection. Ethical approval was obtained from institutional ethical committee of XXXX Hospital, Mangaluru. An informed consent was taken from the participants after elucidating about the study and Participant Information Sheet was also distributed. The total duration of the study was 24 months.

The AMVP training programme consisted of the following components. A self-learning material on aggression management and violence prevention, a video presentation on aggression management techniques and safe use of soft limb restraints, interactive session on basics of aggression management, a demonstration on safe use of soft limb restraints and techniques of self-protection, and simulated situations to practice violence prevention and aggression management techniques.

Results

SPSS-16 software was used to analyse the quantitative data. The data were analyzed separately for trainer group nurses and trainee group nurses. The results are as follows.

Training for Trainer Group Nurses:**Table 1: Frequency and Percentage Distribution of Characteristics of Trainer Group Nurses**

N=44

Variable	Frequency (f)	Percentage (%)
Age (in years)		
20-30	24	54.5
31-40	7	15.9
> 40	13	29.5
Gender	11	25
Male	33	75
Female		
Professional qualification		
Diploma	30	68.2
Graduation	11	25
Any other	3	6.8
Designation		
Staff Nurse	28	63.6
Ward in-charge	8	18.2
Nurse administrator	8	18.2
Current area of work		
Psychiatry	24	54.5
Causality	13	29.5
ICU	7	15.9
Total years of experience		
1-3	13	29.5
4-6	6	13.6
>6	25	56.8

The data presented in table 1 show that 54.5% of the trainer group nurses were between the age group of 20-30 years. Among them, 75% were females and 68.2% were studied diploma in nursing. Sixty-four percentage

of the nurses were staff nurses by designation. Maximum nurses (54.5%) were from a psychiatric setting. Most of the nurses (56.8%) had more than 6 years of experience as a nurse.

Table 02: Level of Competency of Trainer Group Nurses

N=44

Competency Level	Range of Score	Pre		Post one		Post two	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Non-competent	0-17	41	93.2	-	-	-	-
Partly competent	18-20	3	6.8	-	-	-	-
Competent	21-34	-	-	44	100	44	100

The data presented in table 02 show that majority (93.2%) of the nurses were non-competent during the pre-test. But, all the nurses were competent (100%) during post-test one and post-test two.

Table 03: Area Wise Competency of Trainer Group Nurses

N=44

Areas of competency	Maximum possible score	Pre -test Mean±SD	Post-test I Mean±SD	Post-test II Mean±SD	Actual Gain	Actual % Gain
De-escalation	07	2.8±1.2	5.7±0.98	5.9±0.97	3.1	44.29
Self-protection	08	2.7±1.2	5.8±1.01	5.9±0.99	3.2	40.00
Restraining	04	2.3±1.1	3.7±0.5	3.9±0.4	1.6	40.00
Prevention	07	2.9±1.2	5.3±1.2	5.7±1.01	2.8	40.00
Other AMVP Techniques	08	2.7±1.3	4.1±1.5	4.4±1.7	1.7	21.25

The data presented in table 03 show that the mean post-test one and post-test two competency scores are higher than mean pre-test competency scores in all the areas of competency. The actual percentage gain is more in the area of de-escalation (44.29) and less in the area of other AMVP techniques (21.25).

Fisher's exact test revealed that there was no significant association between competency and selected demographic variables and it was inferred that aggression management and violence prevention related competency of trainer group nurses who participated in the AMVP training programme was independent of their age, gender, professional qualification, designation, current area of work, and years of experience.

Repeated measures one-way ANOVA test was carried out to find out the effectiveness of AMVP training programme among trainer group nurses. The test result showed that there was a significant difference in the competency of trainer group nurses who were participated in the AMVP training programme between the pre, post I and post II test scores, i.e., $p < .05$. It was also inferred that the competency increased significantly immediately after the training, and the performance was consistently higher three months after the training programme.

Training for Trainee Group Nurses:**Table 04: Frequency and Percentage Distribution of Characteristics of Trainee Group Nurses**

N=138

Variable	Frequency (f)	Percentage (%)
Age (in years)		
20-30	86	62.3
31-40	19	13.8
> 40	33	23.9
Gender		
Male	15	10.8
Female	123	89.1
Professional qualification		
Diploma	88	63.8
Graduation	45	32.6
Any other	5	3.6
Designation		
Staff Nurse	116	84.1
Ward in-charge	17	12.3
Nurse administrator	5	3.6
Current area of work		
Psychiatry	72	52.2
Causality	38	27.5
ICU	28	20.3
Total years of experience		
1-3	72	52.2
4-6	17	12.3
>6	49	35.5

The data presented in table 04 show that most of the (62.3%) trainee group nurses were between the age group of 20-30 years. Majority of them (89.1%) were females. Majority of them (63.8%) studied diploma in nursing. Eighty-four percentage of the nurses were staff nurses by designation. Maximum nurses (52.2%) were from psychiatric area. Maximum nurses (52.2%) had 1-3 years' experience as a nurse.

Table 05: Level of Competency of Trainee Group Nurses

N=138

Competency	Range of Score	Pre test		Post test	
		Frequency	Percentage	Frequency	Percentage
Non-competent	0-17	134	97.1	-	-
Partly competent	18-20	4	2.9	-	-
Competent	21-34	-	-	138	100

The data presented in table 05 show that majority (97.1%) of the nurses were non-competent during pre-test and all the nurses were competent (100%) during post-test.

Table 06: Area Wise Competency of Trainee Group Nurses:

N=138

Area		Maximum possible score	Mean	SD	Mean %	Actual gain	Actual % Gain
De-escalation	Pre	07	2.6	0.89	37.1	3	42.86
	Post		5.6	0.98	80		
Self-protection	Pre	08	2.3	0.9	28.8	3.1	38.75
	Post		5.4	1.2	67.5		
Restraining	Pre	04	2.2	0.9	55	1.3	32.50
	Post		3.5	0.5	87.5		
Prevention	Pre	07	2.2	0.9	31.4	2.9	41.43
	Post		5.1	1.1	72.9		
Other AMVP Techniques	Pre	08	1.9	0.9	23.8	2.3	28.75
	Post		4.2	1.2	52.5		

The data presented in table 06 shows that the mean post-test competency scores of trainee group nurses are greater than the mean pre-test competency scores in all the areas of competency. The actual percentage gain is more in the area of de-escalation (42.86) and less in the area of other AMVP techniques (28.75).

Chi-square test revealed that there was no significant association between competency and the selected demographic variables and it was inferred that aggression management and violence prevention related competency of trainee group nurses who participated in the training programme was independent of their age, gender, professional qualification, designation, current area of work, and total years of experience.

Paired sample t test was carried out to find out the effectiveness of AMVP training programme among trainee group nurses. The test result showed that there was a significant difference in the average competency between pretest and posttest ($p < .05$). It was inferred that in the present study there was significant increase in the competency of the trainee group nurses who have undergone the AMVP training programme.

Opinion from Key personnel:

N=26

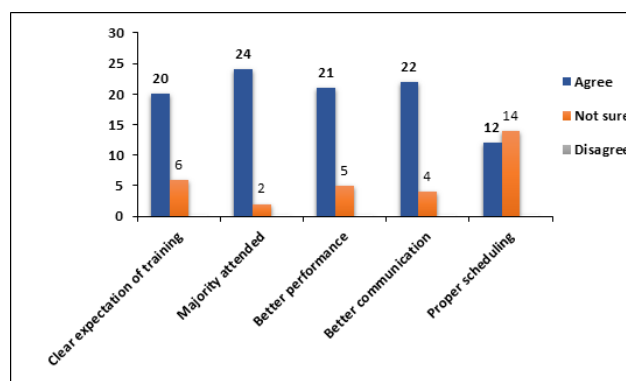


Figure 01: Cluster bar diagram showing opinion of key personnel regarding AMVP training programme

The data presented in figure 1 show that majority of the key personnel (92%) expressed that, most of their staff attended the AMVP training programme. Following the participation in the training programme, majority of them (81%) found that their staff perform better aggression management practices. The majority of the key personnel (85%) also expressed that the educational sessions which their staff received, helped them to communicate more efficiently concerning aggression management related matters.

Discussion

The current study revealed that the AMVP training programme was very effective in improving the competency of nurses; especially to improve the competency in using de-escalation and other techniques, self-protective measures, safe use of restraints, and preventive measures. The training was found to be effective for both the trainer group nurses and the trainee group nurses.

The present study was supported by a study done by Grube et al., (2001) to find out the effectiveness of a self-defense training to control aggressive behaviour. The result showed that the training increases the degree of self-protective behaviour and concurrently decreases the amount of strain in violent situations⁴. The present study also revealed that the AMVP training programme developed confidence in many of the nurses and also motivated the nurses to think positively about aggression management.

A study done by Arguvanli et al., (2015) concluded that the AMVP training programme was very effective in improving the knowledge and developing a favorable attitude towards aggression management and violence prevention among nurses. The mean knowledge score was 40.7 ± 18.2 before the training, 75.2 ± 22.4 immediately after the training and 68.1 ± 24.0 after three months of the training⁵. Whereas the present study has a slight increase in the mean score 3 months after the training programme, this may be because of the assessment of competency instead of assessing only the knowledge.

A one group pretest-posttest study done by Mthuvanakatachalam et al., (2014) show that there was a significant improvement in the knowledge score regarding aggression management after the training programme (<0.001 ; paired sample 't' test). The mean pre-test score was 7.97 ± 2.8 and the post-test score was 11.63 ± 1.9 ⁶. The study was conducted for the multi-disciplinary team members in a psychiatric setting. These findings were in harmony with the present study findings.

Conclusion

The present study revealed that the AMVP training programme developed confidence in many of the

nurses and also motivated the nurses to think positively about aggression management. Training of trainers and motivating the trainers to train the trainees will help to improve the competency of both trainer and trainee group nurses in aggression management and violence prevention. The AMVP training programme can be made mandatory for a newly hired employee in psychiatric and emergency settings.

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Source of Funding: Self

Ethical Clearance: Ethical clearance was obtained from institutional ethics committee of Kasturba Medical College, Mangaluru.

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Road Traffic Accidents: Development's Collateral Damage and a Major Public Health and Economic Concern

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Abstract

Road construction is viewed as a core development activity. The unfortunate downside of this is the increasing burden of Road traffic Injuries (RTIs). 50 years ago, the WHO was called upon to do something about the heavy human toll of RTIs. However, RTIs remain a very significant contributor to human morbidity and mortality. It is significant to note that the burden of RTIs has shifted to low and middle income countries (LMICs), which despite having only about 50% of the world's motor vehicles, account for 90% of the burden of 12.5 lakh road traffic deaths and 2 to 5 crore non fatal road traffic injuries. UN Sustainable development goal (SDG) target 3.6 is to reduce by 50% the number of deaths and injuries from road traffic crashes across the globe by 2020. This implies the saving of 50 lakh lives, the prevention of 5 crore serious injuries, and an economic benefit to the tune of over US\$3 trillion. This is a major challenge. The WHO says that RTIs have a significant negative macroeconomic impact in LMICs. The loss to national GDP ranges from 1.03 percent in South Korea to 2.9 percent in Vietnam. Reducing RTI morbidity and mortality by 50% over a 24 year timeline can generate an additional flow of income equivalent to 22.2 % GDP (2014) in Thailand, 15% in China, 14% in India, 7.2% in the Philippines and 7.1% in Tanzania. RTI deaths in India have consistently increased year on year from 1990 to 2015.

Key words: Road traffic accidents, public health concern, economic burden

Introduction

Road construction is viewed as a core development activity. The unfortunate downside of this is the increasing burden of Road traffic Injuries (RTIs). 50 years ago, the WHO was called upon to do something about the heavy human toll of RTIs. However, RTIs remain a very significant contributor to human morbidity and

mortality. It is significant to note that the burden of RTIs has shifted to low and middle income countries (LMICs), which despite having only about 50% of the world's motor vehicles, account for 90% of the burden of 12.5 lakh road traffic deaths and 2 to 5 crore non fatal road traffic injuries. UN Sustainable development goal (SDG) target 3.6 is to reduce by 50% the number of deaths and injuries from road traffic crashes across the globe by 2020. This implies the saving of 50 lakh lives, the prevention of 5 crore serious injuries, and an economic benefit to the tune of over US\$3 trillion. This is a major challenge. The dramatic increase in vehicle density and traffic volumes in LMICs has naturally increased the opportunities for crashes.¹

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With the increase in road construction in rural areas, the burden of RTI mortality and morbidity has also increased sharply.² LMICs also suffer from the phenomenon of a death rate per vehicle sharply higher than in high income settings. This can be attributed to the lack of ability or political will in the LMIC settings to fund traffic regulations enforcement, maintenance of roads and improvements in road design. Drastic increases in RTI mortality were noticed by the mid 1970s in countries like Panama, Guatemala, Jamaica and Peru.³ The trend in high income countries has been the exact opposite. From 1990 to 2015, the average mortality from RTIs in the OECD countries came down from 22 to 8 per 1 lakh population. An outstanding example is Australia, where obvious interventions like fining and prosecuting drunk driving, strict imposition of driving speed limits and the use of road and vehicle safety devices drastically brought down the RTI mortality rate by 83% from 30 per 1 lakh population in 1970 to 5 per 1 lakh population in 2010. In 1993, the World bank estimated that 74 % of global RTI deaths were in LMICs.⁴

Despite the knowledge of solutions to lower RTI rates, the global burden of RTIs continues to rise. With government attention and investment divided across a plethora of issues and concerns, road safety seems to end up as a low priority concern. The evidence, however, suggests that RTIs are not just a public health concern, but also an economic one. The WHO says that RTIs account for the largest share of long term disability and mortality in the 15-29 age group. They also account for a significant chunk of morbidity and mortality in the 15-64 age group.⁴ Men account for 75% of RTI deaths. This places tremendous financial strain on families, especially in societies where men are generally the primary source of income. Rural areas suffer a disproportionately high burden of morbidity and mortality from RTIs. This can worsen already existing deficiencies in human resources in places that are productive economically but seeing migration to urban areas.⁵

Discussion

RTIs are catastrophic for low income households and households moving out of poverty, in particular in settings without universal health coverage requiring high out of pocket payments. Experts have wrestled with significant concerns in evaluating and describing the economic pay off in having accident rates decline.⁶ The WHO says that RTIs have a significant negative macroeconomic

impact in LMICs. The loss to national GDP ranges from 1.03 percent in South Korea to 2.9 percent in Vietnam.⁴ Reducing RTI morbidity and mortality by 50% over a 24 year timeline can generate an additional flow of income equivalent to 22.2 % GDP(2014) in Thailand, 15% in China, 14% in India, 7.2% in the Philippines and 7.1% in Tanzania. RTI deaths in India have consistently increased year on year from 1990 to 2015. Official Indian statistics probably under report severe injuries by 50% and mortality by between 10 and 30%.⁴ Notwithstanding the downward curve since about 2005 in China's RTI data, 2013 is estimated to have witnessed more than 2.6 lakh RTI deaths. There is an economic loss associated with each year that LMICs fail to act to enhance road safety.

The Global plan for the decade of action for road safety 2011-20 has identified the following 5 action areas⁴: 1. Road safety management capacity. 2. infrastructure safety. 3. vehicle safety. 4. road user behaviour. 5. post-crash care. A WHO report on road safety made recommendations to operationalize the global plan⁷: 1. Identification of a nodal agency in the national government to head the country level effort. 2. Assessment of country specific RTI related problems and policies. Assessment of the capacity for RTI prevention in each country. 3. Preparation of a country level road safety strategy. Preparation of a country level plan of action. 4. Allocation of adequate financial resources to tackle the problem. Allocation of adequate human resources to tackle the problem. 5. The implementation of specific approaches to prevent road traffic crashes and to minimize RTIs and the consequences of RTIs. The evaluation of the impact of these actions. The implementation of these recommendations at a country level would require that the initiatives to strengthen institutions are sequenced in a manner appropriate to the learning and absorptive capacity of the concerned country.⁸ The role of institutional management functions, especially that of the lead agency is critical. Only interventions will not be enough to sustain improvements in road safety.⁹ Institutional management functions can be built through doing the following: Enhancing institutional capacity, including nodal institutional capacity for RTI prevention. Evidence based training of stakeholders in the traffic police, transport, justice and health departments; senior policy makers, stakeholders in ministry nodal points and managers in relevant sectors.⁴

Political support can be obtained if communities that suffer the burden of RTIs put across their demands. This can be facilitated by civil society and private sector participation. National traffic injury surveillance systems need to be improved with the objectives of better mapping of injuries and their causes and consequences. These surveillance systems will also play a very significant role in generating the data that is needed to evaluate the effectiveness of RTI mitigation efforts. Several policies and interventions that have very promising potential to reduce the incidence of RTIs are very cost-effective: The reduction of speed limits, improvements in road design, diligent traffic rules enforcement, public awareness campaigns on road safety, installation of speed cameras, application of deterrent penalties are examples of interventions that are both cost wise and operationally effective. Studies show that with an increase in vehicular speeds of 1km/hour, a 3 percent increase in incidence of crashes resulting in injury is observed, with the corresponding increase in the incidence of fatal crashes being 4 to 5 percent. The risk of dying for an adult pedestrian which is less than 20 percent when struck by a car at 50 km/hr, balloons to almost 60 percent at 80 km/hr. Bringing about a reduction in RTIs through systematically bringing down drunken driving is another low hanging fruit that the nodal agencies can look to pluck. Regulatory blood alcohol limits need to be aligned with internationally accepted norms.

Seatbelt and helmet adoption can be enhanced in the following ways: Publicity campaigns; deterrence based police enforcement campaigns; adoption of higher safety specifications for new cars and the adoption and aggressive promotion of vehicle seatbelt reminder systems. The correct use of helmets can reduce the risk of death among 2 wheeler commuters by more than 40%. The corresponding decrease in the risk of serious injury in the same population is 70%. The decrease in the risk of death among car commuters wearing a seat belt is 40 to 50% for front seat passengers and 25 to 75% for rear seat passengers. The formulation and enforcement of laws to prevent mobile use while driving is another important measure. State of the art emergency medical services play a critical role.⁷

Supervising children walking or cycling to school in Malaysia was seen to reduce the risk of injury among the supervised children by 57%. With the principle of separating different types of road users, an exclusive motorcycle lane was introduced in Malaysia. This led

to a 600% decrease in deaths from motorcycle crashes and a 39% decrease in the number of motorcycle crashes themselves. With a view to reduce average vehicular speeds through traffic calming measures, simple engineering measures such as crosswalks, speed breakers and raised intersections were introduced in China. Of the 4 intervention sites, it was observed that the average speed dropped by 9 percent in 3 of them. It was observed that there was a drop of 60% in the overall number of casualties. Speed control measures, implementation of revised traffic rules, use of seat belts and improved emergency and prehospital care were implemented in Brazil, which were seen to result in a significant reduction in mortality. Setting and enforcing blood alcohol concentration limits resulted in a 17% decrease in RTI mortality in Uganda; the same intervention in Cuba brought about a 9.9% reduction in traffic crashes, a 70.8% reduction in RTI mortality, and a 58.7% reduction in RTI injuries in comparison to the previous year's data. Setting and enforcing the use of seat belts in Iran resulted in a statistically significant reduction in death rates from 38.2 per 100,000 population in 2004 to 31.8 per 100,000 population in 2007; also, the death rate per 10,000 vehicles reduced from 24.2 to 13.4. Setting and enforcing helmet use among two wheelers in Colombia resulted in a 52% reduction in two wheeler RTI deaths; the same intervention in Thailand resulted in a 500% increase in helmet usage, a 41% decrease in RTIs and a 20.8% decrease in RTI deaths; the same intervention in Vietnam resulted in a 16% decrease in RTIs. and an 18% decrease in RTI deaths; the same intervention in Malaysia resulted in a 25% fall in two wheeler crashes, a 27% fall in two wheeler RTIs and a 35% fall in two wheeler RTI mortality. The encouragement of helmet use among child bicycle riders in the Czech republic resulted in a 100% increase in helmet use and a 75% reduction in road traffic accident related head injury admission rates.¹⁰ In Argentina, over the period from 2010 to 2016, with the implementation of several road safety initiatives, a significant improvement in road safety indicators was seen, with a 45% decrease in RTI fatalities and a 11% decrease in the total number of non fatal RTIs in the implementation areas.¹¹

It has been clearly demonstrated that the reduction of RTIs has a significant positive effect on long term income growth at the macro level.⁴ Further research is required to compare the relative economic effects of averting injuries and diseases. Evaluating the impact of RTIs only through an economic prism would miss the bigger picture, i.e. the

intangible value that society assigns to health, which is not captured in growth estimates.¹² It has been estimated that welfare benefits ranging from 6% of GDP to 32% can be accrued by reducing RTI mortality by 50% over a period of 24 years. RTI morbidity and mortality, which are entirely preventable, impose unacceptably high social and economic costs. Well planned road safety interventions yield measurable results faster than most other investments in human capital. These interventions also have a very good cost to benefit ratio. Health capital, which is defined as the value of a person's lifetime health, and human capital, which is defined as the sum of knowledge, skills and know-how that a population possesses, are both impacted positively by a reduction in RTI morbidity and mortality. This is relevant in the light of research clearly indicating that investments made in human capital have a very significant impact on economic growth and prosperity. Evidence suggests that over the last two and a half decades, the difference in economic growth between nations that invested the highest in human capital building and those that invested the least is as high as 1.25% of GDP per year.¹³

Conclusion

The least used of all RTI reduction strategies are probably those that aim to reduce exposure to risk. Road traffic risk stems from the need to travel; for work, education or leisure. This can be tackled with a twin pronged strategy: First, through the promotion of regional economies such that the need for long distance travel is reduced. Second, the setting up of self sufficient compact townships that would scale down the need for intercity short distance commuting. Road traffic risk on Indian roads is aggravated by the mixed nature of the traffic, with pedestrians, buses, bicycles, trucks, mopeds, cars, scooters, vans, motorbikes, taxis and autorikshaws all vying for the same space. Risk exposure reduction requires that on road networks used by multiple categories of non motorized and motorized vehicles of varying width and speed, there is a need to separate the slow moving vehicles from the fast moving vehicles. Heavy vehicles need to be separated from the light vehicles. Speed limits need to be enforced on fast moving vehicles. In many developed countries, speed governors are increasingly being used in commercial truck and bus operations. In stark contrast, in India, such devices are rarely used, and even if installed, are promptly disabled by the operators. Private bus and truck operations are mostly based on tightly drawn timetables

that incentivize speeding, pressurizing drivers. Wages are often linked to number of trips and number of ticket receipts. Enforcement of speed limits in India is almost non existent.¹⁴

Inexperienced drivers are high risk drivers. In a society like India, which is seeing increasing levels of motorization, the risk that inexperienced drivers pose is amplified because of their relatively high proportion in the driving population. Added to this, inadequate driver training and testing facilities, and we have a ready recipe for disaster. The speed choice of drivers is influenced by factors like age, experience, alcohol use, drug use, psychological condition, road surface condition, road layout, traffic density and extent of road traffic rules enforcement. Accident risk reduction requires that drivers' perception of speed risk change; the biggest hurdle to this change is the lack of acceptance among them that their choice of speed greatly influences RTI risk for themselves as well as for other road users, both drivers and pedestrians.¹⁴

The increase in RTI deaths on Indian roads has been alarming. RTI fatalities have increased more than 10 times from 14,500 in 1970 to 1,47,913 in 2017. From 2003 to 2013, RTI deaths increased at the rate of 5 percent every year, compared to the 1.4 percent annual increase in population. The rate of RTI deaths increased from 7.9 per hundred thousand people in 2003 to 11.2 per hundred thousand people in 2013. Despite low levels of motorization, RTI mortality risk in India is 4 times that in Sweden and Britain, and double that in Germany and Japan. The RTI mortality rate per 10,000 vehicles has fallen from 87.5 in 1970 to 8.6 in 2013. Many developed countries are at >1 fatality per 10,000 vehicles.

Large reductions in RTI morbidity and mortality are within the reach of most countries. Governments need to muster the political will to adopt, enforce and sustain over the long term fool proof proven strategies with evidence based actions, institutional engagement and a constant recalibration of strategies in response to real time data. In the 25 years from 1990 to 2015, average RTI fatality rates in the OECD countries dropped by more than 63%, from 22 to 8 per hundred thousand population. The window of opportunity is open for leaders to surpass these achievements, ensuring healthier lives for their people and giving a fillip to economic growth and wellbeing.⁴

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Custodial Torture: A Two Years Prospective Study

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Abstract

Torture and violence are known since ancient times. The torture essentially is the cruelty committed by the persons in power over the helpless and the weak. Custodial torture means torture in police custody, jails or in custody of other governmental authorities. It is gross negation of the human rights and is violative of the article 21 of the constitution of India. To find out the various methods of torture employed in custody, present prospective study was conducted in the Department of Forensic Medicine and Toxicology, Govt. Medical College, Amritsar. Over a study period of two years, a total of 21 (16 male and 5 female) patients of alleged custodial torture, who were admitted in the emergency of Shri Guru Nanak Dev Hospital associated with Govt. Medical College, Amritsar were studied in detail. The maximum no of cases, 15 (71.4%) were from jail custody, 5 (23.8%) were in police custody and 1 (4.8%) patient was a victim of domestic violence who was detained in her own house. The maximum no of patients of custodial torture (33.3%) were in the age group of 21-30 years. 9.5% of the custodial patients suffered physical torture, 57.1% of the patients suffered mental torture and 33.3% of the patients were victims of both physical and mental torture. This study outlines the various methods of torture employed in custody with the aim of creating awareness in the society about the menace of torture and to help in the prevention of torture by the authorities.

Keywords: custodial torture, methods of torture, prevention of torture.

Introduction

Torture is the intentional infliction of severe mental or physical pain or suffering by or with the consent of the state authorities for a specific purpose. It is often used to punish, obtain information or a confession, take revenge on a person or create terror and fear within a population. Torture of a fellow human being by another human being is essentially an instrument to impose the will of strong over the weak¹. The aim of application of torture is to dehumanize the victim. Even in the modern era of civilized society, torture continues to be the handiest implement to terrorize and vanquish the weak.

Custodial torture is a matter of grave concern and is perhaps one of the worst crimes in a civilized society governed by the rule of law. It is further aggravated by the fact that this torture is committed by the persons who are supposed to be the protectors of the citizens. It is committed under the shields of “uniform” and “authority” within confines of a police station, lock up or prison, where the victim is totally helpless².

The practice of torture has been widespread and predominant in India since ages. It has become a ‘normal’ and ‘legitimate’ practice of police functioning all over the country. In the name of investigating crimes, extracting confessions and punishing individuals by the law enforcement agencies, torture is inflicted upon the people in the form of cruel, inhuman and degrading treatment, grossly derogatory to the dignity of the human person³. Torture in custody flouts the basic rights of the citizens and poses a serious threat to an orderly civilized society⁴.

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An important element in the prevention of torture is the effective investigations of torture allegations and the prosecution of those responsible. The insignificant conviction rate of the police personnel for the gory crime of torture has only encouraged more policemen to inflict torture. Under these circumstances, there is an urgent need to examine and analyze the issue of custodial torture in depth, so as to develop criminal jurisprudence and also to make the police officers accountable for their actions. In view of the skill with which health professionals can contribute to the investigations of human rights violations in general and torture in particular, the medical investigation of torture and cruel inhuman treatment assumes greater importance. Considering the moral or ethical value of a doctor, it is imperative on his part to protect the individuals from such treatment by effective investigation and documentations to provide evidence of torture and ill treatment, so that the torturers are made accountable for their actions⁵.

Material and Method

The present study was a two years study of the custodial torture cases, i.e. from 1.5.2008 to 30.4.2010, conducted in the emergency of the Guru Nanak Dev Hospital, Amritsar associated with Govt. Medical College, Amritsar. The custodial patients, who were brought to the emergency for treatment during the period of study, and who alleged physical or psychological torture of some kind, were included in the study. They were thoroughly evaluated as regards their history,

physical examination, examination of the injuries as well as their allegation of torture. The written consent of the patients was obtained before examination. The patients of domestic violence, which is also a kind of torture, were also included in the study, as even if they were tortured, they could not report because of the fear of their spouses. They were evaluated in the same way as in the case of other custodial patients. The categorization of torture was done as physical torture, mental torture or a combination of the two.

Observations

In the present study, a total of 21 patients, who alleged custodial torture, and were admitted in the emergency of the Guru Nanak Dev Hospital, Amritsar were studied.

Table I: Distribution of cases of custodial patients

Type of Custody	No. of cases	%age
Jail Custody	15	71.4
Police custody	5	23.8
Domestic custody	1	4.8
Total	21	100.0%

A total of 21 custodial patients alleged torture of some kind, physical or mental. Out of these 15 (71.4%) were in jail custody, 5 patients (23.8%) were in police custody and 1 (4.8%) patient was in domestic custody.

TABLE II: Age wise distribution of custodial patients

Age in yrs	Jail custody		Police custody		Domestic custody		Total	
	No. of cases	% age	No. of cases	% age	No. of cases	% age	No. of cases	% age
11-20	2	9.5%					2	9.5%
21-30	4	19.0%	2	9.5%	1	4.8%	7	33.3%
31-40	3	14.3%	3	14.3%			6	28.6%
41-50	2	9.5%					2	9.5%
51-60	3	14.3%					3	14.3%
>60	1	4.8%					1	4.8%

As is shown in the above table, maximum No. of patients of custodial torture were in the age groups of 21-30 years (33.3%), followed by the age group of 31-40 years (28.6%). Minimum no. of patients were in the age

group of above 60 years. All patients in police custody were in the age group of 21-40 years. The only patient of domestic violence, who was in domestic custody, was a 28 years old married female.

Table III: Sexwise distribution of custodial patients

Type of custody	Male patients		Female patients	
	No. Of cases	% age	No. Of cases	% age
Jail custody	14	66.7%	1	4.8%
Police custody	2	9.5%	3	14.3%
Domestic custody	-	-	1	4.8%
Total	16	76.2%	5	23.8%

76.2% of all the cases were males, while 23.8% of all the cases were females. Except one case of jail custody, all were male. In police custody, 2 out of 5 patients (9.5%) were males and the rest were females.

Table IV : Distribution of patients according to their Education status

Education status	Jail custody		Police custody		Domestic custody		Total	
	No. Of cases	% age	No. Of cases	% age	No. Of cases	% age	No. Of cases	% age
Illiterate	2	9.5%	-	-	-	-	2	9.5%
Primary	8	38.1%	1	4.8%	-	-	9	42.9%
Matric	2	9.5%	-	-	1	4.8%	3	14.3%
Under Graduate	2	9.5%	4	19%	-	-	6	28.6%
Graduate	1	4.8%	-	-	-	-	1	4.8%
Total	15	71.4%	5	23.8%	1	4.8%	21	100%

The maximum no of cases i.e. 9 cases (42.9%) were educated upto the primary level, while only one case (4.8%) was graduate. The maximum no. of patients in police custody were undergraduates. The only patient of domestic violence was a female educated upto the matriculate level.

Table V: Distrubution of patients in relation to the type of torture

Type of custody	Type of torture					
	Physical		Mental	Combined		
	No. of cases	% age	No. of cases	% age	No. of cases	% age
Jail custody	1	4.8%	8	38.1%	6	28.6%
Police custody	1	4.8%	4	19.0%	-	-
Domestic custody	-	-	-	-	1	4.8%
Total	2	9.5%	12	57.14%	7	33.3%

As shown in the above table, 9.5% of custodial patients were subjected to physical torture in the form of beating and slapping over minor things, beating with canes and leather strips. One patient reported kicking on the chest with the shoes on, while he had fallen down due to beating. 57.14% patients were subjected to mental torture in the form of delaying of medical treatment and abusive and obscene language. One case reported that he was denied food as a punishment for speaking loudly. More than one kind of mental torture was reported by some patients. 33.3% of patients were victims of both physical and mental torture.

Table VI: Types of injuries observed in physical trauma patients

Type of injury	No. of cases	% age
Bruise	1	4.8%
Abrasion	1	4.8%
Fracture	2	9.5%
Stab wound	1	4.8%
BURNS	1	4.8%
TOTAL	6	28.6%

In one case, there was a painful bruise on the right side of chest. In another case, there was an abrasion on the left forearm. While in one case there was a fracture of the right clavicle, in another there was fracture of the femur. In one case, a prisoner was assaulted by his jail inmate leading to stab injuries in the abdomen. In one case, a prisoner was burnt alive by the prison inmates due to scuffle, as a result of which he later died in the hospital.

Discussion

In the present study, out of a total of 21 patients of alleged custodial torture studied, 16 (76.2%) were males and 5 (23.8%) were female. In a study of torture patients from six countries, Moisander and Edston (2003)⁶ reported that there was a strong male dominance in the torture victims in all six countries except in the Ugandan group where 43% were woman. The male dominance in torture victims also reflects in the present study, in which 76.2% of torture victims are males.

The maximum no of patients of custodial torture were in the age group of 21-30 years (33.3%), followed

by the age group of 31-40 years (28.6%). The minimum no of patients were in the age group of above 60 years (4.8%). A study of people's watch (2007)⁷, a human rights organization in Bihar reported that 11.4% victims of torture in police custody were children of age between 0-14 years, while 28.3% were between 15-30 years. In the present Study, 40% of the police custody patients were in the age group of 21-30 years. A study by Laws and Lacopino (1997)⁸ of police torture victims in Punjab, reported that average age of the victims at the time of torture was 37 years. In the present study, the average age of victims of torture in police custody was 30 years.

Type of torture

In the present Study, 9.5% of the custodial patients suffered physical torture, 57.1% of the patients suffered mental torture and 33.3% of the patients were victims of both physical and mental torture.

In the study of Laws and Lacopino (1997)⁸, all the victims of police torture reported physical torture of different types as well as mental torture and humiliation in the hands of the police. In our study, only one person reported physical torture in police custody, while most of the cases reported mental torture. 7 out of the 15 cases (46.6%) in jail custody reported physical torture. The only patient of domestic violence complained of both physical and mental torture. It is evident that the incidence of physical torture is less in the present study as compared to their study. It can be concluded that over the years, the use of physical torture has been on the decrease by the police.

Methods of torture

In the present study, the methods of physical torture in custody were found to be beating, slapping on minor offences, beating with canes and leather straps and kicking. In one case, a prisoner was stabbed by his jail inmates in a fight. In another case, a prisoner was burnt alive by his jail inmates after a scuffle. The methods of mental torture included abusive and obscene language, threats, delaying the medical treatment, refusal to give food, humiliation and insulting and not allowing to meet the relatives. The methods of torture in the female patient of domestic violence were beating, slapping, kicking with shoe on, beating with canes, abusing and humiliating, restraining the patient in her house, not allowing her to go out or talk to anybody and not giving food to her.

In the study of laws and lacopino (1997)⁸, the methods of custodial torture in living persons were beating (95%), leg stretching (75%), suspension (63%), roller torture (over the thighs) (62%), electric shock (27%), falanga (beating the soles of the feet) (15%) and burning (6%).

In the study by Moisander and Edston (2003)⁶, the methods of physical torture were found to be beating with fists, sticks and truncheons, beating with lathis, whipping with electric cords, rape and genital torture, suspension, falaka i.e. beating of the soles and burn injuries due to cigarettes. In the present study, only beating, slapping and kicking were reported as the methods of physical torture. It can be concluded that the traditional barbaric methods of torture have decreased in police and jail custody.

Moisander and Edston (2003)⁶ in their study described sensory deprivation by isolation and blind folding as methods of mental torture. These methods were also not found in the present study. Thus methods of mental torture in custody in this region are limited to abusing, threats, humiliation and insulting, delaying the medical treatment and refusing the prisoners to meet their relatives.

Type of injuries

In the present study, the types of injuries noted were abrasions, bruise, stab wounds, burns and fractures. The abrasion was present on the left forearm in one person in police custody, which he sustained due to falling when he was pushed by the police personnel. In one case, a person was stabbed by his jail inmates in a fight. In another case, a prisoner was burnt alive by his jail inmates due to scuffle. In two cases, the prisoners in jail sustained fractures after the accidental falls.

In the study of Laws and Lacopino (1997)⁸ injuries were found on victims of custodial torture in the form of scars or other physical findings such as broken bones, thigh indentations, and joint abnormalities.

Moisander and Edston (2003)⁶ in their study found injuries in the form of fractures, scars, subjectively reported symptoms especially joint pain and ear, nose and throat symptoms and Post Traumatic Stress Disorder. These types of injuries due to custodial tortures were not found in the present study. Thus, it can be concluded that traditional barbaric and third degree torture methods

have decreased in this region of the country.

Conclusion

The Article 21 of the constitution of India guarantees all persons the fundamental rights of life and personal liberty. The custodians should respect the human rights of the persons in custody. They should also abide by their legal duty to provide necessary amenities for the health and safety of the individuals. The prisoners should be provided proper medical care and humane living conditions. Undoubtedly, the incidents of custodial torture are a blot on the face of human society. However, it is heartening to note that in the present study, the incidence of custodial torture has shown a decreasing trend. The reasons for this are the activism of the National Human Rights commission, media awareness regarding custodial torture and deaths, general public awareness, the constant fights of various NGO's against the custodial torture and the last but not the least, the role of medical fraternity in the proper documentation of various torture cases.

The inmates of prisons are prone to various diseases due to unhealthy, crowded and stressful living conditions and they also suffer from various mental health problems due to anxiety, depression and lack of interaction with their families. The authorities should improve the living conditions of the prisoners and do periodic psychological counseling to prevent violent behavior in them. The doctor has a pivotal role in the diagnosis and treatment of these physical and mental conditions. The role of doctor in the suppression of torture cannot be overemphasized. The forensic pathologist is in a unique position to foster the prevention of torture. By effectively investigating and documenting medical evidence in cases of custodial torture, he can greatly improve communication between health professionals and the regulatory authorities as well as facilitate the proper evaluation of information on the subject.

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Assessment of Knowledge Regarding Prevention of Peptic Ulcer among Adolescents in Selected College at Shimla, Himachal Pradesh, India

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Abstract

Introduction: Gastrointestinal system is the most essential system of the body which has got a relation with diet in turn helps in maintaining normal growth and development and normal functioning of the body.

Materials and Method: In order to achieve the objectives of the study, a descriptive study approach was adopted for the study. A closed ended questionnaire was used to assess the knowledge of adolescents on peptic ulcer and its prevention. Probability multi-stage sampling technique was appropriate to select 200 adolescents from a selected pre-university colleges of Shimla as the sample.

Results: The assessment of knowledge among adolescents regarding peptic ulcer and its prevention reveals that the highest percentage (47.5%) of the students had moderate level of knowledge regarding prevention of peptic ulcer, 18.5% of adolescents had good knowledge, 0.5% had excellent knowledge and 33.5% had poor knowledge regarding peptic ulcer. The overall knowledge on peptic ulcer and its preventive measures is 49.58% with mean and standard deviation 15.87 ± 4.082 . The area-wise analysis revealed that the adolescents scored highest in the area prevention of peptic ulcer (50.89%) with mean and standard deviation 4.58 ± 1.56 . Findings of the study revealed that knowledge among adolescents regarding prevention of peptic ulcer is moderate.

Conclusion: Prevention is always considered as better than cure, the identification and understanding of the risk factors is the important step of preventing peptic ulcer.

Keywords: Knowledge, Adolescents, Information booklet

Introduction

Adolescence is considered as the transitional stage of human development. It is fascinating period of life as well as period of great complexity. It is the time of movement towards independence.¹ Adolescents are very vulnerable to changes in lifestyle and easily get influenced by their peers and other mass media and communications. Now a day a lot of changes in the lifestyle can be seen in their health causing diseases like peptic ulcer, obesity etc. eating habit is another contributing factor for peptic ulcer as they prefer junk food and carbonated beverages rather than healthy diet.²

Gastrointestinal system is the most essential system of the body which has got a relation with diet in turn

helps in maintaining normal growth and development and normal functioning of the body. Gastric diseases are becoming very common, unless treated promptly and completely, they can cause problems throughout the life. There are many contributing factors which irritates the gastric mucosa and it adversely affects the health of the people even may cause death. The foci of nursing intervention are education; and modification of behavior to promote a healthy life style pattern.³

Materials and Method

The objectives of the study were to 1) Determine the existing knowledge among adolescents regarding prevention of peptic ulcer as measured by a close-ended structured questionnaire.2) find the association

between knowledge scores on prevention of peptic ulcer and selected demographic variables.3) develop and distribute information booklet regarding prevention of peptic ulcer. In order to achieve the objectives of the study, a descriptive study approach was adopted for the study. A closed ended questionnaire was used to assess the knowledge of adolescents on peptic ulcer and its prevention. Probability multi-stage sampling technique was appropriate to select 200 adolescents from a selected pre-university college of Shimla. In the first stage, simple random sampling method, i.e., lottery method was adopted for selecting the pre-university colleges. In the second stage, lottery method was used to select 200 subjects. The data collected were systematically tabulated to facilitate the data analysis. The collected data analyzed by using descriptive and inferential statistics.

Results

Part I: Description of demographic characteristics of the adolescents

The demographic characteristics showed that With regard to gender distribution of the samples 56% of the respondents were male and 44% of the respondents were female. The age distribution of the samples shows that most of the participants (61.5%) are from the age of 17, 29%.5% are of 16 years and 9% are of 18 years. Distribution of according to their area of residence revealed that (62.5%) are of urban area and remaining

(37.5%) are from rural area. Distribution of the sample with reference to diet pattern reveals that most of the (85.5%) are mixed diet type and the remaining (14.5%) are vegetarians.

Part II: Knowledge of adolescents regarding prevention of peptic ulcer.

Table 1: distribution of level of knowledge of adolescents
N = 200

Level of knowledge	Percentage range of score	Number of respondents	Percentage
Excellent	81 – 100	1	0.5
Good	61- 80	37	18.5
Moderate	41- 60	95	47.5
Poor	0 - 40	67	33.5

Table 1 show that the Assessment of level of knowledge of the adolescents shows that highest percentage (47.5%) of the students had moderate level of knowledge regarding prevention of peptic ulcer, 18.5% of adolescents had good knowledge, 0.5% had excellent knowledge and 33.5% had poor knowledge regarding peptic ulcer.

Table 2: Area-wise analysis of the knowledge scores

Table 2: Item wise distribution of correct responses of PU students regarding clinical features, diagnosis and management of peptic ulcer.

Sl No	Items	Number	Percen-tage
15	Peptic ulcer leads to dull cramping pain	95	47.5
16	Most of the peptic ulcer shows the symptoms except headache	67	33.5
17	Peptic ulcer causes bleeding when there is erosion of ulcer through blood vessels	103	51.5
18	In case of chronic peptic ulcer presence of blood in vomits is called hematemesis	81	40.5
19	Identification of peptic ulcer is mainly by signs and symptoms	91	45.5
20	Foundation of treatment for peptic ulcer drug therapy	101	50.5
21	Antacids are the drug which neutralizes the gastric acid	90	45
22	Dietary management of the peptic ulcer recommends balanced diet	94	47
23	Natural way of neutralizing gastric acid is by drinking adequate fluids	123	61.5

Table 2 shows that the Analysis of correct response of adolescents on clinical features , diagnosis and management of peptic ulcer reveals that the highest percentage 61.5% of adolescents had knowledge that “natural way of neutralizing gastric acid is by drinking adequate fluids.” 33.5% of adolescents were aware that

Most of the peptic ulcer shows the symptoms except headache”.

Part III: Association of knowledge of adolescents on prevention of peptic ulcer with selected demographic variables

N=200

Table 3. Knowledge of adolescents on prevention of peptic ulcer with selected demographic variables

Demographic variables	Df	χ^2	P value	Inference
Gender	2	1.009	p>0.05	NS
Age	2	3.062	p>0.05	NS
Area of residence	1	1.827	p>0.05	NS
Dietary pattern	1	1.391	p>0.05	NS
Activity after college hour	2	6.20	p>0.05	NS

S = Significant; NS = Not Significant

The data provided in Table 3 shows that there was significant association between the knowledge scores and demographic variables.

Discussion

Part I ; Demographic characteristics of the study

Fifty six percent (56%) of the sample were male and forty four percent (44%) were female. Highest percentage (61%) of students was in the age group of 17 years. Majority (62.5%) of the adolescents were from urban area. Majority (85.5%) of the adolescents taking mixed diet. Most (46%) of the adolescents were having indoor games as activity after college. Majority (89%) of adolescents are not having any family history of peptic ulcer. Most (82%) did not have previous information regarding prevention of peptic ulcer. Majority (69.2%) of the adolescents received information from academic education.

Findings of the study is supported by a study conducted in japan , the findings reveals that majority of sample were male (62%). Majority of sample were taking mixed diet (78%).⁴

Part II : Level of knowledge of adolescents regarding prevention of peptic ulcer

Majority (47.5%) of the adolescents had average knowledge regarding prevention of peptic ulcer. 18.5% had good knowledge , 0.5% of the sample had excellent knowledge and 33.5% of the sample had poor knowledge on peptic ulcer.

Area-wise analysis of the knowledge scores

The overall knowledge on peptic ulcer and its preventive measures is 49.58% with mean and standard deviation 15.87 ± 4.082 . The area-wise analysis revealed that the adolescents scored highest in the area prevention of peptic ulcer(50.89%) with mean and standard deviation 4.58 ± 1.56 . the mean percentage in the area concept and cause is 50.43% and signs and symptoms, diagnosis and management is 46.945%. These findings are consistent with the findings of Bujanda in Spain.⁵

Item wise analysis of the knowledge score.

Analysis of correct response of adolescents on concept, cause and risk factors of peptic ulcer reveals that the highest percentage 68% of adolescents had knowledge that “peptic ulcer develops in the presence of acidic environment”. 37% of adolescents were aware that “Gastrointestinal system is normally protected by mucosal barrier.” Analysis of correct response of adolescents on clinical features, diagnosis and management of peptic ulcer reveals that the highest percentage 61.5% of adolescents had knowledge that

“natural way of neutralizing gastric acid is by drinking adequate fluids.” 33.5% of adolescents were aware that Most of the peptic ulcer shows the symptoms except headache”. Analysis of correct response of adolescents on prevention of peptic ulcer reveals that the highest percentage 63% of adolescents had knowledge that “food has to be taken at regular times”. 42% of adolescents were aware that “Milk is avoided in peptic ulcer because it stimulates gastric acid production”. The findings are similar to the study by Ko YC, Chiou YY in 2004. ⁶

Part III : Association of knowledge score of adolescents with selected demographic variables

There is no significant association between the knowledge score and the demographic variables. The null hypothesis was rejected.

Conclusion

The assessment of knowledge among adolescents regarding peptic ulcer and its prevention reveals that the highest percentage (47.5%) of the students had moderate level of knowledge regarding prevention of peptic ulcer, 18.5% of adolescents had good knowledge, 0.5% had excellent knowledge and 33.5% had poor knowledge regarding peptic ulcer. The present health care system focuses on primary prevention and in order to achieve primary prevention it is important to understand the existing knowledge of people at risk. There are number of risk factors identified which are contributing to the development of peptic ulcer. The lifestyle changes in adolescents like junk food, changes in eating habits and time more of stressful life are considered as important risk factor of peptic ulcer in adolescents.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Taken from the college of nursing ethical committee.

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A Case of Quick Mummification: The Influence of Intrinsic and Extrinsic Factors in the Post Mortal Processes

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Abstract

After death, the corpse is subjected to many different post mortem phenomena that change the whole biochemical and physical structures of the vital body. Those phenomena have different evolutions depending on numerous factors typical of the death body and of the setting where the body lies. Mummification is one of the special transformative process that consist in the drying of the entire body structures and requires particular wheatear condition and timing.

Keywords: *mummification; post mortem; transformative phenomenon.*

Introduction

Mummification is a post mortem process that belongs to the transformative process. It happens only when the dead body lies in a place with some particular weather condition: dry and windy climate. Usually this process takes 6-12 months to be complete. In this case report we analyze some particular factors that produce the body mummification with a different timing.

Case Report

In May 2004, in Albano Laziale (Rome), some policemen found the dead body of a woman in her apartment, after the warning of some neighbors. This body was found lying in the bed, with some clothes on, all the windows were close with the shutters down. Basing on what the neighbors said, the woman was missing from 30 days. The examination showed that the body was covered by a white cotton bathrobe, a white silk pajamas top, a pair of brown stockings and two socks. The body, extremely light, was in advanced state of putrefaction. The skin of the face and of the trunk

was dry, the texture was hard and like parchment, the color varied from brown to black; instead the skin of the abdomen, of the gluteus and of the back of the legs, was brown and a little bit more elastic. The eyeballs were absent, for putrefactive process. Moreover, there were some larvas. The autopsy did not show any injuries. The study by dissection highlighted a good conservation of the organs and just initial post mortem phenomena, in particular it was possible appreciate initial putrefaction at the mucous membranes of the oral cavity and of the upper airways.

Discussion

Mummification is a process that happen when the dead body lie in a space dry, hot and windy: all this conditions allow a quick dehydration of the body. Otherwise, mummification could happen when the body lie in a space where some specific mildews grow (they are called in Italian "idrovore")¹. Furthermore, the burial in grounds that are dry and rich of nitrates could allow the evolution of this process. However, in addition to environmental factors^{2,3}, even intrinsic factors could conduct a really important role: for example, in a really skinny person or a debilitated one, the mummification process is easier⁴. Usually, mummification is completed after 6-12 months, but even after 6 weeks we could find a superficial mummification⁵. When particular conditions occur, the mummification can be completed in a much shorter time period of four weeks^{6,8}. At the end of the

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process, the skin is thin and non-elastic, the colour is generally brown (in all its shades), the tissues are deeply fixed to the bones. The body is typically extremely light and all the joints are very rigid. The volume of the innards is reduced. In the case in discussion here, the woman was missing from 30 days: a period really shorter than the 6-12 months expected for the fully mummification process. But there was a specific element about the anamnesis of the woman: she had a history of anorexia. As is common known, people affected by anorexia have a really important loss of the body weight. This loss is owed by a reduction of the body fat, but also by the loss of mineral component of the bones. Furthermore, the body of this person is deeply dehydrated. Another important element was the crime scene: the dead body was found in her bed, covered by some clothes; all the windows were closed (so there was not possibility of the entrance of insects of the outside). This configured a particular ambient: there was not the contamination from the outside and there was not the possibility of air circulation in the apartment. We can identify a double cause of this early mummification: first cause was the status ante-mortem of the body, second one was the characteristic crime scene.

Conclusion

Mummification makes the identification of age of the death really hard and approximate. In fact, express an opinion about the thanatocronology of a case needs a deep analysis of several factors that own to the specific case and a comparison with the data of scientific literature. In the end, in some particular situation (due both to the environmental condition and to the body specifics) the process of the mummification can be extremely speeded up and can occur even in normal weather conditions.

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Ethical Clearance: Informed consent was obtained from legal guardian for uses of the case materials for research purposes and publication findings.

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The Immunoreactivity of Uroplakin III in Urothelial Carcinoma of Urinary Bladder and Other Non-Urothelial Carcinoma

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Abstract

The aim of present study is evaluate the sensitivity and specificity of uroplakin III marker in the urothelial cancer patients, and to show whether there is association this marker with their clinicopathological parameters. This study is a retrospective (70 cases) of whom diagnosis as urothelial carcinoma of urinary bladder (male 41 and female 29) with added normal urothelial tissue and breast tissue were taken as control group. 41 nonurothelial carcinoma are also involved. All paraffin blocks which diagnosed as urothelial carcinoma were supported the diagnosis by pathologist. The all research materials are applied according to protocol from, Bio SB, Inc. Uroplakin III immunoreactivity assessment is depend on staining intensity and the positive percentage tumor cells. The age group between 64-75 years old reveals highest positive value 18 (42.9%). Uroplakin III expressions sensitivity is 44.3% , and it has higher positive percentage in low grade 20 (47.6%) in comparison with high grade 11(39.3%) but without significant difference (p = 0.492). Ta-1 and T2 Tumor stage show 26 (46.4%) and 5(35.7%) positive uroplakin III staining respectively, with no statistical association between them (p = 0.47). The all non-urothelial carcinoma show negative result (100% specificity). expression of uroplakin III with mild sensitivity and high specificity, it is regarded as good marker (even with mild sensitivity) for differentiation between primary urothelial carcinoma from other urological cancers in same site, and it can be useful for diagnosis of unkown metastatic cancer because of high specificity of uroplakin III.

Key words: Urothelial carcinoma of urinary bladder, uroplakin III, immunohistochemistry.

Introduction

The urinary bladder cancer is regarded as the sixth most common cancer in United States of America, with about 430,000 reported cases in the world wide ¹.

Also, urinary bladder cancer is commonest cancer among both male and female². So. It is registered as the fourth frequent cancer in male with lesser degree in female. It is a common cancer in old age group with mean age is 73 years old at the time of diagnoses ³.

Urothelial Carcinoma is more common bladder cancer type, representing about 90% from the total bladder cancer ⁴.

Urinary bladder cancer is divided according to stage into non-muscle invasive type and muscle invasive type.

Non-muscle invasive type is about 75%-85% ⁵, and it has ability to recur about 50%-70% and to progress about 10%-20% to an advance grade with or without muscle invasive bladder cancer ⁶.

The both tobacco smoking and industrial compounds may be the causes of predominance of increasing rate of bladder cancer in male ⁷⁻⁹.

The most presenting symptoms are hematuria while dysuria is more liable among high grade tumor ¹⁰⁻¹¹.

The role of immunohistochemistry in Urothelial Carcinoma is used mainly for differentiate Urothelial Carcinoma from other secondary malignancies which metastasized to urinary tract area, and also immunohistochemistry has ability to know original site for unknown primary cancer that metastasized ¹²⁻¹⁸.

The markers of immunohistochemistry that make a diagnosis of muscle invasive Urothelial Carcinoma is thrombomodulin, GATA3, Uroplakin III, Cytokeratin7, high-molecular weight cytokeratins, and p63¹⁹.

The urothelial plaques (also called uroplaques) are represented one of characteristic of differentiation of urothelium and specifically, they found in superficial umbrella cell (represented final stage of differentiation of urothelium).

These uroplaques are transmembrane proteins family and they are uroplakin Ia, uroplakin Ib, uroplakin II, and uroplakin III²⁰. Its functions are urothelium permeability barrier, maintenance surface of urothelium, and growth of urinary tract²¹.

Because the uroplakin is specific to urothelium surface area, so the uroplakin is regarded as an important immunohistochemical marker for original primary urothelial carcinoma and from metastatic cancer of unknown origin²².

The uroplakin III is marker for urothelial carcinoma, it has very good specificity but low sensitivity that varies between 10-60% for urothelial carcinoma²³.

The uroplakin III is useful for clinical application, the losing of uroplakin III (expression immunohistochemical marker) is associated with aggressive behavior of urinary bladder cancer and patients will have a bad prognosis that doing radical cystectomy²⁴.

The aim of present study is to evaluate the sensitivity and specificity of uroplakin III marker in the urothelial cancer patients, and compare this marker with clinicopathological parameters.

Materials and Method

This study is a retrospective (70 cases) of whom diagnosis as urothelial carcinoma of urinary bladder. we obtained clinicopathological information of patients with from surgical files of pathology laboratory at Al-Hilla Surgical Teaching Hospital after taking approval from this Hospital and from multiple private laboratories.

In present study, 41 nonurothelial carcinoma with low and high grade are also included as shown in Table 1.

Age group of urothelial carcinoma is ranged between 45-75 years old and according to gender, they

are divided into 41 males and 29 females.

Clinicopathological data of patients include age, sex, clinical features, bladder biopsy type that include endoscopic resection or cystectomy, and paraffin blocks collected during period is carried out between July /2017 to August/2018. Also, paraffin blocks of normal urothelial tissue and breast tissue were taken as positive and negative control group respectively. These control tissues are run with each procedure of immunohistochemistry.

This study was prepared and completed at pathology department / College of dentistry/Babylon university.

All paraffin blocks that previously diagnosed with urothelial carcinoma were re-examined by pathologist to support the diagnosis, and the tumor was staging and grading according to TNM classification system 2010 (American Joint Committee on cancer)²⁵ and WHO/ISUP system respectively/2016²⁶.

Section of 5 micron thickness are taken from all samples of paraffin blocks and stained by uroplakin III immunohistochemistry were done Hydrophilic plus slides.

The all research materials are applied according to protocol from, Bio SB, Inc., 69 Santa Felicia, Dr.Santa Barbara, CA 93117, USA, in which, the primary Uroplakin III antibody is Rabbit Monoclonal antibody of sotype IgG with Cytoplasmic and Membranous expressions, Clone EP321, ready-to-use, 3 ml, Catalog No. BSB 3239. Since, there are different level of staining intensity in cancer appearance with various positive cells numbers, Uroplakin III immunoreactivity is depend on staining intensity and positive percentage tumor cells. Staining intensity is graded as weak, moderate, and strong, while immunostaining percentage is more than 1% is regarded a positive that is graded as 1%-25%, 26%-50%, 51%-75%, >75%. All statistical analysis of this study was using SPSS version 22 software. Continuous variable are presented as mean±SD, median and range. Pearson's chi square (X²) and Fisher's Exact Test are measured to show the relationship between categorical variables. P value ≤ 0.05 is significant.

Results

Patients and tumor parameters:

A total of 70 patients that have median age (mean

±SD) is 65 (63.26±8.48) years old. The age range of the patients is from 45 to 75 years old. The sex distribution are male 41(58.6%) and female 29(41.4%). 42(60%) of patients has low grade while 28(40%) is high grade. Also, stage Ta-1 represents 56(80%) and stage T2 is 14(20%) as their summarized in Table1.

Uroplakin III immunohistochemical analysis:

Uroplakin III staining may show membranous outlines of cells with cytoplasmic staining, and it show intense staining in normal urinary bladder epithelium. Immunohistochemical findings are demonstrated in Table 2.

The age group between 64-75 years old exhibit highest positive value 18 (42.9%). Uroplakin III expressions sensitivity is 44.3% , and it has higher positive percentage in low grade 20 (47.6%) in comparison with high grade 11(39.3%) but without significant difference ($p = 0.492$).

Ta-1 and T2 Tumor stage show 26 (46.4%) and 5(35.7%) positive uroplakin III staining respectively, with no statistical association between them ($p = 0.47$).

From total uroplakin positive cases 31 (44.3%), 25 (80%) appears moderate to strong staining while the rest 6(20%) express weak staining as in fig. 1.

Table 3 shows the extent of immunostaining , zero level is regarding as negative and 26-50% value shows more number of staining extension.

The totally non-urothelial carcinoma give negative result and outcome is 100% specificity for uroplakin III(Table 4).

Discussion

In this study, we try to test the sensitivity and specificity of uroplakin III in both urothelial and non-urothelial carcinoma by using Rabbit Monoclonal antibody that bind to Uroplakin III.

The sensitivity and specificity of uroplakin III is 44.3% and 100% respectively. Moll et al.²⁷ showed that sensitivity of uroplakin III in primary urothelial carcinoma is 53%, and Kaufmann et al.²³ recorded that sensitivity and specificity of uroplakin III in primary urothelial carcinoma is 60% and 100% respectively by using monoclonal antibodies (clone AU 1). This difference in sensitivity level is also mention by

Kaufmann et al.²³ may be due to uroplakin III is spread heterogeneously inside tissue with specimen mistake because small size of tumor (it is taken in present study by transurethral resection of tumor).

In this study, the clinicopathological parameters (age, sex, grade, and stage (T)) display insignificant difference with uroplakin III expression. There are many studies agree with that results and results are demonstrated in Table-2.

Tadin et al.²⁸ is demonstrated that uroplakin III is not correlated with age, sex, tumor grade and stage.

Two previous studies that done on urothelial tumor reported not association between uroplakin III and neoplasm grade^{23,27}.

Wenping et al.¹⁵ was also shows no correlation between uroplakin III and stage of urothelial carcinoma of urinary bladder.

Decline expression of uroplakin III in high grade and high stage (T2) may result from normal urothelium injury by aggressive behavior of this cancer and consequently, it leads to reduction of immunohistochemical staining of uroplakin III²⁹.

In conclusion of this study, expression of uroplakin III with mild sensitivity and high specificity, it is regarded as good marker (even with mild sensitivity) for differentiation between primary urothelial carcinoma from other urological cancers in same site.

In same time, it is helpful in diagnosis of unknown metastatic cancer because of high specificity of uroplakin III.

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Ethical Clearance: All steps done in this study using paraffin blocks and application of immunohistochemical staining with their instruments are according to the ethical standards national research committee of our country.

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Conflict of Interest: The authors declare that they have no conflict of interest.

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Overview of Selected Native Seeds in Agricultural Wastes and its Properties

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Abstract

Agricultural waste is considered as the valuable assert in the world, they can be actively used as fibers, fertilizer, biogas production, softwood furniture manufacturing etc. However, limitations are to be taken into account. Generally, seeds play a major role in agricultural waste which indicated with huge amount of nutritive value and phytoconstituents. They reflect the therapeutic activity. In this review, we discussed the seeds phytoconstituents and their utility as bioactive agent. In near future, it would be efficient to gain knowledge of seeds which is considered as a waste in their therapeutic evaluation and also as nutritive value.

Keywords: Agrowaste-seeds, seeds, bioactivity, physico-chemical properties, chemical composition.

Introduction

Agricultural wastes are broadly accessible, they are considered as an important source due to their properties like renewable and virtually free ². They can be changed over into heat, steam, charcoal, methanol, ethanol, bio diesel and also crude materials (animal feed, composting the soil, energy and biogas development etc.,). All these wastes are well-known to have high supplement levels of nitrogen, potassium, phosphorus which would enhance soil fertility and crop yields are increased, for example, vegetables, maize that bring high costs and consequently upgrade food security. This substitute technique for usage by farmers for horticultural generation has additionally lessened the rate of accumulation, with consequent decrease on ecological contamination in this way enhancing natural wellbeing. This requires a more prominent familiarity with the general population and farmers of the advantages of appropriate management and use of natural waster in agriculture. This will prompt reduced fear and assumptions of irritation issues that diminish arrive values and environmental degradation ²⁹.

Malaysia is located in Southeast Asia demonstrating a high development rate in the economy. This is credited to the way that Malaysia government approach has prompted the industrialization of the nation driving towards the long-term responsibility for attaining the status as developed country by 2020 ¹⁰. With the fast-

economic growth, Malaysia's gross domestic product (GDP) has advanced so that a growth rate of 5.1%, 5.6% and 4.7% has been attained in 2011, 2012, and 2013 respectively. In accordance with this, the total population of Malaysia has increased from 18 million in 1990 to 30 million in 2014 ^{25, 26, 27, 28}. Therefore, the energy demand in Malaysia has extremely risen during the most recent two decades.

Agricultural wastes all around if developing nations keep on intensify cultivating systems. It is evaluated that 998 million tons of agricultural waste is delivered yearly. Organic waste can sum up to 80 percent of the overall solid waste produced in any farm²⁹

In Malaysia, about 1.2 million tons of agricultural wastes are disposed of into the landfills yearly ^{3, 4}. It is assessed that 15% of the entire waste produced in Asia is agro-waste, with rural waste production in Malaysia at roughly 0.122 (kg/top/day) in 2009 which is anticipated to achieve 0.210 (kg/top/day) by 2025 ^{3, 4, 18, 19}

So the objective ought to be to make the farming waste an asset that can be used and not simply disposed of. It is additionally vital to set up establishments that can outfit the extensive capability of rural squanders as an asset in cultivating and in vitality creation. Utilizing proper innovations, animal and product waste can be transformed into valuable assets.

Materials and Method

1-Agricultural waste:

Is defined as the waste outcome from various agricultural processes. It comprises of manure, other wastes from crop residues and harvest waste (like residual stalks, straw, leaves, roots, husks, shells, etc), poultry houses and slaughterhouses, fertilizer run-off and pesticides so on. Agricultural practice involves in all actions that can arise on a farm and incorporates activities, for example, slurry spreading, chemical and waste storage, silage making and waste pesticide clearance.

There are few main types of agricultural waste such as biological, solid and hazardous. Biological waste is any material which contains or has been contaminated by bio hazardous. Biological waste which contains syringes, culture tubes, blood vials, absorbent material etc., whereas solid waste include garbage, rubbish, refuse, litter etc.

Features of agricultural solid waste:

*Fruits and vegetable processing:

Where the type of waste includes biological sludges, trimmings, peels, leaves and stems, soil, seeds and pits, and **the disposal method includes** Landfill, animal feed, land application, burning.

*Sugar processing:-

where the type of waste includes Biological sludges, bagasse, pulp, lime mud, filter mud and **the disposal method includes** Landfill, burning, composting animal feed.

* Animal production:-

where the type of waste includes Blood, bones, feather, litter, manures, liquid effluent **the disposal method includes** Land-application, fertilizer

* Dairy product processing:-

where the type of waste includes Biological sludges **the disposal method includes** Landfill, land spreading

* Leather tanning:-

where the type of waste includes Fleshings, hair, raw and tanned hid trimmings, lime and chrome sludge,

grease **the disposal method includes** Rendering, by-product recovery, landfill, land-spreading

* Rice production:-

where the type of waste includes Bran, straw, hull **the disposal method includes** Feeds, mulch/soil conditioner, packaging material for glass and ceramics

* Coconut production:-

where the type of waste includes Stover, cobs, husk trunk, leaves, coco meal **the disposal method includes** Feeds, vinegar, activated carbon, coir products

Results and discussion

1-RISK OF AGRICULTURAL WASTE

Risk is viewed as a significant and ever-present factor affecting the advancing conduct of farm changing in accordance with disequilibria in agriculture.¹⁷ Manure and straw burning will produce a great deal of harmful gas, smoke, and residue, and air environment^{21, 23},

particulate matter from manure, air ventilation and smoke from incinerators passes into the air and particularly cause respiratory problem in humans¹².

1.3 NUTRITIVE VALUE OF AGRO-WASTES

The nutritional state of the fertilizer may likewise help in concealment of soil-borne plant pathogens.¹⁶ Manure and organic matter contain nutrients that are not promptly accessible for plant up-take, in contrast to inorganic fertilizers.²⁹

1.4 BENEFIT ECONOMY OF AGRICULTURAL WASTE

The advancement of agricultural industry waste biomass through escalated utilization of non-conventional crude materials, for example, oil palm, coconut, pineapple and bagasse were in technically and economically attainable.^{14, 15}

Benefits of agricultural waste in Malaysia are discussed in Table 1.

Table 1: Benefits of agro-wastes in Malaysia

Agro-waste	Benefits
Rice husk	Electricity production
Rice husk ash and charcoal	Additive in cement mixes, water glass manufacture, active carbon
Banana peel	Paper making pulp
Oil palm empty fruit bunch (EFB)	mulching, organic fertilizer, reinforcement in polymer
Oil palm stems and rubber wood	Composites, particle boards, softwood furniture
Onion skin and ground husk	Heavy metal removal, mushroom cultivation
Sugarcane baggase and banana fruit reject	Ethanol, biogas production
Sunflower stalk, corn stalk, baggase fibers	Reinforcement for polymer composites

Source: Adopted from ¹⁵

Some building items, for example, boards, door screens, door frames, material sheets and batter forming mixes produced using jute, sisal, coir were explained. ²⁹. In

China bagasse has been utilized to make particleboard²⁹. Hardboards produced using Thai hardwoods and coconut fiber have been explored in Thailand ²².

Ikpambese et al.²⁰ considered the use of palm fibers for asbestos free car brake cushions.

2-AGROWASTE SEEDS

Agricultural wastes which incorporate by-product of agricultural activities²¹.



Figure 1 Durian fruit



Figure 2 Papaya fruit and seeds



Figure 3 Pumpkin



Figure 4 Mango



Figure 5 Jackfruit



Figure 6 Rambutan

Table 2 Physicochemical properties of seeds

Species	Physicochemical properties							
	pH	Saponification value	Acid value	Iodine value (g)	Specific gravity	Moisture content (%)	Viscosity (mm ² /s)	Peroxide (meq/kg)
<i>Durio zibethius</i>	4.5	190.65	19.4	81.07	Less than 1	54.90	360 cps	3.9.
<i>Carica Papaya. L</i>	5.93	193.5	0.94	76.9	0.918	5-7	27.4	0.18
<i>Cucurbita</i>	7	185.5-195.3	0.516	121	0.920	30-35	45	8.66
<i>Mangifera indica</i>)	4	190.1-195.1	5.8	39.6	2.18	44.4	3.3	1.2
<i>Artocarpus heterophyllus Lam</i>	5.78	353.65	3.51	14.15	0.6-0.7	55	1.52	6.4
<i>Nephelium lappaceum</i>	5	182.1	6.1	50.27	0.71	34.1	1244 cps	4.2

3-BIOACTIVITY

*ANTIOXIDANT (DPPH ASSAY) OF SEEDS OIL

Antioxidant is a process of inhibition of oxidation of other molecules. Oxidation is defined as a chemical reaction which transfers electrons or hydrogen from a substance to an oxidizing agent.²⁹

1-DURIAN

There are a few reports accessible on deciding the antioxidant activity of durian. *In vivo* work directed by Leontowicz et al.²⁴ results indicated that durian have high dimensions of antioxidant agent with polyphenols and flavonoids which contrasted with the develop and overripe durians.²⁴.

2-PAPAYA

Oxidative damage is linked with high events of some degenerative diseases like cancer, arthritis, arteriosclerosis, inflammation, aging and brain dysfunction. Earlier studies demonstrated that papaya fruits, leaves and seeds are high in antioxidant activity with high amount of vitamin B, C and E, carotenoids⁹.

3-PUMPKIN

Pumpkin seed protein was found to lessen the

detrimental effect related with protein malnutrition and CCl₄ intoxication²⁵. Pumpkin was established to effectively hinder the H₂O₂-caused diminished cell viability, lactate dehydrogenase leakage, and malondialdehyde formation.²¹

4-MANGO

The major antioxidant agents, Vitamin E, vitamin C and β -carotene, might be valuable to disorders. The extract was report to possess a scavenging action of hydroxy radicals and iron chelator.²⁹.

5-JACKFRUIT

In jackfruit 12 to 14 mg of vitamin C is available per 100 g, which is well known for antioxidant property. Vitamin E (α -tocopherol) is a basic supplement that capacities as a chain-breaking cell reinforcement and can keep the engendering of free radical responses on all cell films of the human body. The acetone extract of jackfruit was found to have higher radical scavenging activity²⁵.

6-RAMPUTAN

Rambutan peel and its by product possess strong antioxidant activity with respect to particular mechanisms like antiradical, ferric reducing activity, chelating agent, beta-chelating agent and lipid peroxidation method¹².

5-ANTI TRYPANOSOMAL ACTIVITY OF THE PLANT SEEDS OIL

Papaya extract was used as an anti-trypanosomiasis agent. Administration of chloroform extract of papaya seed was reported to inhibit the *Trypanosoma cruzi* in animal ²⁵. Leaf decoctions of papaya was documented to possess activity against *Trypanosoma brucei rhodesiense*, *Trypanosoma cruzi* ^{15, 22}. Leaves of papaya was shown to inhibit *Trypanosoma brucei* at different concentrations ¹¹. Ethanolic extract of papaya was found to decrease the number of *Trypanosoma evansi* in liver and kidneys ²⁵.

6-SUN PROTECTION FACTOR (SPF) OF THE PLANT SEEDS OIL

Sun protection factor is defined as the numerical ratio between the minimal erythral dose (MED) of sunscreen-protected skin which is applied about 2 mg/cm² and the minimal erythral dose of unprotected skin.

7-CHEMICAL PROFILE IN SEEDS OIL

Chemical constituents in *Durio zibethius*, *Carica Papaya. L*, *Cucurbita*, *Mangifera indica*, *Artocarpus heterophyllus Lam*, *Nephelium lappaceum* are discussed in detail.

8-FATTY ACIDS COMPOSITION OF SEEDS OIL

Durio zibethius was found to possess fatty acids in seed. Palmitoleic acid methyl ester, Palmitic acid methyl ester, Ethyl-9-hexadecenoate, Palmitic acid ethyl ester, 9,12-Octadecenoic acid (Z,Z) methyl ester Linoleic acid methyl ester, 9-Octadecenoic acid (Z) methyl ester(6) Oleic acid methyl ester, 9-Octadecenoic acid (E) methyl ester Oleic acid methyl ester, Octadecanoic acid methyl ester Stearic acid methyl ester, 9,12-Octadecenoic acid ethyl ester, Linoleic acid ethyl ester, Z-Ethyl oleate, E-Ethyl oleate, 5,8,11,14,17-Eicosapentaenoic acid (all-Z) methyl ester, 4,7,10,13,16,19-Docosahexaenoic acid (all-Z) methyl ester, Cholest-5-en-3-ol(3.beta) 24.951 386.36 99 1,2 15 Vitamin E ^{5, 8,20,12,13}.

10- α -TOCOPHEROLS COMPOSITION OF THE PLANT SEEDS OIL

Durio zibethinus was found to possess α -tocopherols about 1.50 $\pm$ 0.26 mg/100 g ²⁵. Researchers found that 51.85 mg/kg of α -tocopherols was present in *arica Papaya. L*²⁶. Additionally, antioxidant property of

Carica Papaya. L was documented due to the presence of α -tocopherols in the peel and seeds¹³.

11-PHENOLS COMPOSITION OF THE PLANT SEEDS OIL

The total phenolic composition of durian fruits along with seed was reported to be 690.62-999.28 mg/L ⁷. The investigation of phenolic composition of different durian cultivars was 361 - 272 mg GAE/100 g FW ¹⁹.

12-FLAVANOIDS COMPOSITION OF THE PLANT SEEDS OIL

In durian, flavonoids were found to be present in 97.9 mg CE/100 g⁶. Stereochemistry and hydrolysis pattern of flavan-3-ol, where durian seeds were found to present the specific content of oligomeric proanthocyanidins ^{1, 2, 18}

R ₁	R ₂	COMPOUND NAME
H	H	Afzelechin
H	OH	Catechin
OH	OH	Gallocatechin
H	H	Epiafzelechin
H	OH	Epicatechin
OH	OH	Epigallocatechin

Conclusion

The agricultural waste through escalated utilization of non-conventional crude materials. Likewise, agro-based waste material has been utilized for numerous applications. Some basic applications utilizing natural fiber composites for automotive and building parts.

Conflict of Interest – Nil

Source of Funding- Self

Ethical Clearance – Not required

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Legal Protection Based on Trancendental Perspective Against Child Sexual Abuse in Indonesia

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Abstract

Introduction: Sexual child abuse becomes a serious concern due to its alarming rate. It is claimed to bring serious hindrance in psychosocial development of children in the future. In 2015, the Survey on Violence against Children was carried out by the Ministry of Social Affairs, the Ministry of Women Empowerment and Child Protection and several agencies, in which it found prolonged and detrimental trauma in victims. The present study reveals sexual child abuse, legal protection against it, and approach in solving the case

Material and Method: It is a literature study that aims at examining references to theories relevant to the problem

Findings: The result reasserts the prevalence of child sexual abuse and the psychological impact of mental trauma, fear, shame, anxiety, even suicidal attempt.

Conclusion: The “soft” punishment for child sex offender is palpable evidence. Hence, an approach based on transcendental perspective based on the spiritual values contained in Islamic

Keywords: *legal protection, child sexual abuse, transcendental perspective*

Introduction

Child sexual abuse is an **alarming** reality and is being increasingly reported all around the world. In fact, paediatricians and medical professionals are usually the first point of contact with the victims and their families. **They have a key role in detecting such an abuse and providing immediate treatment and support**¹. Evidence confirms the prevalence of violence against children. As a part of the post-2015 Sustainable Development Agenda, the United Nations has called to end children sexual abuse at global level².

The victims of sexual abuse, however, have a range of health and social issues that should be identified, requiring further intervention. Comprehensive medical care has a significant role to protect children³. Sexual

exploitation of children is a topic that deserves increasing attention from research, health care, and social service communities⁴. Nevertheless, cases of violence against children are not always successfully diagnosed due to the limitations of paediatricians who may have less experiences or understanding of the proper evaluation approach. Yet there are many new methods to assist in the recognition of abuse, including screening instruments and electronic medical records for consultation with the Child Protection Program⁵.

Child sexual abuse potentially devastates child's psychosocial, growth and development in the future. The Ministry of Social Affairs, the Ministry of Women Empowerment and Child Protection (KPPPA) and a number of agencies collaborated in the Survey on Violence against Children, in which it found out that the prevalence of sexual abuse in groups of male and female aged 18-24 years could be classified “high”. The percentages were 6.36% and 6.28%, respectively, for male and female groups under 18 years old. There were 39 cases in Semarang City in 2015, consisting of 25

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cases of rape, five cases of sexual abuse and nine cases of sexual harassment⁶.

Government has enacted Law No. 17 of 2016 on Stipulation of Government Regulation in Lieu of Law No. 1/2016 on the Second Amendment to Law No. 23 of 2002 on Child Protection. It should have a deterrent effect because it does not merely regulate criminal sanctions and the exposure of the identity of perpetrators, but also an additional legal threat of chemical castration and the installation of electronic detector for adult perpetrators. But on the contrary, continuous recurrence and disclosure of child sexual abuse increasingly spread fear, anxiety, even terror in the community⁷.

Child sexual abuse is closely linked to adulthood and it potentially affects child's psychic experience. Child sexual abuse with psychic experiences has adverse effect in adulthood. Some evidences show that the proportion of sexual abuse in childhood will lead to the destructive adult life and the trauma relatively lingers to adulthood⁸.

Recently, a psychological therapy is implemented to treat the victims. However, the effectiveness of the method has not been determined yet. In fact, certain traumas cannot be approached by using psychological therapy. Such a therapy should be accompanied by the support of the family in healing the trauma⁹. Protracted trauma is very detrimental to the future of the victims of sexual abuse. Serious treatment is extremely required. Child sexual abuse is associated with a huge risk for psychiatric suffering and less religious involvement, but spiritual and religious engagement and beliefs appear to facilitate resilience in the context of harassment¹⁰. The transcendental paradigm seems to be a prospective alternative in the prevention of sexual abuse. This paradigm is interpreted as a fundamental perspective of the law science that should be studied along with its scientific methods. There are various paradigms as approaches in the development of science, i.e., positivism, post-positivism, holistic and transcendental. In the present study, the authors are interested in discussing Legal Protection Against Child Sexual Abuse from Transcendental Perspective¹¹. It will describe the cases of child sexual abuse, legal protection against child sexual abuse, transcendental perspective, and approaches in solving child sexual abuse.

Method

The type of research is normative legal research,

namely research on the basic principles of law. It may be conducted on primary legal materials and secondary law materials. The present study is a descriptive research that specifically, meticulously and systematically describes legal protection against child sexual abuse from transcendental perspective. Data collection method used in this research is literature study, document study¹². Literature study is conducted by reviewing law and regulations, relevant books, literature, and other scientific works. Data analysis is done qualitatively, comprehensively and completely so as to produce normative-empirical legal research¹³. The data obtained from this study will be analyzed and subsequently presented in detailed, systematic and explanatory description hence conclusion can be drawn.

Results and Discussion

Cases of Sexual Abuse in Children

The last three years have been a year of desolation for Indonesia. The Indonesian Child Protection Commission (KPAI) recorded hundreds of cases of sexual violence against children. KPAI Commissioner released there were 218 cases of child sexual abuse in 2015, 120 cases in 2016, and 116 cases in 2017.

KPAI Chairman argues that the number is far beyond reality since most victims' families are reluctant to file the cases¹⁴. The main reason is the perpetrator of sexual abuse is frequently a relative of the victim¹⁵. Moreover, 68% of perpetrators of sexual abuse are known to the victims while 34% of them are their own parents¹⁶.

Similar case is found by a study in Semarang city. The victim is an elementary school student while the perpetrator is the neighbour of the victim. Her parents are suspicious since the victim endures painful urination hence they decide to see the doctor. It turns out that their child has been sexually assaulted in which she confirms the incident. The case is reported to the authorities and the police arrested the perpetrator. The perpetrator admits he has been done sexual abuse since the last three months. The case is being investigated and the lure proposed to the victim has not been divulged. Yet the perpetrator is claimed to threat the victim while carrying out the action. The perpetrator is charged under article 76e jo 81 paragraph (2) of Law No. 35 of 2014 concerning child protection and/or article 287 of the Criminal Code concerning sexual exploitation of children and is liable to imprisonment for seven years. Nevertheless, the victims

still experience severe trauma and psychological support and assistance is required.

Despite the high crime rate in Indonesia, the sanctions for perpetrators are deemed to be extremely unfair. Consequently, there is no deterrent effect and even, the rate of sexual abuse in children is increasingly high. The injustices indicate an apparent problem related to the legal system. The legal system is defined as a set of networks that are intentionally made for specific purposes in which in the context of criminal justice system, it involves several structures including police, judges and prosecutors. Friedman argues that the development of a legal system involves three interrelated components of the legal substance, legal structure, and legal culture. Moreover, a transcendental perspective in resolving cases of sexual abuse is required. Judges' decisions are an important aspect in settling a case hence every decision must be made in accordance with the value of justice, essential truth, human rights, and morality values¹⁷. Moreover, transcendental is a foundation in the process of civilization. It embodies religion or Islamic values in a civilization and plays a role in giving meaning that will direct the aim of human life. Islam guides people towards the noble values of humanity. By realizing transcendental values in legal system, every order made by the judge will be a fair decision.

Despite the enactment of Law on Child Protection and the establishment of special agency to protect children against violence, the cases continually increase. In 2015, the Child Protection Task Force advocated 52 unresolved cases of child abuse. It implies the fact that collaboration of wide-ranging networks, including the government and relevant agencies, e.g., the Indonesian Child Protection Commission (KPAI), is required to address such cases.

Child sexual abuse can be defined as being forced, threatened or deceived a child into sexual activities. The activities include looking, touching, penetration (intercourse) or rape. It brings physical, psychological, and social impacts on children. **Physical impact can be a tear on the hymen.** Psychological impacts include mental trauma, fear, shame, anxiety or even suicidal attempts or attempts. Social impacts are in the forms of the cynical treatment of the community around the victim, the fear to join the community and so forth¹⁸. Effective prevention of sexual abuse requires attention to the development of the child's overall sexuality not

just limited proscriptions about vaguely identified forms of adult/child touch. A model for prevention of sexual harassment must be established to reduce cases of child sexual violence¹⁹.

Two aspects linked to the issue of child sexual abuse are treatment and prevention aspects. The first aspect is how to provide rehabilitation for the victims of physical and sexual violence. Meanwhile, the second aspect is how to educate family as the smallest scope of society. Furthermore, various factors are linked to the occurrence of child sexual abuse, including poverty and parenting style.

Despite the ratification of various laws, professional codes, or educational authorities, many countries have reported the prevalence of violence against children. Nevertheless, key solution to overcome this issue is indecisive. It is necessary to cooperate with all parties, and to provide protection for children related to their health²⁰.

Sexual Abuse Prevention Model in Transcendental Perspective

Problems related to child sexual abuse can be solved with the Child Advocacy Center (CAC) model. The lack of referral to therapeutic services and support, and potentially traumatic investigation may contribute to low conviction rates for abuse and poor outcomes for children. This model aims to solve the problems by combining multidisciplinary teams, joint investigations, and services, in a child friendly environment²¹. Model A (Assessment of the situation, and activation of the MDT (if available), R (Reporting and referral to proper agencies), I (Information and informed consent), S (Safety and SAMFE-P exam), E (Education and Empowerment) is another alternative²².

Social factors are linked to the treatment of post-traumatic stress disorder (PTSD) after interpersonal trauma. Nevertheless, strategies for social problem solving tend to be overlooked. The current studies employ social problem solving, i.e., rational approach and impulsive strategy as intermediary among the victims. Furthermore, avoidance problem solving serves as a mediator between the three types of abuse and PTSD severity²³. Among several sequelae of child sexual abuse is a maladaptive response to stress. Stress is frequently associated to a reduction in the immune system's ability to resist disease. Grounded theory analysis finds three

themes emerging: hypervigilance, outward-focused hyperawareness; somatic detachment, a lack of inward focus on self; and healing pathway, the process of healing from the abuse. By using these themes, stress on victims is possibly reduced²⁴.

In addition to the prevention of sexual abuse, the model based on the transcendental perspective such as religion, ethics, and morals are positioned as separate parts of a unified development of modern civilization. In its development, it has lost its essential facet, namely the transcendental values. In the epistemology of science, there is a model that integrates the rational science and values that depart from the transcendental spirit. The integration of science, philosophy and religion is offered as the basis of epistemology for scientific learning and research in the future²⁵.

In a transcendental perspective, there are several aspects in Islamic education for children. *First, tawhid* or an absolute monotheism is the first and foremost method in Islamic education for children. By instilling monotheism from an early age to children, it is aspired that they will have a faith that there is no god but Allah SWT. It will enforce the child always believe in God and rebuff any aspects contradictory to Islamic teachings. *Second*, exemplary is a key in Islamic education for children hence all parents are obliged to comprehend it. By being reliable role model for children, they will be grateful with Islam in which they will emulate the behaviour of role model in their lives. *Third, muamalat* is set of rules (*fiqh*) related to worldly matters, which is very important in the context of Islamic-based learning method for children. It is important to teach children how to have absolute faith in Allah and good relationship with fellow human beings²⁶.

Conclusion

The number of the cases of sexual abuse in children is alarming, it reveals the psychological impact on the victims, including mental trauma, fear, shame, anxiety and even desire or suicidal attempt. Apparently, the current legal protection against child sexual abuse can be deemed as neither liable nor effective. The “soft” punishment for child sex offender is palpable evidence. Hence, an approach based on transcendental perspective based on the spiritual values contained in Islamic.

Conflict of Interest : There is no

Ethical Clearance: Not required

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The *Sifon* Culture (The Practice of Traditional Circumcision) of the Soe People, in the Aspect of Law and the Risks of the Female Reproductive Health

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Abstract

This research talks about women in the *sifon* tradition (the practice of circumcision) among the Soe people, Central Timor Regency, East Nusa Tenggara Province, Indonesia. The *sifon* tradition is seen as an element with a cultural value on reproduction, where it is implemented through the practice of circumcision for men of the Timor tribe. In this ritual, women are the object for the sake of the men's sexual vitality, where afterwards, the men undergo intercourse with women. This practice is believed to have a magical and a religious sense. The *sifon* tradition is produced through a traditional ritual, in which a circumcised man undergoes intercourse with a minimum of three women as a process to heal the circumcision wounds. In the religious aspect, the *sifon* tradition becomes a belief for women to obtain values of propriety and compliance by sacrificing themselves for the sake of having the circumcised men healed. *Sifon* is a symbol of the men's masculinity towards their status in the society, with an ignorance of the women's rights of their reproductive health and also is a crimes.

Keywords: *Oppression of women, Sifon culture, Human right, Reproductive health.*

Introduction

The practice of traditional circumcision is a cultural phenomenon which takes place in the society, especially among societies who practice the Islamic religion, in which it is believed that circumcision must be done to males from an early age. Yet, the practice of circumcision is not only done among Muslims, as it is also a tradition of the people of the Timor tribe, where Christianity and animism is the dominant religion and believe. It is called the *sifon* ritual. This ritual is a type of the traditional circumcision ritual which is preserved from generation to generation⁽¹⁾. In the past, the *ohélet* (shaman) emphasized the role of widows or women who have been left by their husbands as the media of the *sifon* ritual, yet as time goes by, commercial sexual workers (PSK / Pekerja Seks Komersial) are the priority media of the *sifon* ritual.

The *sifon* culture legitimizes a structural oppression towards women of the *Atoni Pah Meto* tribe⁽¹⁾. People of this tribe have the belief that the practice of circumcision before marriage is executed may bring risks of impotency and infertility. Apart from that, those who are not willing to practice the *sifon* tradition will be reproached and ridiculed.

The consequence of the traditional circumcision practiced by people of the Timor tribe is related to the obligatory rite which must be done by the men as the circumcision patients to undergo intercourse at least three times with different women. The involvement of women in the healing ritual for the circumcision patients surely raises various problems. For instance, in the aspect of health, this ritual harms women, as the pus and the wounds of the patients must be discarded to the female reproductive organ, which is the vagina.

According to Republic of Indonesia's Constitution No. 7 year 1984 concerning to the Ratification of the Convention on the Elimination of All Forms of Discrimination Against Women, it is stated that the same rights of women and men have been described

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and therefore it is stated that all forms of discrimination against women must be eliminated⁽³⁾. During the voting process in the said convention, Indonesia voted in agreement as a manifestation of Indonesia's desire to participate in the international efforts to eliminate all forms of discrimination against women⁽³⁾. It is clear that in the constitutional point of view, the practice of *sifon* is a form of violence and discrimination towards women. It is against the human rights, as it is an abuse of the women's dignity. Moreover, in the health aspect, it is a risk towards the women's health, as it may transmit contagious diseases such as sexually transmitted diseases and HIV/AIDS. Therefore, the practice of the *sifon* culture not only refracts the concept of gender, yet it is also a neglect of the women's right for reproductive health, both for the women who are the media of the *sifon* culture, as well as the women who are wives of the men who practiced the *sifon* ritual.

Hence, the practice of traditional circumcision (*sifon*) among people of the Central Timor tribe which is still practiced until today have caused women to experience oppression through different aspects. The cultural structure which is still maintained in the *sifon* culture in the Central Timor area, East Nusa Tenggara Province, have development impacts from different aspects, especially in the aspect of health, where the female reproductive health is troubled. Based on the frame of mind above, thus this writing tries to analyze the oppression of women in the *sifon* culture in the legal perspective and the risks of the female reproductive health in the Central Timor, East Nusa Tenggara Province, Indonesia.

Discussion

Legal Aspect of the *Sifon* Culture

Sifon is a tradition of sexual intercourse which are done by mature men with the age of around 18 years old, who already have wives, with or without children. *Sifon* practicers, or those who undergo traditional circumcision, are obligated to have sexual intercourse with some women. The women they have sex with cannot be their own wives, nor can it be close relatives of the circumcised man. Yet, it can be with women who are unmarried or even with married women. In reality, *sifon* practicers who undergo the sexual intercourse ritual with a married woman can be charged Article 284 of the Criminal Law concerning adultery and may be sentenced to jail for a maximum period of 9 months

if the husband of that woman reports to the authorities.

In the point of view of the men who underwent the *sifon* tradition, their penises will be swollen, and they will have difficulties penetrating into the vagina. This will cause pain and the swell will break inside the vagina. After the men's genitals are fully healed, they will give some rewards to the women whom they had had sex with for the sake of *sifon*.

The reward used to be some silver (a strip of silver). Following the dynamics of the times, the reward nowadays would be some money, with the sum of around IDR 250.000 (two hundred and fifty thousand rupiah) or some cattle, usually chickens. The procession of the *sifon* tradition starts off with handing over some 'dowry' to the shaman or the *ohelet*, usually some chickens, some knick knacks, and some money. After that, the patient will be taken to the river to undergo a confession of sins.

Then, the *ohelet* will form the cut (circumcision) using a *sembilu* blade (made from thin bamboo or it can also be a knife), where the man will then be returned to the river to be cleansed. This will be done in a period of a week or more. There is a term '*Pria Ato in Meto Fatumnasi*' which means seeking for women who will become the victims of *sifon*. The men may use fake promises and seduction, saying that they will marry the women as long as they are willing to sacrifice themselves for the *sifon* tradition. After having had sex, the men will actually leave the women. A term used among the *Ato in Meto* men is '*Haiknikit*', which can be defined as seeking for *sifon* victims, or cooling down the end of their circumcised genitals, which aims to make it smooth.

Another term is '*ta'sanutma'putu*' which means cooling down the heat, or '*polinma'putu*'. The seduction the men do to the women is merely a strategy to attain the '*polinma'putu*' or '*at polin ai ma'out*' relations from the women. Therefore, the sperm from that intercourse will serve as a cure to heal the wound of the man⁽³⁾. This ritual is practiced when the circumcised genitals are almost healed, yet not yet fully healed, which is around 2-7 days prior to the circumcision⁽⁴⁾.

The culture of patriarchy still has a high influence in this culture, therefore women have trouble exiting from the confinement of the tradition which demeans women⁽⁵⁾. In one of the tabloids which discuss about the *sifon* culture, it is said that victims of this ritual may be

threatened to not be married for the rest of their lives⁽⁶⁾.

Traditional leader of the Tubuhue Village, Amanuban Barat Sub-District, explains that the men who will practice the *sifon* culture must ask for leave to their wives or their families, because they will not directly return after the circumcision⁽⁷⁾. Meanwhile, the time of circumcision, according to the local culture, must be practiced when corn starts to grow grains. This has a meaning that the circumcised man's face will shine. This is why, in the maize season, women in the Central Timor and also in other areas of the Timor Island are reluctant to travel alone as they are worried that they will become victims of the *sifon* ritual⁽⁸⁾.

Young men of the Meto tribe who do not undergo the *sifon* ritual will be isolated, ridiculed, and insinuated during traditional ceremonies⁽⁹⁾. Women whose husbands undergo the *sifon* practice will not be jealous nor will they feel betrayed as they believe that the *sifon* practice is also for their sake⁽⁹⁾.

The women may be widows, commercial sex workers, or even good women who are seduced with fake promises to be married. Legally, the men who seek women as the victims of the *sifon* ritual with fake promises may be charged with the Criminal Law Article 378, concerning fraud and may be sentenced with imprisonment for a maximum period of four years.

Women who sincerely accept the *sifon* tradition are because of their awareness towards the magical-religious values of that practice, without understanding its dangers for their reproductive health. Again, women are placed in an inferior position, where they are silenced by a masculine-dimensioned system. The healing ritual practiced by the circumcision patients through the vagina makes it seem that the vagina is a trash bin to contain filth as results of the circumcision, which has the aim to prevent impotency and to cure infertility⁽¹⁰⁾.

Regarding silenced women, the term 'Subaltern' is popularized by Spivak, which is followed by a question, "Can the Subaltern speak?" This question aims to emphasize that a subject named the Subaltern, who have difficulties speaking out, even regarding themselves. Spivak explicitly states that the Subaltern are women, as they are subjects who do not have a position nor an influence in social change⁽¹¹⁾. Spivak understands that his desire to give voice to the Subaltern in history is formed by the imperial-masculine ideology⁽¹²⁾.

***Sifon* Culture and Its Risks towards the Female Reproductive Health**

The *sifon* culture, if associated with the Constitution of Health, it can be said that the women related to it (the *sifon* women as well as wives of the *sifon* actors) do not reach a state of welfare for their bodies, their minds, nor their social lives. It is difficult for them to reach a welfare-state, both economically and socially, as they are confined in a culture which produces risks towards their health. Results of Lake states that *sifon* women, will cause the *sifon* women to become skinnier day by day. They will experience a lengthy fever and their skin and eyes will become yellowish⁽¹³⁾.

It is noted that the number of HIV cases in the area of Central Timor Regency in year 2013 is as many as 11 cases. It increased to 14 cases the next year, which then increases to 23 on 2015. On 2016, there are 11 cases. Meanwhile, there are 20 cases of AIDS in 2013, increasing to 25 cases in the next two years, and becoming 39 cases in 2016. The cases of HIV/AIDS are caused by free sex, drugs, a high mobility and migration, also the fast flow of information and communication⁽¹⁴⁾.

The high number of people with AIDS in the Central Timor area shows a potentially dangerous condition for women (both the *sifon* women as well as wives of the *sifon* actors). The ritual of free sex in the *sifon* ritual are usually done through the following method:

Penetration of the penis to the vagina even though there cannot be ejaculation, as its purpose is only to smear and to release blood and pus from the swollen penis as results of the circumcision. It is believed that it will bring effect towards the vitality of men.

Sifon is done by married men with widows or women who have been left by their husbands or by virgin girl. The development of the era shifts this condition and nowadays the media of *sifon* may be commercial sex workers.

The *sifon* ritual is practiced through those methods, which may pose risks towards the occurrence of sexually transmitted diseases (STDs), such as:

Gonorrhea and Chlamydia, caused by bacteria. Infection starts a few days until a few weeks after having sexual intercourse with an exposed person. In men, the genitals will excrete some liquid which will make urinating feel painful. Meanwhile, in women, the

symptoms are not severe, or there might be none at all. But, if not cured, this disease will become worse and may cause infertility.

Herpes, caused by virus, which may be treated but not healed. Symptoms start to occur three until ten days after having sexual course with someone exposed to this disease

Syphilis, caused by bacteria. Symptoms will appear between three weeks until three months after having sex with someone who suffers from this disease. Blisters will look like holes in the skin, with higher edges. It is usually not painful. The blisters may disappear after a few weeks, but the virus will stay in the body and this disease may reappear as blisters all over the body.

Human Papilloma, caused by virus (HPV), where one or many boils or ulcers will appear, between one month until one year after having sexual intercourse with a sufferer. In women, it may cause cervical cancer.

AIDS (Acquired Immune Deficiency Syndrome) is a disease of HIV (Human Immunodeficiency Virus), caused by unprotected sex. It may cause death after around ten years after being infected by the HIV virus.

Because of that, the *sifon* ritual needs an immediate attention from all elements, to come together and to make efforts so that the *sifon* culture may be stopped. This may be done through continuous programs from the related authorities.

Education by the Public Health Office to give counseling concerning the *sifon* culture and the harm it causes. There needs to also be a data on the *sifon* practicers and the commercial sex workers, so that they can be checked regularly.

Education by the religious leaders, such as the Christian/Catholic priests or the Islamic scholars to strengthen their spiritual knowledge, so that the society understands that the *sifon* culture is a primitive act which is against the religious, social, and legal norms.

Legal action must be taken to the practicers of the *sifon* who undergo sexual intercourse with underaged women or with women who are married. This also applies to men who make fake promises and seduction to marry those with whom they will undergo sexual intercourse for the sake of *sifon*.

Conclusion

Sifon is a culture in which men undergoes a traditional circumcision and tries to heal it by having sexual intercourse with at least three women who are not their wives, which makes women victims of oppression. Politically, *sifon* is a strategy to strengthen the system of masculinity and patriarchy to subdue women to obey in becoming sexual objects. This unhealthy culture contributes greatly on the transmission of sexual diseases such as HIV/AIDS, which poses risks to the reproductive health of the women in the Central Timor area, East Nusa Tenggara. Legal action must be taken immediately to prevent further harms caused by this tradition.

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Effectiveness of an Educational Program on Nursing Students' Abilities Regarding Drug Dosage Calculation

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Abstract

Objectives: the study aimed to assessment of the effectiveness of an educational program on nursing students abilities regarding drug dose calculation (pre and post test) A quasi-experiment design was carried out at college of nursing/ university of Kirkuk for fourth stage students from 1st of March, 2018, up to the 1st of March, 2019. The program and the instrument were designed by the researcher to achieve the purpose of the study. A non-probability (convenience sampling) of (40) students both male and female from morning (20) and evening (20) studies was selected. All of the study sample were included in the program (study group) the questionnaire was consisted of three parts: part one the demographic data of the sample, part two the abbreviation and conversion skills. And part three the calculation skills. The data were collected through the use of pretest and posttest the program was explained to the students mathematically to the students and then after two week they given the questionnaire. they were analyzed through the application of descriptive statistical analysis and inferential statistical data analysis. The findings of the study indicated that (52%) of the samples were female, (48%) were male (50%) of the sample were morning study students, (50%) also were evening study students.

Keywords: Abilities, Educational program, Drug dose, Drug dose calculation.

Introduction

As core skills of nurses' work, nursing staff and nursing students should understand the medication preparation, medication administration, and medication dosage calculation effectively before injecting the drugs to the patients in order to prevent the hazards resulting from medication errors and to promote more patients safety. National Patient Safety Agency (NPSA) reported that 59.3% of medication administration errors occur during of drug preparation. Dose calculation errors comprise 28.7% of all reported drug errors ¹ Drug dose calculation applied through mathematic and numerical formula, some of formula applied for tablet drugs and others for liquid medication as used in the program for the students ² Increasing students' knowledge and skills

regarding drug dose calculation should be emphasized in the curriculum in to the students to increase their skills regarding drug dose calculation. stated that the knowledge and calculation skills of nursing students were inadequate ³. Emphasized that 92% of 229 nursing students in England failed a drug calculation test and reported that efforts to improve essential numerical and drug calculation skills should be integrated into the university curriculum⁽⁴⁾. Objective of the study:

To determine the effect of an educational program on students' knowledge about drug dose calculation.

To assess pre-test knowledge of students regarding drug dose calculation in both groups (study, control).

To assess post-test knowledge of students regarding drug dose calculation in both groups (study, control) after implementation of program.

To comparing the level of knowledge before and after the implementation of educational program in both groups (study and control)

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To find out the relationship between the level of knowledge regarding drug dose calculation in the study group with selected demographical variables such as gender and type of the study.

Methodology

A quasi experimental research design with pre and post-test to the study groups approach was used to evaluate effect of the educational program regarding drug dose calculation skills was carried out from 1st March 2018 to 1st March 2019. The study was conducted in college of nursing/ university of Kirkuk in Kirkuk city. A Probability random sampling was chosen for the present study. The sample consists of (40) student nurse the entire sample included in the program (experimental group). An instructional program about drug dose calculation was constructed depending on the results obtained from the assessment of nurses knowledge from reviewing the related literature and the experts opinion. The questionnaire was constructed for the purpose of the study. The Instruments consisted two parts: Part 1: Demographic Data: This part concerned with personal information include, the (gender, type of the study), Part 2: Abbreviation and conversion skills: which include 8 question about abbreviation and 8 questions about conversion skills regarding medication. part 3: calculation of drug dose skills: which consist of three mathematic questions about liquid medication and two mathematic questions about tablet medication. The researcher fed the computer by all the data collected in the study, the data were analyzed through the use of Statistical Package for Social Science (SPSS) version 20. The statistical procedures which were applied for the data analysis and assessment of the results include the following: descriptive statistics (frequencies, percentages) and statistical inferential (chi-square test) in order to find the differences between the experimental group. Table 1: shows that female constitute (52%) of the study sample, (48%) was male. Morning and evening students were (50 %) equally. Table 2: shows that the effect of a program on the students' abilities regarding abbreviation skills was effect on students. Table 3: shows that the effect of a program on the students' abilities regarding conversion skills was high effect. Table 4: shows that the effect of a program on the students' abilities regarding calculation skills was high effect.

Results and Discussion

Table (5) shows that there is no significant difference between (pre and post abbreviation skills) domain with their gender. And there is significant differences between (pre and post conversion and calculation skills) domain and their gender at $P \text{ value} \leq 0.05$. Table (6) shows that there is no significant difference between (pre and post abbreviation skills) domain with their type of the study. And there is significant differences between (pre and post conversion and calculation skills) domain and their type of the study at $P \text{ value} \leq 0.05$. Table 1: shows that female constitute (52%) of the study sample, (48%) was male. Morning and evening students were (50 %) equally, Explanation of our results the system in our faculty usually accept 75% from students female and 25% male there for we are find most of the students female this results is agreement with other study conducted by Guneş and others 2014 mathematical and drug calculation skills of nursing students in turkey and find , 64.8% were female⁽⁵⁾. Also the results shows in table (2) that the effect of a program on the students' abilities regarding abbreviation skills was effect on students ,this result is disagreement other study conducted by Guneş and others 2014 mathematical and drug calculation skills of nursing students in turkey and find Based on a passing grade of 60%, 52% of the students had grades below 60, and based on a passing grade of 80%, 73.6% of the students were determined to have failed⁽⁵⁾ With regard to the effect of a program on the students' abilities regarding conversion skills was high effect in table (3) this results is agreement with other study conducted by Cohen and Weeks and shows that An implication of an education program the can be to let nurses regularly attend an e-learning course followed by a screening test to uncover the weak calculation topics there for find improve conversion skills⁶ Also the results shows in table (4) shows that the effect of a program on the students' abilities regarding calculation skills was high effect. The educational method used in teaching drug-dose calculations has a substantial impact on educating students. The efficacy of various educational methods related to developing nursing students' skills with dose calculation has been evaluated⁷. Table (5) shows that there is no significant difference between (pre and post abbreviation skills) domain with their gender. And there is significant differences between (pre and post conversion and calculation skills) domain and their gender at $P \text{ value} \leq 0.05$. Pentin and Smith found

that nurse's ability to calculate drug dosages without a calculator remains contentious and many nursing programmes test their students but allow them to use a calculator or do not assess the process of the calculation when a calculator is used. Moreover they support that the issues for healthcare practice in relation to drug dosages calculation requires further investigation, including establishing if there is any difference in drug calculation error between nurses who use a calculator only and those who perform maths calculation with and without a calculator⁽⁸⁾. Table (6) shows that there is no significant difference between (pre and post abbreviation skills) domain with their type of the study. And there is significant differences between (pre and post conversion and calculation skills) domain and their type of the study at $P \text{ value} \leq 0.05$. The study by Cook and others (2015) was not able to demonstrate an overall difference in learning outcome between the two didactic methods, either of statistical or clinical importance. Both methods resulted in improvement of drug dose calculations after the course, although the learning outcome was smaller

than what was defined as clinically relevant. Adjusted for other contributing factors for learning outcome in the multivariable analysis, the classroom method was statistically superior to e-learning, and so was the case for a subgroup with a low pretest result. This finding from the post hoc analysis was probably the only outcome that could have a meaningful practical implication for choice of learning strategy, if reproduced in new studies. These results were in accordance with a meta-analysis of 201 trials comparing e-learning with other methods⁽⁹⁾. Table (5) shows that there is no significant difference between (pre and post abbreviation skills) domain with their gender. And there is significant differences between (pre and post conversion and calculation skills) domain and their gender at $P \text{ value} \leq 0.05$. Table (6) shows that there is no significant difference between (pre and post abbreviation skills) domain with their type of the study. And there is significant differences between (pre and post conversion and calculation skills) domain and their type of the study at $P \text{ value} \leq 0.05$

Table 1: Percent distribution of demographic data of the study sample

No.	Variable		F.	%
1	gender	Male	19	48
		Female	21	52
		Total	40	100
2	Type of study	Morning	20	50
		Evening	20	50
		Total	40	100

Table 2: Effectiveness of educational program on students' abilities regarding abbreviation skills

No.	Items	Pretest		Posttest	
		F	%	F	%
1	low	2	5	1	2.5
2	mild	9	22.5	4	10
3	high	29	72.5	35	87.5
4	total	40	100	40	100

Table 3: Effectiveness of educational program on students' abilities regarding conversion skills

No.	Items	Pretest		Posttest	
		F	%	F	%
1	low	21	52.5	1	2.5
2	mild	10	25	7	17.5
3	high	9	22.5	32	80
4	total	40	100	40	100

Table 4: Effectiveness of educational program on students' abilities regarding calculation skills

No.	Items	Pretest		Posttest	
		F	%	F	%
1	low	32	80	4	10
2	mild	4	10	13	32.5
3	high	4	10	23	57.5
4	total	40	100	40	100

Table 5: Association between pre and posttest of students' abilities to calculate drug dose with their gender

Male						
No.	variable	total	Chi-square	Crit. χ^2	Df.	Sig.
1	Abbreviation abilities	40	2.533	5.99	2	NS
2	Conversion abilities	40	16.8	5.99	2	S
3	Calculation abilities	40	14.46	5.99	2	S
Female						
1	Abbreviation abilities	40	0.65	5.99	2	NS
2	Conversion abilities	40	16.42	5.99	2	S
3	Calculation abilities	40	27.52	5.99	2	S

Table 6: Association between pre and posttest of students' abilities to calculate drug dose with their type of study

Morning study						
No.	variable	total	Chi-square	Crit. X ²	Df.	Sig.
1	Abbreviation abilities	40	0.78	5.99	2	NS
2	Conversion abilities	40	15.56	5.99	2	S
3	Calculation abilities	40	25.6	5.99	2	S
Evening study						
1	Abbreviation abilities	40	1.96	5.99	2	NS
2	Conversion abilities	40	16.76	5.99	2	S
3	Calculation abilities	40	16.26	5.99	2	S

Conclusion

The educational program was effect on nursing students skills regarding abbreviation, conversion and calculation skills. The association was significant differences between (conversion and calculation skills) domain and their gender The association was significant differences between (conversion and calculation skills) domain and their type of study

Financial Disclosure: There is no financial disclosure.

Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the College of Nursing/ University of Kirkuk/ Iraq and all experiments were carried out in accordance with approved guidelines.

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Low level laser Therapy in Management of Oral Lichen Planus (OLP)

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Abstract

Oral lichen planus (OLP) is a chronic state of inflammatory condition with immunological behavior of unknown etiology, Laser application on different lesions has been suggested as new treatment modalities without significant adverse effects. Eighteen females subjected from OLP with mean age (37.9) years; without signs and symptoms for any medical diseases, these patients treated with low level laser (Epic X 10 diode laser for soft tissues). The symptoms of oral lichen planus can be treated by 630-980 nm low level lasers to reducing both the pain and mouth soreness with no adverse effects. The action of laser in this field by; convert the pro-inflammatory state to anti-inflammatory condition and progression in collagen repair, cell proliferation and finally tissue regeneration.

Key words: *Laser Therapy, OLP*

Introduction

Lichen planus is a mucocutaneous, chronic with an autoimmune reaction disease which occurs in skin, oral mucosa, genital mucosa, and nails then scalp¹. Within oral cavity field; it is presented mostly on the buccal mucosa, tongue and finally gingival area. About 50% of the patients with oral lichen planus (OLP) have skin lesions. No possible etiology has been found; but different hypothesis that dealt with this disease like viral infection, stress and finally collagen disease². The OLP features associated with multiple drugs and agents like antihypertensive (e.g. ACE inhibitors) as captopril, non-steroidal anti-inflammatory drugs, and psychoactive drugs as tricyclic antidepressants³. The OLP clinically can be differentiated into multiple types: reticular associated with white keratosis striae surrounding by erythematous area, papular like plaque in shape, erythematous appears as redness superimposed with

desquamative gingivitis of mucous membrane pemphigoid in clinical diagnosis, then finally erosive kind⁴. The diagnosis of lichen planus through both the clinical features and histopathological examination, incidence of OLP mostly in women ranging from 25-45 years old; buccal mucosa area of oral cavity is the most clinical site of lichenoid phenomena⁵. Definitive etiology of lichen planus not well defined; but T-cell mediated immune reaction and can be considered under type-four allergic reaction. Treatment of this disease by corticosteroids and other drugs like non-steroidal anti-inflammatory drugs, long term use of steroidal agents lead to candida albicans appears as side effects⁶. Low level laser therapy or soft tissues laser; can be considered as treatment modalities for OLP, also (CO₂) type of laser; these types of laser are important and beneficial in relieving of symptoms and pain associated with clinical appearance of lichen planus. Diode laser with wavelength 810- 980 nm range is effective and absorbed by soft tissue rather than hard tissue like bone, with penetration depth about 2-3 mm; this depth can cover as well the sub-epithelial layer of tissue^{7,8}. The 980 nm diode lasers have showed acceptable in both coagulation and hemostasis features. Good healing of wound, lack bleeding and swelling, pain and formation of scar tissue after soft tissue surgical approaches are other benefits named for diode lasers (Moritz *et al.*, 1997).

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Materials and Method

18 females subjected from OLP with mean age (37.9) years; without signs and symptoms for any medical diseases, these patients treated with low level laser (Epic X 10 diode laser for soft tissues), Low level laser therapy LLLT or called diode laser with the following specifications: 1- Probes with 980 wavelengths. 2- Energy density with 10J / cm² in average. 3- One KHz diode laser frequency with 80% of a duty cycle of. The OLP patients already diagnosed by both clinical and histopathological findings as shown in figure (1), with lack of salivary flow due to long period of corticosteroids administration. The laser treatment begins from 3 session to 9 sessions for about 1-2 months assessment. The points of laser application by direct contact of head probe on OLP areas, these procedures shown in figure (2).

Results and Discussion

After end of laser treatment sessions, good improvement of pain and wound healing with good tissue contour; without discomfort and no bleeding. The mean age of patients with lichen planus was (37.9) years. The etiology of lichen planus till now not well defined; but different proposal explanation that deal with etiology as autoimmune, stress, smoking and finally viral etiological factors. Corticosteroid is considered as drug of choice in management and suppression of acute state of disease; but this drug associated with different side effects on human body ⁹. The LLLT is a modern evolution in physiotherapeutic approaches in medical, dental and biological fields regarding mucocutaneous diseases like oral lichen planus ¹⁰. Passeron *et al.*, 2004 found the pain and OLP lesion reduction due to LLLT application in 630 nm wavelengths by 12 sessions for about six weeks without side effects and discomfort to the patients and without relapse; these results agreed with the present study. Köllner *et al.*, 2003 showed that using low level laser therapy in treatment of oral lichen planus by 9 sessions for 3 months with one month later assessment after end of treatment these findings agreed with the current study. An about 630 nm and above wavelengths are considered multiple millimeters tissue penetration or mucosal surface interance then leads to better results of pain and lesions reduction without remission later. In conclusion, the symptoms of oral lichen planus can be treated by 630-980 nm low level lasers to reducing both the pain and mouth soreness with no adverse

effects. The action of laser in this field by; convert the pro-inflammatory state to anti-inflammatory condition and progression in collagen repair, cell proliferation and finally tissue regeneration.



Figure (1): 40 years old female patients with reticular surrounding by erythematous lichen planus for two years ago.



Figure 2 A



Figure 3 B



Figure (3): A, B, C: Laser application on OLP lesions

Conclusion

Laser therapy is update evolution in medical treatment in different diseases like OLP with no pain and side effects and better non-invasive, no surgical procedure.

Financial Disclosure: There is no financial disclosure.

Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the Department of Oral Surgery and Oral Diagnosis /College of Dentistry/ Babylon University, Iraq and all experiments were carried out in accordance with approved guidelines.

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Middle Age Knowledge Regarding Health Screening

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Abstract

Objectives: To assess the middle age knowledge regarding health screening, regularity performing the health screening and the obstacles that prevent perform it. Non-probability sample (purposive sample) of one hundred and seventy four (174) middle age persons (87 women and 87 men) who attending outpatient clinic. Statistical descriptive and inferential methods were used in data analysis. The results indicated that the highest percentage study sample 22.9 % were in age group (55 - 59) years old. The highest percentage study sample 27.5 % they were suffered from Hypertension. 44.8 % know if the screening results are abnormal, should follow-up. 71.3% didn't know the health screening is done for people who look or feel well. The highest 31.7 % they have knowledge about the Screening test of Diabetes recommended for test , method of measurement, and screening frequency. 71.3% didn't have knowledge about the Screening test of High blood cholesterol recommended for test, Method of measurement, and Screening frequency. 96.5 % they did not perform a health screening on a regularly and finely regarding the obstacles that prevent perform a health screening the highest percentage of study sample 89.2 % agree that there are no facilities for health screening.

Keywords: Middle age, knowledge, health screening

Introduction

Health screening was a rapidly growing and widely accepted practice in health care during the twentieth century. ¹ Is a strategy used in a population to identify the possible presence of an as-yet-undiagnosed disease in individuals without signs or symptoms. This can include individuals with pre-symptomatic or unrecognized symptomatic disease. As such, screening tests are somewhat unusual in that they are performed on persons apparently in good health. ² Proponents of screening programs affirm that in addition to the potential of early disease detection, interventions are designed to identify disease in a community early, thus enabling earlier intervention and management in the hope to reduce mortality and suffering from a disease. Although screening may lead to an earlier

diagnosis (secondary prevention), they also provide the opportunity for screening participants to change unhealthy lifestyles through the so-called lifestyle counseling (primary prevention). ³ Health Screening is an important part of health promotion efforts. There is an emerging emphasis on health screening that screening for chronic diseases such as hypertension, diabetes, high cholesterol, obesity, breast cancer, cervical cancer and colorectal cancer, which is internationally recognized as a cost effective way to identify and treat health problems before they develop or worsen and help to prevent major complications of common diseases and chronic medical problems. The health Screening promotes healthy lifestyle as well as preventive quality health program. ⁴ Developing a health screening program can facilitate the improved functioning of a health care system. It should, be undertaken in a manner that is integrated with existing services so as to improve health system functioning. ⁵ Objectives: To assess the middle age knowledge regarding health screening. To determine whether the health screening is conducted regularly and the obstacles that prevent it. To identify the association between level of knowledge of study sample and studied variables.

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Methodology

A descriptive analytic study was carried out to assess the middle age knowledge regarding health screening, who attending outpatient clinic for seeking treatment at Baghdad General Teaching Hospital. Non-probability sample (purposive sample) of one hundred and seventy four (174) middle age persons (87 women and 87 men) who attending outpatient clinic for seeking treatment at Baghdad General Teaching Hospital. The instrument was designed and constructed by the investigator after reviewing related literatures, clinical background and previous studies. The questionnaire form was consisted of (3) main parts: Demographic characteristics, knowledge regarding health screening, and regularity performing the health screening and the obstacles that prevent perform it. The data were collected by using interview method and self-report techniques with study participants after obtaining permission from each of them according to the inclusion criteria. Statistical procedures include: Descriptive Statistics: frequency, percentage and Mean of score. Inferential methods were used in data analysis: Contingency Coefficients test. Participant's knowledge were rated and scored for each item as two (2) for yes and one (1) for no Assessment with Scoring Scales. Low (1-1.49), Moderate (1.5 – 1.75), and High (1.76 – 2].

Results and Discussion

Table 1 demonstrates that the highest percentage study sample 22.9 % were in age group (55 - 59) years old , the highest percentage of their educational level 27 % were Secondary school graduated, the highest percentage study sample 41.3% were governmental employee and the highest percentage 41.3% of study sample at Middle level of economic status. Table 2 demonstrates that the highest percentage study sample 44.8 % know if the screening results are abnormal, should follow-up, while the highest percentage of them 71.3% didn't know the health screening is done for people who look or feel well. Table 3 demonstrates that the highest percentage of study sample 31.7 % they have knowledge about the Screening test of Diabetes recommended for test , Method of measurement, and Screening frequency while the highest percentage of them 71.3% didn't have knowledge about the Screening test of High blood cholesterol recommended for test , Method of measurement , and Screening frequency. Table 4 demonstrates that the highest percentage study sample 96.5 % they did not perform a health screening on a regularly, and regarding

the obstacles that prevent perform a health screening the highest percentage of them 89.2 % agree that there are no facilities for health screening in hospitals and health centers. Table 5 demonstrates that there was statistical significant relationship between level of knowledge and (level of education and occupational status), while there were no statistical significant relationship between level of knowledge and (age, Economic states). The present study revealed that the highest percentage of study sample 22.9 % were in age group (55 - 59) years old , the highest percentage of their educational level 27 % were Secondary school graduated, the highest percentage of study sample 41.3% were governmental employee and the highest percentage 41.3% of study sample at Middle level of economic status. Middle age is between 45 and 65.”The period between early adulthood and old age, usually considered as the years from about 40 to 65. ⁶ Educational level of the target population is thus a basic measure that will contribute to early diagnosis of the disease, and upon which screening must be based. ⁷ People who do not have health insurance or a usual source of health care, those with lower incomes and those living in rural areas. ⁸ Table (2) show that the highest percentage of study sample 44.8 % know if the screening results are abnormal, should follow-up, while the highest percentage of them 71.3% didn't know the health screening is done for people who look or feel well. A variety of developing countries, having limited access to health screening activities. Typically, these have low population coverage of screening, predominance of clinical services for patients presenting with symptoms, absence of pre-established calls for screening to patients in pre-defined age groups, insufficient quality control of chronic medical problems and limited follow-up of patients with positive tests. In many countries this is associated with limited access to treatment. Health screening Program in developing countries tends to be decentralized and only partially funded, and organized to meet immediate needs rather than long-term follow-up and management. ⁹ Table (3) demonstrates that the highest percentage of study sample 31.7 % they have knowledge about the Screening test of Diabetes recommended for test, Method of measurement , and Screening frequency while the highest percentage of them 71.3% didn't have knowledge about the Screening test of High blood cholesterol recommended for test , Method of measurement , and Screening frequency. Where hypertension has been recognized as a major local public health problem only recently. Intermediate

rates of hypertension awareness and control are not unexpected findings because hypertension has become a major health concern only lately, possibly a consequence of the rapid epidemiological transition over the last two or three decades. Although a nationwide program of prevention and control of cardiac vascular disease was initiated in 1991.¹⁰ table (4) demonstrates that the highest percentage study sample 96.5 % they did not perform a health screening on a regularly, and regarding the obstacles that prevent perform a health screening the highest percentage of them 89.2 % agree that there are no facilities for health screening in hospitals and health centers. Health screening programs do not exist in most developing countries. Their existing health-service infrastructure, human resources, and health-service

investments often preclude the possibility of introducing and sustaining effective screening programs. Substantial investments in improving health care infrastructure, human resources, and improvisation systems will be required to improve early detection and treatment of chronic medical problems in many countries¹¹ Table (5) shows that there was statistical significant relationship between participant's knowledge and (level of education and occupational status), while there were no statistical significant relationship between level of knowledge and (age group, Economic states). Evidence suggests that those who achieve a higher level of educational attainment are more likely to engage in healthy behaviors and less likely to adopt unhealthy habits.¹²

Table (1): Distribution of the study sample according to socio - demographic characteristics

Variables	Groups	No.	%
Age	40 – 44	30	17.2
	45 – 49	26	14.9
	50 – 54	30	17.2
	55 – 59	40	22.9
	60 – 64	25	14.3
	≥ 65	23	13.2
Level of education	Illiterate	7	4
	Read and write	15	8.6
	Primary	25	14.3
	Intermediate	35	20.1
	Secondary	47	27
	Institute	20	11.4
	College & H.E.	25	14.3
Occupation	House wife & Unemployed	47	27
	Employed	72	41.3
	Non-governmental employee	28	16
	Retired	27	15.5
Economic status	High	42	24.1
	Middle	72	41.3
	Low	60	34.4

Table (2): Distribution of the study sample according to their knowledge regarding health screening

Variables	Items	I know		I don't know		Ms	Asses.
		No.	%	No.	%		
What is health screening	1- Its physical examinations or other procedures to detect disease early	70	40.2	104	59.8	1.40	Low
	2- Its important actions to everyone you	65	37.3	109	62.7	1.37	Low
	3- prevent or delay serious complications	76	43.6	98	56.4	1.43	Low
	4- It is done for people who look or feel well	50	28.7	124	71.3	1.28	Low
	5- It is different from diagnostic tests	54	31	120	69	1.31	Low
	6- If the screening results are normal, should continue to go for regular screening	60	34.4	114	65.6	1.34	Low
	7- If the screening results are abnormal, should follow-up	78	44.8	96	55.2	1.44	Low

Table (3): Distribution of the study sample according to knowledge regarding General Screening Tests

To screen for	Method of measurement	Screening frequency	I know		I don't know		Ms	Asses.
			No.	%	No.	%		
<u>Hypertension</u> (High blood pressure)	Blood pressure measurement	Once every two years or more frequently as advised by your doctor	53	30	121	70	1.32	Low
<u>Diabetes mellitus</u>	Fasting blood glucose	Once every three years or more frequently as advised by your doctor	55	31.7	119	68.3	1.32	Low
<u>Hyperlipidaemia</u> (High blood cholesterol)	Fasting lipids	Once every three years or more frequently as advised by your doctor	50	28.7	124	71.3	1.32	Low
Osteoporosis	dual energy X-ray absorptiometry (DEXA)	Get at least once at age 65	53	30	121	70	1.31	Low

Table (4): Distribution of the study sample according to doing health screening regularly and obstacles if not

Variables	Items	Yes		No		Ms	Asses.
		No.	%	No.	%		
	Is the health screening conducted regularly?	6	3.5	168	96.5	1.03	Low
	If no what are the obstacles						
	1- I'm in a good health and I do not need a health screening	148	88	20	12	1.81	High
	2- I do not have time to do a health screening	100	59.5	68	40.5	1.63	Moderate
	3- I am afraid of the results of the health screening	98	58.4	70	41.6	1.63	Moderate
	4- I do not trust the credibility of the examination in the laboratories of government hospitals and health centers	118	70.2	50	29.3	1.64	Moderate
	5- Due to examination costs	70	41.7	98	58.3	1.40	Low
	6- I am afraid of the screening procedure	50	29.3	118	70.2	1.28	Low
	7- There are no facilities for health screening in hospitals and health centers	150	89.2	18	10.8	1.82	High
	8- I do not know the importance of health screening	87	51.7	81	42.3	1.47	Low

Table (5) shows the association between Level of Knowledge of Study Sample and Studied variables

Studied variables unacceptable No		Knowledge level		χ^2	d.f	P-value	Sig.
		acceptable					
		No					
Age	40-49	30	26	12.617	2	.027	NS
	50-59	49	21				
	60and more	37	11				
Level of education	Illiterate -Read and write-Primary	29	18	29.609	2	.000	S
	Intermediate & secondary	49	33				
	Institute & college	38	7				
Occupational status	Work	89	38	17.521	1	.001	S
	Not work	27	20				
Economic states	High	27	15	1.476	2	.478	NS
	middle	53	21				
	low	36	22				

Conclusion

Depend on analysis and interpretation of the results, the following conclusions: The highest percentage study sample 22.9 % were in age group (55 - 59) years old the highest percentage 27 % were Secondary school graduated. The highest percentage study sample 44.8 % know if the screening results are abnormal, should follow-up, while the highest percentage of them 71.3% didn't know the health screening is done for people who look or feel well. The study samples have low level of knowledge regarding general Screening Tests. The highest percentage study sample 96.5 % they did not perform a health screening on a regularly, and regarding the obstacles that prevent perform a health screening the highest percentage of them 89.2 % agree that there are no facilities for health screening in hospitals and health centers. There was statistical significant relationship between participant's knowledge and (level of education and occupational status), while there were no statistical significant relationship between participant's knowledge and (age group, Economic states).

Financial Disclosure: There is no financial disclosure.

Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the Nursing Technology Department, Medical Technical Institute / Baghdad, Middle Technical University, Baghdad, Iraq and all experiments were carried out in accordance with approved guidelines.

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Determination Knowledge of Second Stage Student in Nursing College about Blood Iron Deficiency (Anemia)

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Abstract

The main aim of the study is to identify the relationship between students' demographic characteristics and blood iron deficiency (anemia).and to identify the relationship between nutrition and blood iron deficiency (anemia). A descriptive designs was used out to determination knowledge of the student second Stage of nursing college about IDA. This study started from January 2016to March 2017. The study population consists of Babylon city college nurses. A purposive (non- probability) sample of 25 student in second stage were learned in college nursing .A self-reported question hare was distributed for the participants. The purpose and significance of the study were explained to each participant before initiating data collection. All participants were informed that participation is voluntary. The question naive needs 10-15 minutes to be completed by the participants. The interview took about (1 day) at morning. The descriptive statistics (frequency of percentage) were used to analyze the data. The results of the study indicated that there were highly significant differences between pre and post-test in the experimental group in the main domains that are related to the nurse s' knowledge and practice concerning chemotherapy precautions.

Key words: *knowledge, Nursing College, blood iron deficiency*

Introduction

Cancer is a death cause that can invade any parts of the body and extend to other organs. It is referred to this process as metastasis. The major cause of death from cancer is metastases, leading to death worldwide. A number of 8.2 million deaths in 2012 related to cancer ^{1,2}. Cancer Chemotherapy indicates to the variety of therapeutic options used to treat malignant diseases, including categories such as biologics, cytotoxic drugs, hormonal treatment, targeted drug therapies, immunotherapies, and high dose chemotherapy regimens accompanied with hematopoietic stem cell transplant. In Iraq 2013s (74%) of patients receiving chemotherapy drugs at Al Amal Hospital for management cancer ³. The use of the term "person" or "persons" will represent both persons having cancer and their families, unless specified ⁴. Cancer chemotherapy encompasses

cytostatic, cytotoxic and biologic agents that are used to modify the body's response to malignant disorders. High toxicity can be found in these agents and they can present specific risks for health care providers and patients. As such, the care provided to the patients receiving these drugs needs specific skill, knowledge and judgment within an environment that supports a high quality practice ⁵. Safe handling of hazardous drugs have been recommended and available for more than twenty years. "Evidence for continued risk of occupational exposure is abundant; however, nurses' use of the recommended precautions is not universal". This may be due to the lack of knowledge or to the lack of serious concern about the potential hazards ⁶. Over five and a half million healthcare professionals are potentially exposed to hazardous drugs in their work environment. Though most drugs that are known as hazardous are "cytotoxic agents" used in the treatment of cancer, many of these drugs are used for other conditions in other patients are equally unsafe ⁷. The National Institute for Occupational Safety and Health [NIOSH] (2004) revealed that there is documented evidence of contamination of the workplace

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with hazardous drug HDs, which puts the pharmacists, nurses and other healthcare workers under a higher risk of exposure when these agents are inappropriately handled.

METHODOLOGY

Design of the study: A quasi experimental study

Sample of the study: Purposive sampling was selected by randomized system which consists of 40 nurse was separated into two groups, “experimental group of (20) nurses exposed to the nursing educational program and control group of (20) nurses were not exposed to the program”.

Setting of the study: “AL- Amal National Hospital for Management Cancer”, collected within the period of 1ST August 2010 to 29th March 2012.

Instruments: The questionnaire was constructed for the purpose of the study. The Instruments consisted two parts:

Demographic Data Sheet

This part includes personal information of the nurses such as (marital status, age, gender, educational level, years of experience in oncology units, training sessions on chemotherapy precaution and nurses health problems related exposure to chemotherapy).

Nurse's knowledge:

The measurement of the impact of nursing educational program using the nurse s' knowledge questionnaire includes (20) multiple choice questions concerning chemotherapy precautions. The questionnaire which includes different options questions have been formed to take the list is based on the system of right and wrong those answers were converted statistically to take code (1) represents the correct answer and code (0) represents the wrong answer. The control group were given pre & posttest of nurses' knowledge at the same time that is given to the group of the study.

Nurse's practices

Observational checklist of nurse's practices includes 32 questions was divided into three domains:

Nurse's practices during preparation and handling of chemotherapy drugs;16 questions.

Nurse's practices during administration of chemotherapy drugs;8 questions

Nurse's practices during disposal of chemotherapy drugs waste;8 questions.

These question were evaluated according to the likert scale (always(3), sometimes(2), never(1)) the levels of scale which were scored as total of three episodes of incidents were observed for each participant ;practices as mean of data collection (3) or(2) correct practices out of (3) episodes were rated as always.(1) correct practices out of (3) episodes were rated as sometimes and uncorrected practices were rated as never.

Validity of the instrument: “Constant validity determined for questionnaire through the use of (15) panel experts who are faculty members from college of nursing and doctor oncologist. The experts were asked to review the questionnaire for content with clarity. Such changes were employed according to their suggestions and valuable comments”.

Reliability of the instrument: Ten nurses selected from Al-Amal Hospital National for Management of Cancer by test –retest revealed that ($r=0.88$) significant at ($p<0.01$) of the knowledge test and $r=0.086$) at the level ($p<0.01$) of observational checklist at the same time with graduated.

Statistical methods: The analysis of the data was conducted by using spss ver.11, and descriptive statistical method (frequencies, percentages, the arithmetic mean and standard deviations,) and statistical inferential (Z test) with the purpose of finding differences between the control group and the experimental group.

Results and Discussion

The sample consists of 40 nurses who were selected randomly to a control group ($n=20$) and experimental group ($n=20$). The average age of the nurses was (mean 35.65 ± 6.21) years in the study group and the average age of the nurses was (mean 35.7 ± 6.40) years in the control group ranged. Most of the sample in both groups were males, married and graduated from nursing institute, (50%) of nurses in the study group with years of experience at oncology units and (33.3%) in the control group were within the group (1-5) .All nurses in both groups did not attend training sessions regarding chemotherapy precautions in oncology units . The table also presented that (65%) of nurses in study group

and (55%) in control were had health problems due to contact with chemotherapy agents (table 1). Polovich 2010 mentions that, the majority of participants were females and middle-aged, although ages were within the range of 23-70 years. Most nurses were very experienced in oncology nursing, nursing and chemotherapy (7). In a recent study of outpatient nurses, participants claimed significant accidental eye and skin exposure to chemotherapy (13). The data analysis of questionnaire item had indicated that pretest responses for nurse's knowledge comparing between control and study groups showed no significant differences in nurse's knowledge between both groups, while the post-test nurse's knowledge in study group revealed more advances after the implementation of the program. Our study presented different results and showed high significant differences between both groups at post-test related to nurse's knowledge (table2&6). A lack of education and the inconvenience of safety equipment may prevent many nurses from taking appropriate precautions for themselves¹⁴. One study mention that, the selected sample of nurses who were knowledgeable of hazardous drugs (HDs) use, experienced in the handling of chemotherapy, confident of using safe handling precautions, and who are aware that HDs exposure is a risk to their health, use of HDs precautions of safe handling was low (7). Our study claimed that there was high significant differences between the control group and the study group at post-test in overall main domains related to nurse's practices (table3,4,5&6). According to Fuller and colleagues, only 54% of nurses were knowledgeable of safe handling programs available in their workplace and only 30% of them actually read the information that was offered. This suggests a potential knowledge deficit and possible lack of compliance with the "National Institute for Occupational Safety and Health" (NIOSH) recommendations Fuller, (2007) identifying a significant safety concern for employees of oncology centers who administer chemotherapy and the general public. Most nurses claimed that they administered HDs (99%, n = 164) and disposed HDs (93%, n = 154), and 73% (n = 120) handled excreta and only 19% (n = 32) prepared HDs (15).

Table (1): Distribution of nurses by their socio-demographic

Variables	Study Group		Control Group	
	Freq.	%	Freq.	%
Age(years)				
21 – 30	4	20	7	35
31 – 40	11	55	8	40
>40	5	25	5	25
Total	20	100	20	100
mean $\pm$ S. D.	35.65 $\pm$ 6.21		35.7 $\pm$ 6.40	
Gender				
Male	11	55	11	55
Female	9	45	9	45
Total	20	100.0	20	100.0
Educational level				
Nursing school	7	35	5	25
secondary Nursing School	5	25	6	30
Nursing Institute	8	40	9	45
Total	20	100.0	20	100.0
Marital status				
Single	3	15	6	30
Married	17	85	14	70
Total	20	100.0	20	100.0
Years of Experience at oncology Units				
1 – 5	10	50	8	40
6 – 10	6	30	6	30
$\leq$ 11	4	20	6	30
Total	20	100.0	20	100.0
Training Courses				
None	19	95	19	95
yes	1	5	1	5
Total	20	100.0	20	100.0
Health problems				
Skin irritation	5	25	3	15
Menstrual disorder	8	40	7	35
Infertility	0	0	1	5
None	7	35	9	45
Total	20	100	20	100

Table (2): Comparison significant between the study and control groups related to nurses' knowledge in post test

Nurse's knowledge	Study group post test		Control group post test		Z test	P.value	S.C
	M.S.	S.D.	M.S.	S.D.			
Definition of chemotherapy	1.00	0.000	0.40	0.503	1.265	0.082	N.S
Types of chemotherapy	0.75	0.444	0.35	0.510	0.949	0.329	N.S
Physical and health risks that lead to deal with chemotherapy drugs	0.60	0.503	0.30	0.470	0.949	0.329	N.S
chemotherapy drugs that enter the body pathogen	0.90	0.308	0.25	0.444	2.055	0.000	S
Chemotherapy drugs that are given to the patient	1.00	0.000	0.60	0.224	0.158	1.000	N.S
Side effects of chemotherapy directly to the digestive system for nurses.	0.70	0.470	0.10	0.366	1.739	0.005	S
Protective measures for the treatment of chemotherapy drugs	0.70	0.470	0.15	0.366	1.739	0.005	S
Place to prepare chemotherapy drugs.	0.85	0.366	0.15	0.366	2.214	0.000	S
Give chemotherapy during pregnancy and lactation	0.70	0.470	0.15	0.410	1.581	0.013	S
Ways to give chemotherapy to the patient.	1.00	0.000	0.50	0.366	0.474	0.978	N.S
A adhesive by advice and protective clothes when giving chemotherapy drugs	0.60	0.503	0.30	0.470	0.949	0.329	N.S
The transfer of chemotherapy to the unit.	0.80	0.410	0.10	0.308	2.214	0.000	S
The use of chemotherapy doses	0.75	0.444	0.10	0.308	2.055	0.000	S

Table (3): Comparison significant between the study and control groups related to nurses' practice concerning preparation and handling of chemotherapy drugs in post test

Nurse's practices	Study group Post test		Control group Post test		Z test	P.value	S.C
	M.S.	S.D.	M.S.	S.D.			
Bring medicine dedicated to the patient by the doctor order	3.00	0.000	3.00	0.000	0.000	1.000	O.C
Hand washing with soap and water	2.30	0.657	1.75	0.75	1.107	0.172	N.S
Wearing a disposable coat with long sleeve	1.00	0.000	1.00	0.000	0.000	1.00	O.C
Wearing a nylon above the coat	1.00	0.000	1.00	0.000	0.000	1.00	O.C

Cont... Table (3): Comparison significant between the study and control groups related to nurses' practice concerning preparation and handling of chemotherapy drugs in post test

Wearing glasses to protect the eyes	1.00	0.000	1.00	0.000	0.000	1.00	O.C
Wearing sterile mask	2.45	0.688	1.50	0.754	0.000	0.035	S
Wearing surgical gloves	2.65	0.489	1.65	0.671	1.423	0.005	S
Cover sleeves by surgical gloves	1.00	0.000	1.00	0.000	1.739	1.00	O.C
Cabin safety biogenic used in the preparation of chemotherapy	1.00	0.000	1.00	0.000	0.000	1.00	O.C
Cover the preparation table by nylon and attends therapy on it	1.00	0.000	1.00	0.000	0.000	1.00	O.C
Preparing the drug in chemotherapy room	1.00	0.000	1.00	0.000	0.000	1.00	O.C
Large syringes used to withdraw liquid solvent	1.00	0.000	1.00	0.000	0.000	1.00	O.C
Avoid full bottles of treatment when deluded.	2.25	0.786	1.20	0.523	2.055	0.00	S
Add chemotherapy to intravenous fluid bag	3.00	0.000	3.00	0.000	0.000	1.00	O.C
Write the patient's name and the name of the medication and the dose and time of administration of intravenous fluid and clear handwriting bag	2.30	0.801	1.00	0.000	2.530	0.00	S
Put the bag of intravenous fluid in a special bag put the patient's name and number of the bed and take them to the unit	1.00	0.000	1.00	0.000	0.000	1.00	O.C

Table (4): Comparison significant between the study and control groups related to nurses' practice concerning administration of chemotherapy drugs in post test

Nurse's practices	Study group Post test		Control group Post test		Z test	P.value	S.C
	M.S.	S.D.	M.S.	S.D.			
The nurse prepares the patient and notes the cannula in his hand	2.60	0.681	1.90	0.718	1.581	0.013	S
Open the bag and examine the chemotherapy drugs and make sure there are no leaks	1.00	0.000	1.00	0.000	0.000	1.000	O.C
Linking the intravenous fluid tube tightly in the cannula	3.00	0.000	3.00	0.000	0.000	1.000	O.C
Notes device administration and places of contact and ensures zero leaks	2.50	0.761	1.00	0.759	1.581	0.013	S
Open valve device administration and ensure the flow of intravenous fluid	2.70	0.470	1.65	0.671	1.897	0.001	S
Tend surgical gloves	2.65	0.489	1.50	0.754	0.739	0.005	S
Tend mask	2.75	0.444	1.30	0.470	2.372	0.000	S
Demonstrate dose treatment with administration time and the name of the nurse with her signature	2.40	0.883	1.30	0.587	1.897	0.001	S

Table (5): Comparison significant between the study and control groups related to nurses' practice concerning disposal of chemotherapy drugs waste in post test

Nurse's practices	Study group Post test		Control group Post test		Z test	P.value	S.C
	M.S.	S.D.	M.S.	S.D.			
After the end of treatment wearing surgical sleeves.	2.15	0.851	1	0.000	2.72	0.000	S
Wearing surgical gloves	2.45	0.759	1	0.000	2.688	0.000	S
Intravenous fluid stops	3	0.000	3	0.000	0.000	1.00	O.C
Separating the administration of the device in the patient's hand cannula.	3	0.000	3	0.000	0.000	1.00	O.C
Gathers remnants of intravenous therapy in a special bag	1	0.000	1	0.000	0.000	1.00	O.C
The nurse to take off PPE	2.65	0.671	1	0.000	2.846	0.000	S
Protective clothing and disposable waste collected and placed in bags, mounted by a chemical contaminated materials are sent to the Holocaust	2.65	0.000	1	0.000	0.000	1.000	O.C
Wash hands with soap and water	1	0.768	1.95	0.759	1.265	0.82	N.S

Conclusion

The finding of study reveals that most of the students have poor knowledge about blood iron deficiency (anemia) according to real and premise average larger than real average which included on 20 while real average include 17 so that indicated significance level found difference between them. Significant relationship was found between student knowledge and clinical application. Significant relationship was existed between students' knowledge and demographic characteristics such as economic states and housing. There was no significant relationship between students' knowledge and demographic variables which includes (age, occupation of father and occupation of mother).

Financial Disclosure: There is no financial disclosure.

Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the pediatric & Psychiatric Mental Health Nursing, College of Nursing, Iraq and

all experiments were carried out in accordance with approved guidelines.

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Molecular Characterization of *Malassezia* spp Isolated from Human Pityriasis Versicolor

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Abstract

The study was looking to isolation and identification of various species of *Malassezia* isolates associated with various clinical phenomena of pityriasis versicolor by molecular Techniques the results of DNA extraction showed that most of the isolates give just single bundle of DNA on agarose gel, and according to PCR results, thirteen DNA samples (43.3%) were amplified after PCR program for amplification by two sets of primers ITS1 - ITS4 3.2 and V9G - LS266, then all the thirteen isolates were subjected to DNA sequencing which showed the following results: eight isolates identified as *Malassezia furfur* and five as *Malassezia globosa* with the alignment bellow of each species. *Malassezia furfur* isolate POL.10.11.IIIA 18S ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene, partial sequence. Sequence ID: KC152898.1 Length: 848 Number of Matches: 1Range 1: 1 to 848. Phylogenetic analysis of the 13 *Malassezia* isolates were analyzed by MEGA 5.05 and compared with sequences of different *Malassezia* species available in Gen Bank database, the data showed a clear convergence between our *Malassezia* isolates from Basra patients and that of the Gen Bank database.

Key words: *Malassezia*, pityriasis versicolor,

Introduction

Pityriasis versicolor is *Malassezia* spp infection of the skin, it's also sometimes called tinea versicolor, although the term tinea should strictly be used for dermatophyte fungus infections, Pityriasis versicolor most frequently affects young adults of both genders and is slightly more common in men than in women, it can also affect children, adolescents and older adults ¹. *Malassezia* species can be identified and diagnosed by methods based on their biochemical features, but such methods do not have enough guttered (discriminatory) power and because of that, cannot characterize the newly defined species. Add to that, the biochemical and phenotypical methods are not suitable to achieve an immediate way

of diagnosis. Recently, molecular approaches and PCR methods for the accurate differentiation of *Malassezia* species are the most convenient way of identification and diagnosis ^{2,3}. The taxonomy and nomenclature of *Malassezia* species was rapped with confusion and chaos until 1995 when the molecular techniques shed lights and allowed physiological and ultrastructural studies to describe the characteristics of each species. Recently, using the combination of biochemical, physiological, morphological and molecular techniques seven additional species have been identified. There are four molecular techniques includes DNA sequence analysis, the first method implored in *Malassezia* species identification, it involves the nucleotide sequence analysis of the obtained ribosomal DNA gene of the yeast and the results are phylogenetically compared with distant or closely related *Malassezia* species, Biotyping using Api 20 NE and ApiZym enzymes, Chromosomal analysis using pulsed field gel electrophoresis (PFGE), molecular technique has received very little attention ⁴, but has so far being used to identify six of the fourteen species of *Malassezia* it depends on the use of enzyme

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activity profiles of the different *Malassezia* species., and Polymerase chain reaction (PCR) – based methods ,this molecular technique is concerned with the use of the heterogeneity in chromosomal number and patterns to identify *Malassezia* species ^{4,5}. The probe used in these molecular analysis techniques is to identify the samples of *Malassezia* species whether obtained from culture media or be collected directly from non-culture 17 sample from skin before performing the molecular analysis or the analysis can be done directly from samples obtained from patient skin scales ⁶.

Materials and Method

Study group

Ninety five patients (40 females and 55 males) suffering from pityriasis versicolor skin disease who attended dermatology outpatient department (DOPD) of Al-Sader Teaching Hospital, Al-Basrah Teaching Hospital and Al-Faihaa Hospital were included in this study (from January 2016 to November 2018). Medical ethics requirements are fully followed during this study especially the collection of the samples under the supervision of the dermatologist and the approval of the patients. The demographic characteristics include gender, age, smoking, nutrition, marital state, education level and residency was recorded, clinical characteristics features of the disease sub divided into severity as mild with few macules(3-5)at one site, moderate more than 5 macules localized at certain area and severe that multiple patches involved large percentage of body surface.

Sample Collections

Ninety five samples were collected from patients with pityriasis versicolor in the form of skin scrapings took by sterile surgical blade, then transported in sterile containers and processed at the Mycology section of the Department of Microbiology. Direct and indirect methods were applied for diagnosis. Direct examination was done under microscope (40X) AL-Hammadani (1997). Indirect exam done with suitable steps depend on ⁷.

Molecular Identification test

Since the recognition of lipid dependent species, other than *M.furfur* ⁸, it became clear that molecular approaches are needed for better diagnostics, as well as our understanding of *Malassezia* community dynamics. It is noteworthy that the PCR- and sequence-based methods used for *Malassezia* biodiversity studies, and

those employed to study *Malassezia* community structure on skin and molecular epidemiology are often similar and the distinction is not always clear. For instance, 13.8% of isolates identified by phenotypic means were found to be misidentified after molecular identification using sequence analysis of the D1/D2 domains of the large subunit ribosomal rDNA (LSU rDNA) and the ITS1+2 regions.

Isolation of DNA

DNA was extracted from thirty isolates for extraction of yeast genomic DNA: A small amount of yeast colony grown on m Dixon's agar with 300 mg glass beads and 300µl lysis buffer (Tris-HCL 100mM Ph=8, EDTA 30mM, SDS 0.5%w/v)were placed in a 1.8ml cryotube then mechanically milled in a homogenizer for 1-2 minutes. It was then boiled at 100°C for 20 min and then mixed with 150 µl of 3M Sodium acetate. After that, kept at -20 °C for 10 min, and then centrifuged at 12000 g for 10 min at 40°C. The supernatant was extracted by mixing with the same volume of phenol- chloroform- isoamyl alcohol (25:24:1) [short vortex] then centrifuged at 12000 g for 10 min at 40°C. The supernatant was extracted by mixing with the same volume of chloroform [short vortex] then centrifuged at 12000 g for 10 min at 40°C. The supernatant (DNA) was precipitated by adding of an equal volume of Isopropanol (2- propanol) at -20°C for 10 min then centrifuged at 12000 g for 10 min at 40°C. Isopropanol was discarded and the DNA washed with 300 µl of 70% ethanol at 12000 g for 10 min at 40°C [note at this step don't vortex the tubes]. Ethanol was discarded and DNA dried and suspended in 50 µl of ultrapure water.[Take a short vortex and microfuge]. Aliquots of 1 µl of the resultant solution are used as template in the PCR reaction. Aliquots of 1 µl of the resultant solution are used as template in the PCR reaction. At last The extracted DNA detected by electrophoresis on agarose gel with ethidium bromide under the U.V. transilluminator.

PCR Amplification

The ITS1-ITS4 and V9G - LS266 primer pairs were used to amplify the internal 5.8S ribosomal DNA(rDNA complex) and the adjacent ITS1 and ITS2 regions.

Primer Preparation

The ITS1 and ITS4 as well as V9G and LS266 primers were provided by Cinna Gen Company/Iran

in lyophilized forms, dissolved in sterilized deionized distilled water to obtain 10 ml as a final concentration and stored in deep freezer until using, as shown in table (1).

Preparation of PCR Reaction Mixture

PCR reactions were carried out in (Thermo-cycler and Flex Cycler) PCR machines and components requirements for PCR reaction are provided in Table (2).

Red pre-mix* :- The PCR master mix contained all the components needed for the PCR reaction except DNA template and primer, it containing 25 µL of Taq DNAPolymerase 2× Master Mix Red (Ampliqon; Skovlunde, Denmark).

Detection of PCR Products

Amplified DNA was running by 1.5 % agarose gel electrophoresis in TBE buffer staining with ethidium bromide and visualized under UV trans illuminator (Gel Doc System) to be sure that the PCR amplicon were correct.

Sequencing

To distinguish these isolates where morphology and PCR were not helpful, and moreover to introduce the sequence data of Basra *Malassezia* strains, 13 isolates were subjected to sequencing. The ITS PCR products for each sample were transferred to a To distinguish those isolates where morphology and PCR were not helpful, and moreover to introduce the sequence data of Basra *Malassezia* strains, 13 isolates were subjected to sequencing. The ITS PCR products for each sample were transferred to a 1.5 µl microtube then were subjected to sequencing on an ABI Prism TM 3730 genetic analyzer (Microsynth, Switzerland) with the V9G and LS266 primers then the obtained sequences were edited and blasted against NCBI database using standard criteria for a significant match for species identification.

Phylogenetic analysis

To discuss the phylogenetic relationships, the nucleotide sequences of each ITS1 -ITS2 region of rDNA of the 13 *Malassezia* isolates were analyzed by MEGA 5.05 and compared with sequences of different

Malassezia species available in Gen Bank database (<http://www.ncbi.nlm.nih.gov/Genbank/index.html>) for each area investigated. Phylogenetic analysis was performed using Un weighted Pair Group Method with Arithmetic Mean (UPGMA) considering ITS1-ITS2 sequence of *Aspergillus niger*

Statistical Analysis

Statistical Package for Social Science (SPSS) version 24, 2016 was used for statistical analysis of the data. Chi-square (χ^2) and Fisher's Exact tests were to determine the difference between the study groups. Comparisons of proportions were performed by crosstab using the χ^2 test to assess the significance of difference between groups. The significance level was set at $P < 0.05$, and the highly significance level was set at $P < 0.001$.

Results and Discussion

DNA extraction

The results of DNA extraction showed that most of the isolates give single bundle of DNA on agarose gel (Fig 1).

PCR Amplification and Detection According to PCR results, thirteen DNA samples (43.3%) were amplified after PCR program for amplification by two sets of primers ITS1 – ITS4 (Fig 3.2 a and b) and V9G - LS266 (Fig2a)

Sequencing

The thirteen isolates were subjected to sequencing, show the following results: eight isolates identified as *Malassezia furfur* and five as *Malassezia globosa* with the alignment bellow of each species.

***Malassezia furfur* isolate POL.10.11.IIIA 18S ribosomal RNA gene, partial sequence;** internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene, partial sequence

Sequence ID: KC152898.1 Length: 848 Number of Matches: 1 Range 1: 1 to 848.

Strand	Gaps	Identities	Expect	Score
Plus/Plus	0/848(0%)	848/848(100 %)	0.0()	1567 bits(848)
Query				
1GGAAGTAAAAGTCGTAACAAGGTTTCTGTAGGTGAACCTGCAGAAGGATCATTAGT				
GAAA 60				
Sbjct				
1GGAAGTAAAAGTCGTAACAAGGTTTCTGTAGGTGAACCTGCAGAAGGATCATTAGT				
GAAA 60				
Query				
GCAAGGGCCAGCCATACGGACGGCGCTACTCGCGTACAACGTCTCTGGCGCCCAAC				61
TTTA 120				
Sbjct				
GCAAGGGCCAGCCATACGGACGGCGCTACTCGCGTACAACGTCTCTGGCGCCCAAC				61
TTTA 120				
Query				
CACAATATCCACAAACCCGTGTGCACCGTTTGGATGAGTAGGCCTCCTCGCGAGGCA				121
GAC 180				
Sbjct				
CACAATATCCACAAACCCGTGTGCACCGTTTGGATGAGTAGGCCTCCTCGCGAGGCA				121
GAC 180				
Query				
TCTCCAATCCATTTCTACCAAACCTCGTATGGTTGTATGAACGTGGAAATCGTTGGAC				181
CGT 240				

Sbjct 181
TCTCCAATCCATTTCTACCAAACCTCGTATGGTTGTATGAACGTGGAAATCGTTGGAC
CGT 240

Query 241
AACTGGCCAACAACCAATAATACAACCTTTCGACAACGGATCTCTTGTTCTCCCATC
GAT 300

|||||

Sbjct 241
AACTGGCCAACAACCAATAATACAACCTTTCGACAACGGATCTCTTGTTCTCCCATC
GAT 300

Query 301
GAAGAACGCAGCGAAACGCGATAGGTAATGTGAATTGCAGAATTCCGTGAATCATC
GAAT 360

|||||

Sbjct 301
GAAGAACGCAGCGAAACGCGATAGGTAATGTGAATTGCAGAATTCCGTGAATCATC
GAAT 360

Query 361
CTTTGAACGCACCTTGCGCTCCATGGTATTCCGTGGAGCATGCCTGTTTGAGTGCCGT
GA 420

|||||

Sbjct 361
CTTTGAACGCACCTTGCGCTCCATGGTATTCCGTGGAGCATGCCTGTTTGAGTGCCGT
GA 420

Malassezia globosa strain 149.1 18S ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene, partial sequence

Sequence ID: KM454161.1 Length: 813 Number of Matches:
1Range 1: 49 to 813.

Strand	Gaps	Identities	Expect	Score
Plus/Plus	0/765(0%)	765/765(100%	0.0()	1413 bits(765)

Query

1TCATTAGTGAAGATTCAAGGGCCAGCCATACAGACGTACAATAAGTGTGTCTCTGG
CGGC 60

|||||

Sbjct 49

TCATTAGTGAAGATTCAAGGGCCAGCCATACAGACGTACAATAAGTGTGTCTCTGGC
GGC 108 Query 61

TCGTATCCACTATACATCCATAAACCCGTGTGCACTGTTAAGGAGTAAGAAAGAAG
GGGA 120

|||||

Sbjct 109

TCGTATCCACTATACATCCATAAACCCGTGTGCACTGTTAAGGAGTAAGAAAGAAG
GGGA 168

Query 121

GGGAGAGAGTGCATGTGCTTTGCATATAACTCTCTCTTTCTCTTCCTTTCTCTCTCT
G 180

|||||

Sbjct 169

GGGAGAGAGTGCATGTGCTTTGCATATAACTCTCTCTCTTTCTCTTCCTTTCTCTCTCT
G 228

Query 181

GTAAATTACACAACTCGTATGGATTTGTATGAACGTGAGATATATCGTTGGACCGT
CAC 240

|||||

Sbjct 229

GTTAATTACACAAACTCGTATGGATTTGTATGAACGTGAGATATATCGTTGGACCGT
CAC 288

Query 241

TGGCCAACAAATATAACACAACCTTTCGACAACGGATCTCTTGGTTCTCCCATCGATG
AAG 300

|||||

Sbjct 289

TGGCCAACAAATATAACACAACCTTTCGACAACGGATCTCTTGGTTCTCCCATCGATG
AAG 348

Query 301

AACGCAGCGAAACGCGATAGGTAATGTGAATTGCAGAATTCCGTGAATCATCGAAT
CTTT 360

|||||

Sbjct 349

AACGCAGCGAAACGCGATAGGTAATGTGAATTGCAGAATTCCGTGAATCATCGAAT
CTTT 408

Query 361

GAACGCACCTTGCGCTCTATGGTATTCCGTAGAGCATGCCTGTTTGAGTGCCGTGAA
TTC 420

|||||

Sbjct 409

GAACGCACCTTGCGCTCTATGGTATTCCGTAGAGCATGCCTGTTTGAGTGCCGTGAA
TTC 468

Query 421

TCCCATCCCAAGCGGTTTTTATCAAAGAATTGCTAGGCGAAGGGGTTGAGATGGGCG
TTG 480

|||||

Sbjct 469
 TCCCATCCCAAGCGGTTTTTATCAAAGAATTGCTAGGCGAAGGGGTTGAGATGGGCG
 TTG 528

Query 481
 TTATAACTGCTTTTCTTCTCTAGAAAAGCTCGCCCGAAAAACAGCTAACGCCTCTGG
 GCC 540

|||||

Sbjct 529
 TTATAACTGCTTTTCTTCTCTAGAAAAGCTCGCCCGAAAAACAGCTAACGCCTCTGG
 GCC 588

Query 541
 ACTTTGCATCCGCTTCTCTGAGGGGAGAAAGCGGCCAAGCGCGCTCTGATCATCAGGC
 ATA 600

|||||

Sbjct 589
 ACTTTGCATCCGCTTCTCTGAGGGGAGAAAGCGGCCAAGCGCGCTCTGATCATCAGGC
 ATA 648

Query 601
 GCATGATACGTCATTTGCTATGCTGTAGGAGAGCATTGTTGTGGTTATACCGCGT
 GCG 660

|||||

Sbjct 649
 GCATGATACGTCATTTGCTATGCTGTAGGAGAGCATTGTTGTGGTTATACCGCGT
 GCG 708

Query 661
 TTATTTTTTTTTTGCAAACGCAAAGAAAAAAAAGCCCCCTTTCATTTCTGGTCTCAA
 TC 720

|||||

Sbjct 709
 TTATTTTTTTTTTGCAAACGCAAAGAAAAAAAAGCCCCCTTTCATTTCTGGTCTCAA
 TC 768

Query 721 AGGTAGGATCACCCGCTGAACTTAAGCATATCAATAAGCGGAGGA 765

|||||

Sbjct 769 AGGTAGGATCACCCGCTGAACTTAAGCATATCAATAAGCGGAGGA 813

Phylogenetic analysis

Phylogenetic analysis of the 13 *Malassezia* isolates were analyzed by MEGA 5.05 and compared with sequences of different *Malassezia* species available in Gen Bank database, show a clear convergence between our *Malassezia* isolates and that of the Gen Bank database. As we mentioned before the methods for identifying *Malassezia* species, several disadvantages are noted for demand the high similarity in physiological test results between some species. Moreover, obtaining specific environmental conditions, culture medium

compounds and type of chemical materials determine the use of these methods to identify *Malassezia* species. The present study aimed to identify the predominant species in Basra/Iraq, using a single step PCR assay in patients with pityriasis versicolor. Most studies around the world used PCR techniques to identify *Malassezia* species isolated from culture medium, and this method was consistent with the present study that two sets of primers were used in 143, the identification of the *Malassezia* species. While most other studies on molecular assays used the scotch tape technique for sampling of skin lesions (DNA of *Malassezia* species was extracted directly from skin scrapings).

Table (1) Oligonucleotide primers used in the PCR reaction

primers	Sequences (5'-3')	Size of Product	References
TS1	(5'-TCCGTAGGTGAACCTGCGG-3')	~509 bp	(White, <i>et al.</i> , 1990)
ITS4	(5'-TCCTCCGCTTATTGATATGC-3')	~509 bp	(White, <i>et al.</i> , 1990)
V9G	(5' TTACGTCCCTGCCCTTTGTA-3')	~1700	(Ende & Hoog, 1999)
LS266	(5' GCATTCCCAAACAACCTCGACTC 3')	~1700 bp	(Masclaux, <i>et al.</i> ,1995)

Table (2) Components required for PCR reaction

No.	Components	Volume(μl)	Concentration
1	Red pre-mix*	12.5	1X
2	ITS1 or V9G primers(30 pmol)	1	0.5 μM
3	ITS4 or LS266 primers(30 pmol)	1	0.5 μM
4	Template DNA	1	<250ng
5	Nuclease Free water	Up to a final volume of 25 Ml	N.A

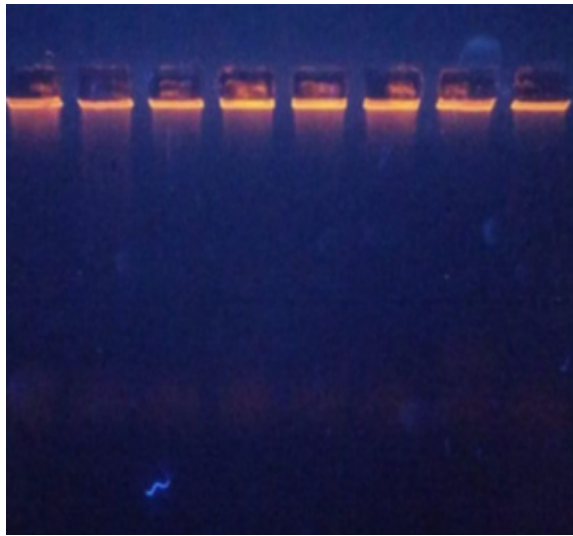


Figure 1: Single bands of DNA on Agarose Gel

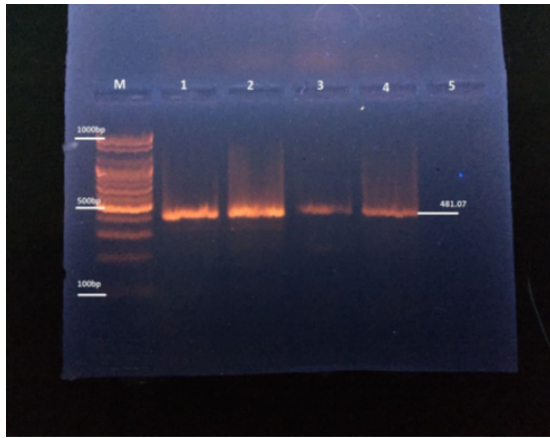


Figure 2 a: Electrophoresis of Agarose gel 1.2% (100 voltage for 60 minutes) with PCR products of *Malassezia* species (ITS1 - ITS4 primers), demonstrated by Gel Doc System, show that M: DNA Ladder (100-1000bp), 1-4 samples are *M.furfur*, 5 is a negative sample.

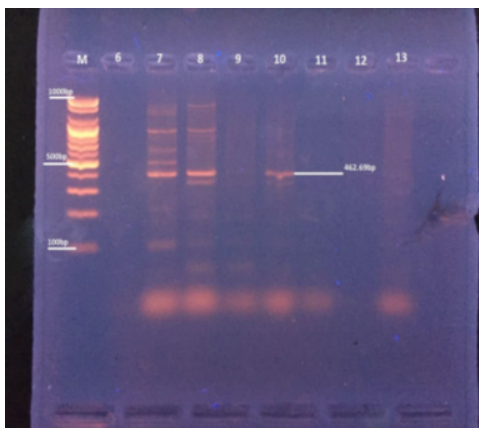


Figure 2 b: Electrophoresis of Agarose gel 1.2% (100 voltage for 60 minutes) with PCR products of *Malassezia* species (ITS1 - ITS4 primers), demonstrated by Gel Doc System, show that M: DNA Ladder (100-1000bp), 7,8 and 10 samples are *M. globosa*, 6,9,11-13 are negative samples.

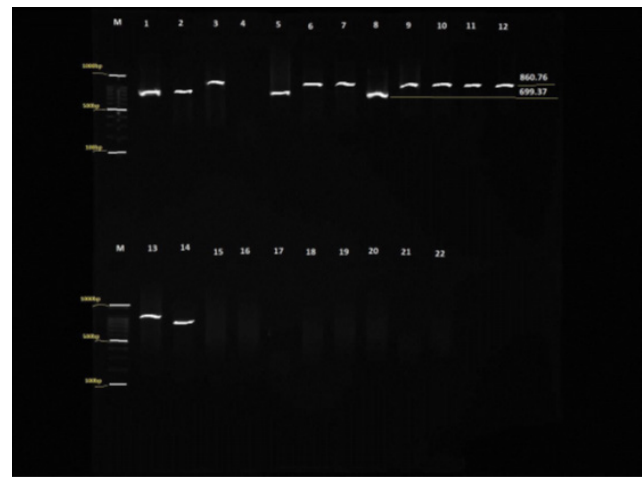


Figure 3: Electrophoresis of Agarose gel 1.2% (100 voltage for 60 minutes) with PCR products of *Malassezia* species (V9G - LS266 primers), demonstrated by Gel Doc System, show that M: DNA Ladder (100-1000bp),

Conclusion

Malassezia furfur isolate POL.10.11.IIIA 18S ribosomal RNA gene, partial sequence; internal transcribed spacer 1, 5.8S ribosomal RNA gene, and internal transcribed spacer 2, complete sequence; and 28S ribosomal RNA gene, partial sequence .Sequence ID: KC152898.1 Length: 848 Number of Matches: 1Range 1: 1 to 848. Phylogenetic analysis of the 13 *Malassezia* isolates were analyzed by MEGA 5.05 and compared with sequences of different *Malassezia* species available in Gen Bank database, the data showed a clear convergence between our *Malassezia* isolates from Basra patients and that of the Gen Bank database.

Financial Disclosure: There is no financial disclosure.

Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the Department of Microbiology, Collage of Medicine, University of Basrah, Iraq and all experiments were carried out in accordance with approved guidelines.

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Physiological Important of Minerals in Fertility of Women: Comparison of Pregnant Women's Minerals in Urban and Rural Areas

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Abstract

Minerals play an important role in maintaining health. Changes in concentration of some essential minerals may be a potential risk to maternal health. The study is designed to examine micro-minerals concentrations: lead (Pb^{+2}), cadmium (Cd^{+2}), copper (Cu^{+2}) and zinc (Zn^{+2}); and macro-minerals concentrations: calcium (Ca^{+2}), sodium (Na^{+}) and potassium (K^{+}) in serum of pregnant females living in urban and rural regions. And involved 160 pregnant women: about 80 pregnant women from urban areas and 80 pregnant women from rural areas, ranged in age from 16 to 35 age groups. The values of Cd^{2+} , Pb^{2+} , Zn^{2+} , Na^{+} and K^{+} in serum were significantly lower in pregnant women living in rural regions for both age groups than urban pregnant women. While the concentration of Cu^{2+} and Ca^{2+} was significantly higher among pregnant women living in rural areas for both age groups than urban pregnant women. The variance in concentration of minerals in both regions due to nutrient deficiencies or lifestyle change may be a danger factor for fertility of pregnant women in both areas.

Keywords: Maternal serum, Micromineral, Macromineral, Rural Area, Urban Area.

Introduction

Environmental pollution is one of major curses of human health¹. One of the major components of environmental pollutants is heavy metals that negatively affect human health². The concentration of minerals in the mother's cord is transferred to the fetus and causes a defect in the outcomes of pregnancy³. Pregnancy is the normal phenomenon in which females experience a broad range of internal physiological changes⁴. It is a time of fast growth and differentiation of cells, together the fetus and the mother. Thus, they are both vulnerable to alters in food supplies, particularly those that are marginal in normal states⁵. During this period, insufficient stocks or micro-nutrients absorption may have negative impacts on the mother, like as high blood pressure(HBP)⁶. Among micro-minerals, Cd^{2+} is a very toxic contaminant found in environment that is harmful for human beings health. At present, exposure to low cadmium doses from all sources is known to have long term health impacts on humans⁷. Moreover, during the prenatal period, not only the cadmium capacity to

accumulate in the placenta region, but also the capability to penetrate this region⁸. Pb^{2+} is another environmental pollutant, and urbanization and rapid industrialization have led to rise levels of environmental Pb^{2+} , therefore human exposure. Lead has no known physiological amount and has long been known as reproductive toxin in both women and men⁹. The pregnancy is linked with raised require for all nutrients such as Zn^{2+} , Cu^{2+} and other micro-nutrients¹⁰. Zinc is a key mineral during fetal development, and fetal growth¹¹. However, the Zn^{2+} mild to moderate deficiency largely predominant in pregnant as well as lactating females in many geographic areas¹². Cu^{2+} can also produce adverse health effects in both excess and deficiency¹³. Before and during pregnancy, foods containing a high proportion of essential minerals should be selected preferentially¹⁴. Mineral nutrients such as calcium and potassium are substantial for normal development and growth, especially during pregnancy¹⁵. It has been suggested that a low dose of Ca^{2+} during pregnancy declines the risk of pregnancy poisoning and gestational hypertension¹⁶. There was evidence that that the dietary potassium intake of the mother was positively

correlated with bone mass measurements¹⁷, and supported by the study of¹⁸. Other studies have shown that serum Na⁺ and K⁺ levels differ in female with pregnancy-induced HBP compared to control¹⁹. However, restriction of Na⁺ absorption during pregnancy period led to significant macro-mineral alters in the plasma, bone muscle, and brain of the maternal living organism to keep normal life of the fetus. Actually, pregnant animals showed that Na⁺ restricted input appeared to alters in water as well as electrolyte metabolism linked with pregnancy complications in human beings²⁰.

Materials and Method

One hundred and sixty pregnant women having age group between 16–35 years. Pregnant women were nonsmokers, free of diseases (such as HBP, liver or kidney disease and gestational diabetes) and they did not take any medication. In addition, they excluded multiple pregnancy, major congenital malformations, because these conditions may affect the condition of minerals in pregnant women, and thus may bias results. Blood samples (5 ml) were collected from each sampling of pregnant women of both areas. The serum samples were separated by centrifuging at 3000 rpm/10 min and kept at -20°C until analysis.

Measuring of minerals

Ten ml of nitric acid was added to one ml of serum, heated under boiling for 3 hours on a hot plate device. Then 5 ml of 30% hydrogen peroxide was added to low amounts of samples, and also heated at the same temperature to dry. The residue was dissolved at 50 ml of 1% HNO₃, after it was filtered by the whatman filter (number 1). The element was then analyzed using atomic absorption spectrophotometer. Depending on a flame photometer device, to assessment Ca²⁺, Na⁺ and K⁺, after

serum dilution with a certain percentage of water free of ions.

Statistical analysis

The data were analyzed by ANOVA, differences in pregnant cohorts for both area were evaluated using F-test, the LSD, least significant difference was utilized to compare the results, and the descriptive analysis was applied to show the mean and the standard deviation [SD] of the results and different characters showed significance in $p < 0.05$.

Results

The data of micro-minerals in serum in all regions of the study showed that cadmium, lead and zinc concentration (urban versus rural) was significantly higher and copper concentration (urban versus rural) was significantly lower in both age groups of pregnant women born of males (Table 1) and pregnant women born of females (Table 2). In addition, the concentration of cadmium and lead is significantly higher in the 16-25 age group than in the 26-35 age group in both regions and for pregnant women born both male and female, but the concentration of Zn²⁺ and Cu²⁺ is significantly lower in the 16-25 age group compared to the age group 26-35 in both regions and for pregnant women born both male and female. The concentration of macro-minerals in serum in both regions of the study shows that the concentration of sodium and potassium (urban versus rural) is significantly higher and the concentration of calcium (urban versus rural) is significantly lower in both age groups of male-born pregnant women (Table 3), and also in female-born pregnant women (Table 4). In addition, the concentration of calcium, sodium and potassium was significantly higher in the 16-25 age group compared with the age group 26-35 in both regions and for pregnant born of males and females.

Table 1. Mean values±SD for micro-minerals and age groups are shown in urban and rural areas of male-born pregnant women.

Microminerals (mg/kg)	Serum maternal				
	Urban area		Rural area		LSD
	Age group (16-25)	Age group (26-35)	Age group (16-25)	Age group (26-35)	
	21.375±2.834	29.775±2.85	19.175±2.863	28.75±2.648	
Cadmium	304.4±0.552a	241.5±0.471b	301.4±0.679c	227.3±0.500d	1.047

Cont... Table 1. Mean values $\pm$ SD for micro-minerals and age groups are shown in urban and rural areas of male-born pregnant women.

Lead	69.02 $\pm$ 0.615a	43.81 $\pm$ 0.028b	62.67 $\pm$ 0.192c	40.91 $\pm$ 0.169d	0.628
Zinc	2.676 $\pm$ 0.001a	2.931 $\pm$ 0.038b	2.068 $\pm$ 0.020c	2.145 $\pm$ 0.019d	0.045
Copper	0.025 $\pm$ 0.001a	0.032 $\pm$ 0.001b	0.030 $\pm$ 0.001c	0.034 $\pm$ 0.001d	0.002

Different letters indicate *significance when $p < 0.05$.

Table 2. Mean values $\pm$ SD for micro-minerals and age groups are shown in urban and rural areas of female-born pregnant women.

Microminerals (mg/kg)	Serum maternal				
	Urban area		Rural area		LSD
	Age group (16-25)	Age group (26-35)	Age group (16-25)	Age group (26-35)	
	21.375 $\pm$ 2.834	29.775 $\pm$ 2.85	19.175 $\pm$ 2.863	28.75 $\pm$ 2.648	
Cadmium	293.9 $\pm$ 0.144a	215.7 $\pm$ 0.057b	266.1 $\pm$ 0.481c	213.1 $\pm$ 0.471d	0.650
Lead	61.41 $\pm$ 0.053a	49.25 $\pm$ 0.010b	58.86 $\pm$ 0.192c	40.9 $\pm$ 0.486d	0.495
Zinc	3.661 $\pm$ 0.029a	3.859 $\pm$ 0.057b	3.57 $\pm$ 0.04ac	3.74 $\pm$ 0.097ad	0.097
Copper	0.034 $\pm$ 0.001a	0.040 $\pm$ 0.001b	0.039 $\pm$ 0.001c	0.042 $\pm$ 0.001d	0.002

Different letters indicate *significance when $p < 0.05$.

Table 3. Mean values $\pm$ SD for macro-minerals and age groups are shown in urban and rural areas of male-born pregnant women.

Macrominerals (mg/kg)	Serum maternal				
	Urban area		Rural area		LSD
	Age group (16-25)	Age group (26-35)	Age group (16-25)	Age group (26-35)	
	21.375 $\pm$ 2.834	29.775 $\pm$ 2.85	19.175 $\pm$ 2.863	28.75 $\pm$ 2.648	
Calcium	699.3 $\pm$ 0.400a	600.6 $\pm$ 0.010b	709.8 $\pm$ 0.800c	663.6 $\pm$ 0.80d	1.133
Sodium	247.4 $\pm$ 0.435a	225.7 $\pm$ 0.152b	194.9 $\pm$ 0.057c	191.1 $\pm$ 0.15cd	8.324
Potassium	20.43 $\pm$ 0.611a	16.73 $\pm$ 0.152b	15.73 $\pm$ 0.152c	14.23 $\pm$ 0.15d	0.626

Different letters indicate *significance when $p < 0.05$.

Table 4. Mean values±SD for macro-minerals and age groups are shown in urban and rural areas of female-born pregnant women.

Microminerals (mg/kg)	Serum maternal				
	Urban area		Rural area		LSD
	Age group (16-25) 21.375±2.834	Age group (26-35) 29.775±2.85	Age group (16-25) 19.175±2.863	Age group (26-35) 28.75±2.648	
Calcium	633.1±0.152a	655.1±0.150b	783.3±0.100c	770.7±0.300d	0.359
sodium	118.5±0.152a	100.8±0.529b	110.1±0.152c	99.00±0.624d	0.796
potassium	17.20±0.010a	16.00±0.700b	12.33±0.152c	11.43± 0.152d	0.696

Different letters indicate *significance when $p < 0.05$.

Discussion

The serum maternal in the urban area had high levels of micro minerals. The reasons of increase of cadmium, lead and zinc in urban may be a result of urbanization and rapid industrialization compared to the rural background. This can be referred to different factors, including the kind of food eaten by pregnant women, where there is a reverse association between the concentration of heavy minerals in the body as well as the healthy diet²¹. These observations are consistent with²², blood lead levels were lower in postpartum women in rural areas compared to their counterparts in urban areas. The concentration of cadmium was significantly higher in females in urban and rural areas compared to the reference range²³. Studies of the human diet have referred that the biological availability of minerals like Pb^{2+} and Cd^{2+} depends on dietary components and essential minerals such as calcium and iron²⁴. Furthermore, in 2004, a study recorded 73.5% zinc lack among pregnant females in a rural region of Haryana state in India²⁵. Moreover the increase in serum copper of pregnant women in rural area was reported by²³. The biological accumulation of heavy minerals in living organisms can be influenced by sex and age but their impacts differ significantly between species and populations²⁶. The cadmium and lead concentration in the skulls of *Lešnica* was the highest in the group of small animals and declined with age²⁷. In natural organism of small mammals, heavy minerals concentrations often decline with age²⁸. In addition, the high metabolic rate of the smaller mothers, which involves high nutrient absorption, may account for increasing amounts of vital xenobiotics, like cadmium and lead, for both regions. Another clarification is a decline in intestinal intake of

some minerals in adults. Urban serum pregnant women are higher levels of sodium and potassium. Also calcium concentration in the pregnant's serum is significantly lower in the urban region compared to rural region. The difference in minerals concentration in pregnant women in urban as well as rural regions may be due to dietary imbalances and lifestyle changes. These examinations were matched with²³. It was documented by²⁹ that Ca^{2+} deficiency rickets among infants presenting the urban hospital in Luck now. By contrast, rural women with poor social and economic groups were documented at their home in Parabanki District, Uttar Pradesh, for less calcium. This increase in calcium concentration in rural areas of Iraq may be attributed to the pregnant's diet, which contains calcium-rich foods and calcium-rich foods: milk, cheese, egg yolks, leafy vegetables, cereals and pulses. The major sources of Ca^{2+} are milk and its derivatives (50%), followed by 11% each of vegetables and cereals³⁰. The efficiency of Ca^{2+} intake of food effects in its concentrations in the body; which remain stable from adolescence to adulthood, and declines in postmenopausal females by 2 percent each 10 years³¹. The potassium concentration was influenced by differences in socioeconomic status, which may reflect variances in the kind and quality of food consumed and the rate of food consumption, and this necessary to maintain adequate potassium levels during pregnancy to protect against electrolyte and water imbalance, and thus hypokalemia, in both mother and child³². It was found that diet study of³³ with dietary approach to stop high blood pressure, which is rich in fruits, vegetables and low-fat dairy products, to reduce Na^{+} absorption. Pregnancy period during adolescence elevates a number of food concerns.

Conclusion

Mineral elements are involved in many metabolic processes and, hence, also have a role to play during pregnancy and fetal development. Thus, the change in the natural levels of these minerals according to the urban and rural lifestyle in Iraq may affect the pregnancy either positively or negatively.

Conflict of Interest: The author declares no conflict of interest.

Ethical Clearance: The protocol of this study was approved by the Scientific Committee the Department of Environmental Pollution Ethics at Al-Qasim Green University/College of Environmental Sciences. The samples were collected from Al-Hilla General Education Hospital and Obstetrics Hospital after obtaining official approval from the Training and Development Center at these two hospitals.

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Self-Confidence upon Nursery Children in Al-Mahaweel with some Variables at the Babylon City

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Abstract

This study is a descriptive study to assess the level of self-confidence in kindergartens in Babylon . The study sample included 50 children with (30) male and (20) female This study was conducted in the province of Babylon in the Mahaweel district – the Imam City in the kindergarten Masoudi for the semester 2016-2017 , The sample collection period was extended from December 2016 to January 2017. Design of the study : Descriptive study , setting of the study : The study was conducted in the province of Babylon in the Mahaweel district , Time of the study : The Semester 2016 - 2017 , the sample of study : The sample was selected in Al-Masoudi kindergarten in Al-Imam district , The study consisted of (50) children, males (30) and females (20). The results of the study showed a difference in the level of self confidence in children through the results of questionnaires, which were based on four fields : motor skills, self-reliance, social skills and physical appearance and included the age of children and level of education for the father and mother.

Key words: *Self-Confidence, Nursery, Children, Some ariables*

Introduction

The basis of each individual's personality lies in the early years of his life If the child's personality had been organized well and if the motives have expressed themselves fully and destination usefully be strong child will be happy enjoying his character strong but if there was a failure in that organization in the early years the individual will be unable to cope with its responsibilities in life ¹ , and the family is the educational environment responsible for the preparation of the child to enter into social life to be an effective element in sustaining it on the basis of good and effective construction ² , As the family is the first social area in which the child is established it has become the most important social environment for the child's social and psychological development ³ , every nation that wants to progress and seek a better life puts within its goals the care of children and provide the appropriate requirements for their care and

establishment ⁴ , And that the interest of most countries in the establishment of schools for pre-school children called kindergartens is where the child enjoys free play in an environment of friendliness and encouragement rather than imposing restrictions and demands on the child ⁵ , And its role as an effective educational stage a meaningful stand-alone seeks to form the basics of a child's development physically, mentally and physically ⁶ , And has an important role in the development of self-confidence through the use of methods that facilitate the process in order to arm them to upbringing him right ⁷ , If self-confidence is not developed at this basic stage this will lead to the collapse of the child's psychological life ⁸ , And is an important factor in the growth of personality traits of the individual and integration into society ⁹ . Aim of the study: Assessment the level of self-confidence at the Preschool in the Imam City. Assessment the level of self-confidence according to the following fields:- Gross motor skills, Self-help skills, Social skills, Physical appearance. The impact of the educational level of the father and mother on the level of self-confidence for children.

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Methodology

Design of the study: Descriptive study.

Setting of the study: The study was conducted in the province of Babylon in the Mahaweel district – the Imam City Al - Masoudi kindergarten.

Time of the study: the semester 2016-2017

Sample of study: The sample was selected in Al-Masoudi kindergarten in Al-Imam district. The study consisted of (50) children, males (30) and females (20). The questionnaire was distributed to the teaching staff in this kindergarten , questionnaire include the child's information (Age of the child ,Gender of the child , scientific attainment of the mother and scientific attainment of the father), and include four fields Each field has five questions (motor skills, self-reliance, social skills and physical appearance).

Results and Discussion

Table (1) : Shows that / (1) the high percentage 30 child (Male) and the low percentage 20 child (Female) / (2) the high percentage 18 (Secondary) and the low percentage 7 (Diploma) / (3) the high percentage 16 (Secondary) and the low percentage 8 (Diploma) / (4) the high percentage 35 (No) and the low percentage 15 (yes) . Table (2) : Shows that / (1) the high percentage 29 child (Never) and the low percentage 9 child (Always) / (2) the high percentage 22 child (Some Times) and the low percentage 12 child (Always) / (3) the high percentage 20 child (Some Times) and the low percentage 14 child (Always) / (4) the high percentage 30 child (Some Times) and the low percentage 8 child (Always) / (5) the high percentage 24 child (Never) and the low percentage 6 child (Always). Table (3) : Shows that / (1) the high percentage 20 child (Some Times) and the low percentage 14 child (Always) / (2) the high percentage 28 child (Some Times) and the low percentage 10 child (Always) / (3) the high percentage 24 child (Never) and the low percentage 6 child (Always) / (4) the high percentage 20 child (Always) and the low percentage 14 child (Never) / (5) the high percentage 34 child (Always) and the low percentage 4 child (Never). Table (4) : Shows that / (1) the high percentage 24 child (Always) and the low percentage 8 child (Never) / (2) the high percentage 26 child (Some Times) and the low percentage 10 child (Always) / (3) the high percentage 28 child (Some Times) and the low percentage 8 child

(Never) / (4) the high percentage 22 child (Some Times) and the low percentage 13 child (Always) / (5) the high percentage 22 child (Never) and the low percentage 8 child (Always). Table (5) : Shows that / (1) the high percentage 28 child (Some Times) and the low percentage 10 child (Never) / (2) the high percentage 26 child (Some Times) and the low percentage 10 child (Never) / (3) the high percentage 20 child (Some Times) and the low percentage 12 child (Never) / (4) the high percentage 24 child (Some Times) and the low percentage 6 child (Never) / (5) the high percentage 24 child (Some Times) and the low percentage 8 child (Always). Through the calculate the date about assessment the level of Self-Confidence at the preschool in the imam city the study results is , (table 1) The gender of the child and the educational achievement of the father and mother has an impact on the personality of the child and the extent of his Self-Confidence and this results was agreement with previous studies ¹², (table 2) In this table the study reached a conclusion that 60 % of child some time tip-toe walking and 40 % of child some time easily fatigued and this results was agreement with previous studies ¹⁰, (table 3) In this table the study reached a conclusion that 68 % of child always toileting routines and 40 % of child some time dressing self and this results was agreement with previous studies ¹⁰ (table 4) In this table the study reached a conclusion that 56 % of child some time solitary play and 44 % of child never ridicule from others and this results was agreement with previous studies ¹² , (table 5) In this table the study reached a conclusion that 56 % of child sometime be happy and optimistic and 40 % of child some time it seems friendly toward others this results was agreement with previous studies ¹²

Table (1) Demographic data of the child

1. Child gender			
		Frequency	Percent
Valid	Female	20	40.0
	Male	30	60.0
	Total	50	100.0
2. The educational attainment of the mother			
		Frequency	Percent
Valid	Primary	14	28.0
	Secondary	18	36.0
	Baccalaureus	11	22.0
	Diploma	7	14.0
	Total	50	100.0

Cont... Table (1) Demographic data of the child

3. The educational attainment of the father			
		Frequency	Percent
Valid	Primary	14	28.0
	Secondary	16	32.0
	Baccalaureus	12	24.0
	Diploma	8	16.0
	Total	50	100.0
4. Child has a disability body			
		Frequency	Percent
Valid	Yes	15	30.0
	No	35	70.0
	Total	50	100.0

Table (2) field of gross motor skills

4. Child tip-toe walking			
		Frequency	Percent
Valid	Never	12	24.0
	Some Times	30	60.0
	Always	8	16.0
	Total	50	100.0
5. Child regular movement			
		Frequency	Percent
Valid	Never	24	48.0
	Some Times	20	40.0
	Always	6	12.0
	Total	50	100.0

Table (3) field of self-help skills

1. Child dressing self			
		Frequency	Percent
Valid	Never	16	32.0
	Some Times	20	40.0
	Always	14	28.0
	Total	50	100.0
2. Child feeding self			
		Frequency	Percent

Cont... Table (3) field of self-help skills

Valid	Never	12	24.0
	Some Times	28	56.0
	Always	10	20.0
	Total	50	100.0
3. Child washing hands/face			
		Frequency	Percent
Valid	Never	20	40.0
	Some Times	24	48.0
	Always	6	12.0
	Total	50	100.0
4. Child helping clean up			
		Frequency	Percent
Valid	Never	14	28.0
	Some Times	16	32.0
	Always	20	40.0
	Total	50	100.0
5. Child toileting routines			
		Frequency	Percent
Valid	Never	4	8.0
	Some Times	12	24.0
	Always	34	68.0
	Total	50	100.0

Table (4) field of social skills

1. Child interest in peers			
		Frequency	Percent
Valid	Never	8	16.0
	Some Times	18	36.0
	Always	24	48.0
	Total	50	100.0
2. Child group play with peers			
		Frequency	Percent
Valid	Never	14	28.0
	Some Times	26	52.0
	Always	10	20.0
	Total	50	100.0
3. Child solitary play			
		Frequency	Percent
Valid	Never	8	16.0
	Some Times	28	56.0
	Always	14	28.0
	Total	50	100.0
4. Child ability to share			
		Frequency	Percent

Cont.... Table (4) field of social skills

Valid	Never	15	30.0
	Some Times	22	44.0
	Always	13	26.0
	Total	50	100.0
5. Child ridicule from others			
		Frequency	Percent
Valid	Never	22	44.0
	Some Times	20	40.0
	Always	8	16.0
	Total	50	100.0

Table (5) field of physical appearance

1. Child be happy and optimistic			
		Frequency	Percent
Valid	Never	10	20.0
	Some Times	28	56.0
	Always	12	24.0
	Total	50	100.0
2. Child maintains a clean exterior appearance			
		Frequency	Percent
Valid	Never	10	20.0
	Some Times	26	52.0
	Always	14	28.0
	Total	50	100.0
3. Child listen to the speaker during the conversation			
		Frequency	Percent
Valid	Never	12	24.0
	Some Times	20	40.0
	Always	18	36.0
	Total	50	100.0
4. Child its importance and he is loved by everyone			
		Frequency	Percent
Valid	Never	6	12.0
	Some Times	24	48.0
	Always	20	40.0
	Total	50	100.0
5. Child it seems friendly toward others			
		Frequency	Percent
Valid	Never	18	36.0
	Some Times	24	48.0
	Always	8	16.0
	Total	50	100.0

Conclusion

Children have an acceptable level of self-confidence. Children who have peers have an average level of self-confidence. Parents who have a good level of education enjoy their children a good level of self-confidence. The field of physical appearance occupied the rank of the domains in the assessment of self-confidence.

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Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the pediatric & Psychiatric Mental Health Nursing, College of Nursing, Iraq and all experiments were carried out in accordance with approved guidelines.

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Gene Polymorphism Vitamin D receptor FokI in Thalassemia Children in AL-Muthanna Province

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Abstract

Background and Objective: Vitamin D receptor is considered genetic variants that related with vitamin D status. Our study was recorded polymorphism in vitamin D receptor (VDR) FokI in beta thalassemia children. In this study has been shown polymorphism VDR FokI dominant (FF), hybrid (Ff). VDR includes a beginning codon polymorphism (BCP) that consist of three codon above the course of a second beginning site (ATG). The BCP can be located by the restriction enzyme Fok I, which allele (f) references first of the restriction site ATG is presents, whereas the allele (F) references its missing. **Materials and Methods:** In this study vitamin D3 levels were evaluated by Enzyme Linked Immunosorbent Assay (Elisa). FokI gene polymorphism were analyzed by using polymerase chain reaction- restriction fragment length polymorphism assay (PCR-RFLP) were estimated in 50 participants children beta thalassemia were distributed to 25 male and 25 female. **Results:** Patients had significant decrease vitamin D and serum calcium $p=0.084$ and $p=0.751$ respectively, alkaline phosphate was recorded $p=0.665$, potassium $=0.278$ and total protein $p=0.521$. in the male study 84% had VD insufficiency and 16% deficiency, female study 96% had VD insufficiency and 4% deficiency. **Conclusion:** Vitamin D3 was higher in female more than male and recorded in age category 9-12 years old. VDR FokI gene polymorphism effect VD status, genotype FF, Ff appeared in our study and absence genotype ff.

Keywords : Vitamin D receptor, Gene, polymorphism, FokI, beta- thalassemia.

Introduction

Thalassemia disease is a common hereditary disorder has been observed in Mediterranean countries¹ that caused increasing anemia and production erythropoietin. As a result widening of bone marrow may share osteoporosis² define is a disease infects bones, which leads by a decrease bone mineral density (BMD) and a retrogradation in bone tissue structure, with a resultant raised bone frailty and become prone to breakage³. BMD is associated with vitamin D receptor (VDR) alleles located on the neighboring area of the 3'-end area⁴ add to the 5'-beginning codon area⁵. The nucleotide sequence of VDR gene consists of two potential translation inception (ATG or start) site⁶.

A hormone steroid, Vitamin D (VD) is fateful for health skeleton and mineral metabolism. It is play role on osteoblasts and osteoclasts and reaction with other tissues and contribute in keeping a balance state between bone rotation and bone growth⁷ as well as

the essential agent for normal calcium and phosphate balance⁸. VD deficiency is an increasing extent specific with thalassemia patient, furthermore to the definitive evidence role of VD in the conservation of various organ systems. Biological mechanisms of action VD status need more attention to focus on this particular group of patients⁹.

VDR represents as a nuclear transcription factor that regulate manufacturing of proteins contributed in bone mineral homeostasis and cell reproduction¹⁰. The VDR of gene exists within chromosome 12(q12-q14) and consists of 11 exons that stretch 75-100 kb. The 5' non coding end of the gene contains zones of exons 1a, 1b and 1c¹¹. The translated VDR protein is encoded with exons 2 to 9. Exons 7 to 9 play a crucial role in linking of VDR to its bind VD¹², many single nucleotide polymorphisms (SNP) that could likely amend the expression and energization of VDR that have been most a lot of studies¹³.

FokI T > C (restriction site RS 10735810) is the most common SNP studied of this gene and shared in the treatment of many diseases^{14,15}. The FokI polymorphism is transmission at the translation beginning site of exon 2 in the 5' coding zone in the VDR of gene. A lot of VDR mutations and cancellations have been specified in patients with a variety of diseases. Mostly often the genetical distortions produce in a VDR that is incapable to link to 1,25-OH-D¹⁶. Many polymorphisms have been announced. The most expansively studied VDR polymorphisms consist of FokI, BsmI, TaqI and ApaI¹⁷.

The aim of the present study investigated the frequency of VDR gene polymorphism FokI (rs 10735810) in a cohort of Iraqi populations. In thalassemia children patients analyzed the relationship between VDR and the keeping bone health and metabolism.

Materials and Method

The present study was performed with take whole blood on fifty patients thalassemia pediatric patients with thalassemia disease. They were 25 male and 25 females and was age average ranging from 1 to 12 years old from period May 2018 to October 2018. The inclusion criteria VD, alkaline phosphatase, potassium, total protein, calcium and body mass index and exclusion others criteria because not linked in the objective study. All patients were inducted from Thalassemia Unit that located in Feminine and Children hospital in AL-Muthanna Province to take blood dose. Data privacy was protected according to the protocol Helsinki Declaration and was agreed by the medical ethics committee. Written acquainted approval was collected from patients and their parents for each participant.

Parameters measurement

Five milliliters of blood withdrawn under optimal condition by venous blood from every child, 3ml on EDTA and 2ml on DNA extraction, subsequently VDR gene

polymorphism while the other part was centrifuged with speed five minutes and sera were obtained and stored under -20°C for assay of serum 25 hydroxy vitamin D3 with Enzyme Linked Immunosorbent Assay (ELISA) type direct. Serum vitamin level was measured according to the manufacturer's directives. Presently accepted standards for diagnosed VD values in thalassemia children are:

1- VD deficiency < 10 ng/ml

2- VD insufficiency 10-30 ng/ml

¹⁸. 3- VD sufficiency 30-100 ng/ml

Others laboratory parameters by using Fujifilm clinical biochemistry (FUJI DRI-CHEM 4000i) investigations, in addition measurement body mass index (BMI) for both genders.

Genotyping

Genomic DNA was isolated by using the phenol chloroform extraction method. Genotypes were revealed by using polymerase chain reaction restriction fragment length polymorphism (rs 10735810) and performed (PCR-RFLP). PCR reaction was performed in 50 µl including Master Mix, 0.5 µM forward, reverse primers, 1-2 µl DNA template and nuclease free water. PCR programme for Phusion normally. The FokI upstream primer is 5' AGCTGGCCCTGGCACTGACTCTGCTCT-3' and reverse downstream primer is 5' ATGGAACACCTTGCTTCTTCTCCCTC-3'. The primer are shown in figure 1. A 273 kb fragment FokI in the start codon of the VDR. DNA was extracted by using a pivot column kit (Qiagen kit) catalogue number of the kit Cat No./ID: 28104 polymerase chain reaction (PCR) amplification and enzymatic digestion with FokI.

The FokI genotypes were detected by using electrophoresis of the DNA samples in 1.5% agarose gels and were named as follows: FF (not present restriction site); ff (present restriction site); Ff (heterozygous of the restriction site). The PCR products for the FokI polymorphism was 273pb and the restriction fragments were 198pb and 75pb. All participants were genotyping for FokI gene polymorphism through the implementation of DNA extraction from circumferentially blood white cells whole blood with a genomic DNA extraction kit.

Statistical analysis

The data were analyzed by using (SPSS) version 22 for windows (SPSS, Chicago, IL, USA). The mean of the data was evaluated by one-way ANOVA and t-test. Furthermore, frequency results were analyzed by Pearson chi-square and Fisher's exact test. Differences were considered statistically significant at $p > 0.05$.

Results

This study was carried out on 50 patients infected

with thalassemia , 25 males(50%) and 25 females(50%) their ages ranging between 1 to 12 years old

Distribution of the studied vitamin D3 according to the genders both were 16.5 ± 3.7 in female and 14.5 ± 3.9 in male that was higher in female in table 1.p value was

0.084, likewise biochemical parameters were higher in female except calcium was higher in male recorded 1.92 ± 0.56 and female was the least 1.87 ± 0.5 .p value was 0.751.

Table (1): Distribution of the studied parameters values according to the gender for patients with thalassemia:

Parameters	Gender		Reference range	P value
	Female	Male		
Vitamin D3 (ng/mL)	16.5 ± 3.7	14.5 ± 3.9	<10 Def. 10-30 Ins. 30-100 Suff.	0.084
ALK. Phosphate (U/L)	68.6 ± 26.5	65 ± 31.9	32-111	0.665
Potassium (mmol/L)	4.49 ± 0.7	4.25 ± 0.7	3.5-5.3	0.278
T. Protein (g/dL)	7.52 ± 0.75	7.38 ± 0.69	6.7-8.3	0.521
Calcium (mmol/L)	1.87 ± 0.5	1.92 ± 0.56	1.9-2.1	0.751

* represents a significant difference at $P \leq 0.05$. Data are expressed as Mean $\pm$ SD.

Regarding gender groups (female and male), the studied parameters were distributed and statistically analyzed. The results showed no significant difference $p > 0.05$ for all studied parameters (Vitamin D3, ALK. Phosphate, Potassium, T. Protein and Calcium).

In table 2 distribution biochemical analysis according to the age in thalassemia patients VD was higher in ages 9-12 years old and p value was 0.605, while biochemical parameters were values variable.

Table (2): Distribution of the studied parameters values according to the age for patients with thalassemia:

Parameters	Age Groups			P value
	1-4 Y	5-8 Y	9-12 Y	
Vitamin D3 (ng/mL)	15.3 ± 3.2	15.2 ± 4.2	16.8 ± 5	0.605
ALK. Phosphate (U/L)	65.6 ± 30	73.5 ± 28	53.7 ± 21	0.251
Potassium (mmol/L)	4.7 ± 0.7	3.9 ± 0.5	4.2 ± 0.7	0.002*
T. Protein (g/dL)	7.38 ± 0.5	7.35 ± 0.8	7.91 ± 0.6	0.142
Calcium (mmol/L)	2 ± 0.4	1.8 ± 0.5	1.6 ± 0.5	0.142

* represents a significant difference at $P \leq 0.05$. Data are expressed as Mean $\pm$ SD.

Regarding age groups, the results revealed there are no significant differences $p>0.05$ among all the studied age groups for all studied parameters (Vitamin D3, ALK. Phosphate, T. Protein and Calcium) in children with thalassemia, except of Potassium that showed a significant difference $p<0.05$ (p value is 0.002).

In table 3 distribution parameters according to body mass index BMI, VD was the higher in <14.5 as well in total protein, while BMI 14.5-16.5 was higher in alkaline phosphate, potassium and calcium 68 ± 32 , 4.7 ± 0.78 and 1.9 ± 0.55 respectively.

Table (3): Distribution of the studied parameters values according to the body mass index BMI for patients with thalassemia:

Parameters	BMI Groups			P value
	<14.5	14.5-16.5	>16.5	
Vitamin D3 (ng/mL)	15.9 ± 3.7	15.5 ± 2.9	14 ± 5.4	0.511
ALK. Phosphate (U/L)	66.9 ± 27	68 ± 32	65 ± 29	0.979
Potassium (mmol/L)	4.2 ± 0.73	4.7 ± 0.78	4.3 ± 0.88	0.276
T. Protein (g/dL)	7.5 ± 0.8	7.2 ± 0.4	7.3 ± 0.6	0.531
Calcium (mmol/L)	1.8 ± 0.56	1.9 ± 0.55	1.9 ± 0.4	0.863

* represents a significant difference at $P\leq0.05$. Data are expressed as Mean $\pm$ SD.

Regarding BMI groups, the results revealed no significant differences $p>0.05$ among all the studied BMI groups for all studied parameters (Vitamin D3, ALK. Phosphate, Potassium, T. Protein and Calcium) in children with thalassemia.

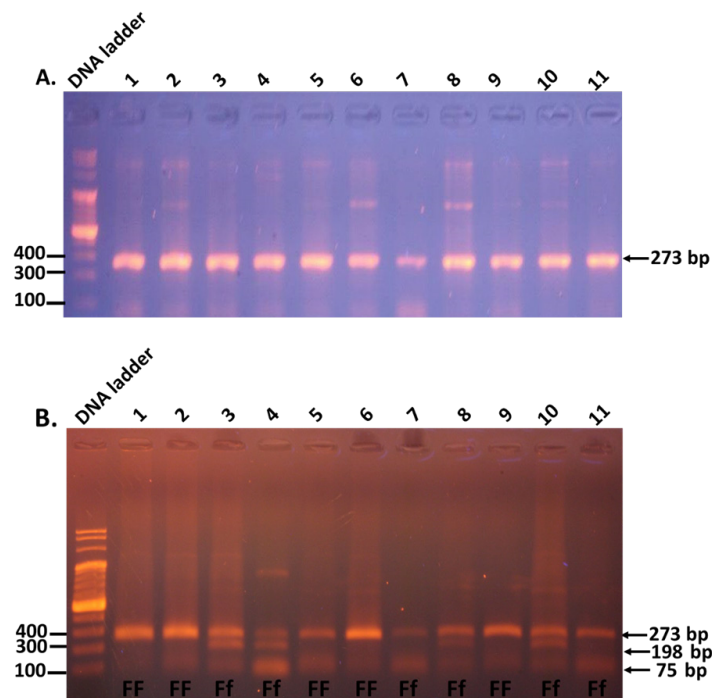


Figure (1): PCR-RFLP analysis of the *VDR* gene polymorphism, using *FokI* restriction enzyme. A. Agarose gel of the *VDR* gene amplification, showing predicted product of 273 bp. B. Agarose gel of *FokI* digestion, homozygous wild type (FF), showing predicted product of 273 bp for lane (1,2,5,6 and 9) and heterozygous mutant (Ff), showing predicted product of 273 bp, 198 bp and 75 bp for lane (3,4,7,8,10 and 11). DNA ladder: molecular weight: 1000–2500 bp.

Discussion

The permanence of patients with thalassemia major has gradually improved with advances in therapy ; however although bone diseases stay continual complications .Sufficient revolving levels of vitamin D are fundamental for optimal skeletal health and reducing breaking risk¹⁹ .Most of the biological activities of vitamin D are mediated by an intracellular receptor VDR in that

many single nucleotide gene polymorphism have been specified.Vitamin D deficiency is growingly specified among thalassemia patients²⁰. Consequently, in an effort to increase our understanding of the interaction between vitamin D status and the genetic polymorphisms of one parameter of the VDR(FokI) in case study male and female carried out on a cohort of Iraqi beta thalassemia patients.

Table(4) Genotype FokI Frequency of patients according to the gender:

FokI gene	Male(no)	Percentage%	Female(no)	Percentage%	Total(no)	Percentage%
FF	11	44	10	0.4	21	42
Ff	14	56	15	0.6	29	58
ff	0	0	0	0	0	0

In this study genotype FokI Frequency was revealed 42% of the patients were homozygous for F allele , 58% were heterozygous for Ff allele and absence for f allele in both genders, these results in table 4 was appeared contradictory with [8,25. In table (1) Low serum calcium levels with rise level of serum alkaline phosphate was noted in our study that compatible with the researcher²¹ have informed hypocalcemia as a late complication of iron overload in beta thalassemia. The researcher²² revealed VD deficiency, osteomalacia and rickets in thalassemia patients as a result of immersed 25 hydroxylation of vitamin D because of iron overload and following liver disorder.Other mechanism leading to deranged calcium , phosphate and VD homeostasis comprise reduced intake,weaken absorption and decreased synthesis of vitamin D²³.

Vitamin D influences on bone mineralization directly by the genomic mechanism through VDR and indirectly via its energizing of intestinal calcium and phosphorus absorption²⁴. VD deficiency in thalassemia patients is caused by decreased intake, lower sun exposure , imperfect skin synthesis linked with jaundice or defective 25 hydroxylation of VD in the liver because hepatic siderosis¹⁹. In the current study the results in table 1 showed no significant differences in the serum vitamin D levels .These fundings were not sudden that compatible with²⁵.

Conclusions

FokI genotypic Ff of VDR can be considered as a risk factor as whom patients suffering from bone disease and thus have amounts appropriate vitamin D and calcium that contribution in bones developing and raise bone mass which leads to prevent osteoporosis in thalassemia patients. VDR genotype and biochemical levels of calcium and VD to detect out who is more influence to osteoporosis.

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Conflict of Interest: Nil.

Ethical Clearance: Take from Thalassemia Centre by approval ethical committee.

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Botulinum Toxin Vs Lateral Internal Sphincterotomy for Anal Fissures

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Abstract

A prospective study of 60 patients with anal fissures that aims to compare between two different types of treatment (Botulinum toxin A injection BTA and lateral internal sphincterotomy LIS) regarding pain-relief, healing rates and side effects and to establish a systematic method to be followed in the treatment.

Keywords: Anal fissure, Lateral sphincterotomy, Botulinum toxin.

Introduction

Anal fissure is a canoe –shaped longitudinal tear that is most commonly found over the posterior wall of the anal canal below the dentate line. Anal fissures that do not heal in six weeks are considered chronic¹. The exact etiology of anal fissures is unknown but there is clear association with hyper-tonicity of the anal sphincter and the condition is triggered by trauma to the anal canal. Previously it was thought to be related to constipation but this is evident in only 75% of anal fissures, and in fact, diarrhea may be a cause². Sexual abuse³ and water stream from bidet- toilettes⁴ may be a cause of anterior anal fissures. Secondary fissures due to Crohn's disease, Tb, herpes and HIV are usually found in atypical locations⁵.

Over the years, multiple methods have been tried for the treatment of anal fissures. All of which aim to reduce the anal sphincter tone which consequently leads to healing of the fissure. Conservative measures eg. Stool softeners, high fiber diet , sitz baths are worth trying in the acute phase but are usually not beneficial for the chronic fissures.

Criteria to consider that a fissure is chronic are:

1. Fissures not responding to the conservative

measures.

2. Sentinel pile.
3. Hypertrophied anal papilla.
4. Induration of the edge.
5. Exposed internal sphincter.

Method

This study had been performed in the Outpatient Department and The Operation Theater of Al Hilla Teaching Hospital between January 2014 and August 2018. Proper informed consent had been taken from the involved patients regarding both procedures and the study method was fully -explained.

Sixty patients with chronic anal fissures(CAF) had been studied prospectively. Thirty of them were treated by Botulinum toxin A (BTA) injection and another 30 by lateral internal sphincterotomy (LIS).

Exclusion criteria were:

1. Recurrence following previous surgery.
2. Multiple fissures.
3. Pregnant women.
4. Secondary fissures eg. Crohn's disease and Tb.

The two groups were matched regarding gender distribution, age and severity of the symptoms (Table 1).

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Table 1: Male: female distribution and mean age

Groups	Females	Males	Mean age
BTA	18(60%)	12(40%)	33.7
LIS	17(56%)	13(43%)	32.6

LIS was performed under spinal and sometimes general anesthesia in lithotomy position. The internal sphincter was divided using cautery while the external sphincter was preserved.

BTA was given to the patients in the outpatient department in the left lateral position. BTA was diluted in saline to a concentration of 50 units/ ml. A 27 gauge needle syringe was used to introduce 10 units of BTA on each side of the midline anteriorly.

Patients of the two groups were reviewed after 2, 6 and 12 weeks regarding side effects, pain relief and fissure healing.

Results

All of the treated fissures were posterior in location.

Pain relief was achieved in 23, 24 and 24 after two, six, and twelve weeks respectively in the BTA group (Table 2) while pain relief happened in 21, 30 and 30 of the LIS group after two, six and twelve weeks respectively (Table 3) .

Healing was achieved in 15, 23 and 26 after two, six, and twelve weeks respectively in the BTA group (Table 2) while healing happened in 16, 22 and 29 of the LIS group after two, six and twelve weeks respectively (Table 3) .

No side effects were detected in the BTA group while incontinence to flatus occurred in 4(13.3%) of the LIS and headache happened in 2(6.6%) following spinal anesthesia and infection happened in 1(3.3%) of the LIS group.

Table 2: Pain relief and healing following BTA

Time	Pain relief	Healing
2 weeks	23(77%)	15(50%)
6 weeks	24(80%)	23(76.7%)
12 weeks	26(86.6%)	24(80%)

Table 3: Pain relief and healing following LIS

Time	Pain relief	Healing
2 weeks	21(70%)	16(53%)
6 weeks	30(100%)	22(73.3%)
12 weeks	30(100%)	29(96.6%)

Discussion

After 3 months of BTA injection the pain relief and healing rate were 86.6% and 80% respectively which is significantly- less than the LIS group which was 100% and 96.6% respectively. Many studies show healing rate of 100% following LIS ^{6,7,8}. No side effects have been reported following BTA while flatus incontinence occurred in 13.3% and headache in 6.6% of the LIS group. A lot of studies report a wide range of side effects following BTA injection including flatus incontinence, hematoma, flu-like illness and epididymitis of which none has been encountered in the presented study ^{9, 10}. When using BTA, the dose, distance from the anal verge and the angle of injection are of paramount importance to achieve the healing.

In view of the above and due to the potentially-significant complications of LIS, it is highly-recommended to start with BTA as a 1st line treatment and shift to LIS if healing has not been achieved. If the patient is ready to accept the risk of incontinence with LIS and wants the better healing rate as a priority, then he should be offered the operation.

Glyceryl trinitrate ointment is another form of chemical sphincterotomy but it causes headache and lacks uniformity some parts being sub-potent and do not achieve healing while others supra-potent and cause hypotension¹¹.

Ten units of BTA were injected in the presented study. Some studies show less healing rate with BTA (93.3%) and this might be attributed to the lower dose¹².

Another important consideration is the cost as while the cost of BTA was about 60\$, the cost of surgery is certainly more but depends on whether it was performed in a government or a private hospital and in average was 300\$. Also the patients had to leave their work during the recovery time for an average of one week. There is also the waiting list time which would be frustrating for

the patient.

Before starting any sphincterotomy, whether chemical or surgical, conservative measures are worth trying as they can achieve healing in 70% of the cases ¹³.

Follow up of the patients in the presented study was considerably- short (12 weeks). A recurrence rate of about (0-8%) 6-24 months after BTA injection has been reported ^{14,15}.

Ethical Clearance: The research Ethical Committee at scientific research by ethical approval of both environmental and health and higher education and scientific research ministries in Iraq.

Conflict of Interest: The authors declare that they have no conflict of interest.

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Assessment of Serum Glucose and B12 in the Pregnant Women and their Correlation with the Blood Hemoglobin

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Abstract

Vitamin B12 plays a dynamic role in one carbon metabolism, which is essential for the general healthy pregnancy and predominantly for fetal growth. Another parameter is maternal glucose during pregnancy. For the transport of the glucose across the placenta, insulin resistance is change for the normal development of the fetus. This study included 30 pregnant women enrolled at Al-Karkh Materuity hospital in January to May 2019. The pregnant women with 23rd to 25th gestational week were included in the present study. Fasting blood was collected from cases (either showed vitamin B12 deficiency or high serum glucose) and healthy participants after obtaining informed consent. The parameters like child birth weight, type of delivery and duration of pregnancy was recorded. The vitamin B12 content was significantly lower (222.43 ± 48.41 pg/ml) in the B12 deficient group as compared to healthy control (492.71 ± 52.81 pg/ml). It was observed that the women with B12 deficiency lead to the premature delivery. The fetus birth weight is negatively correlated with the presence of vitamin B12 deficiency. Compared to the healthy control, women with high serum glucose showed significant ($p \leq 0.0001$) increased in the fetus weight, which may be one of the reason for C-section delivery. About 87.32% GDM women undergone C-section delivery, while only 12.68% normal delivery occurs. Most of the normal child delivery was found in the B12 deficient women and maximum normal child delivery rate was in the healthy control. The fetus birth weight is positively correlated with the presence of increased serum glucose levels of the mother. It was positively correlated with the pregnancy complications such as premature birth, increased in fetus weight etc. For anaemic condition in the mother, vitamin B12 deficiency can be one of the key factor and it should be monitored before planning of pregnancy.

Keywords: Vitamin B12 deficiency, Normal delivery, Pregnancy, Fetus birth weight

Introduction

Vitamin B12 plays a dynamic role in one carbon metabolism, which is essential for the general healthy pregnancy and predominantly for fetal growth¹. Maternal health during gestation has been very serious and commanding for intergenerational health. The genetic regulation of fetal growth is influenced by the intra-uterine environment in which the fetus grows²⁻³. Nutrients, glucose and oxygen supply from the mother is a one of the factors for fetus good healthy and survive⁴⁻⁵.

Vitamin B12 (cyanocobalamin) is a chemically complex vitamin. Structurally, it is a corrin ring, and two of the pyrrole rings directly bonded⁶.

Vitamin B12 is used by the body for DNA methylation and hemoglobin production. It is a Fe-containing metal protein in the erythrocytes which carries oxygen in red blood cells⁶⁻¹⁰. The gastrointestinal absorption of vitamin B12 is a very complex in the human¹¹ and deficiency occurs when the absorption mechanism gets disturbed and/or poor diet. Causes can also relate to inadequate Intrinsic factor production, atrophic gastritis, interference with the ill uptake of vitamin B12 due to disease, resection or interference by bacterial overgrowth, drug-nutrient interactions as well as some less common genetic defects¹². Hence, during pregnancy the serum levels of the B12 are one of the

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importance parameter for the fetus development.

Another parameter is maternal glucose during pregnancy. For the transport of the glucose across the placenta, insulin resistance is change for the normal development of the fetus. When glucose is transported across placenta it stimulates pancreatic insulin secretion. Insulin is also an important hormone required for growth apart from its role of just maintains glucose homeostasis¹³. Gestational diabetes is a temporary form of diabetes in which the body does not produce adequate amounts of insulin to regulate sugar during pregnancy¹⁴. In normal pregnancy, insulin resistance is similar to type 2 diabetes. This syndrome worsens in the third trimester and leads to gestational Diabetes Mellitus (GDM). Hyperglycemia during pregnancy is less severe than in type 2 diabetes. But still, it can lead to adverse pregnancy outcome. Carbohydrate intolerance in pregnancy who are without Gestational Diabetes, also leads to adverse maternal and even fatal outcomes. Hence, the present study aims to study the correlation between the serum B12 and blood hemoglobin as well as serum glucose levels and pregnancy outcome in the Iraqi women.

Material and Method

Study design

This study included 30 pregnant women enrolled at Al-Karkh Materuity hospital in January 2019 to May 2019. The pregnant women with 23rd to 25th gestational week were included in the present study. The test was performed Al-Karkh Materuity hospital. Fasting blood (n=30) was collected by a single puncture from cases (either showed vitamin B12 deficiency or high serum glucose) and healthy participants after obtaining informed consent. The parameters like child birth weight, type of delivery and duration of pregnancy was recorded.

Blood collection and biochemical analysis

The fasting blood was collected (2ml) in the plain vacutainers from the vein after getting participant oral consent. The samples were kept at room temperature for 30min. Followed by the centrifugation at 3000rpm for 15min. The serum was separated and kept at -20°C for further study. Serum glucose, vitamin B12 content and blood haemoglobin were estimated by commercially available kits (Sigma, USA).

Statistical Analysis

The results were depicted as Mean $\pm$ Standard Error (SE). The unpaired t-test was done to estimate the statistical significance using GraphPad Instat (3.0, Trial Version)..

Results

Average weeks of child delivery were found to be about 35.72 and 38.10 weeks in women with vitamin B 12 supplementation and healthy women, respectively.

Serum glucose levels in the pregnant women

The women with fasting blood glucose (FBG) ≥ 105 mg/dl were enrolled in the present study (GDM). Other, women were included in the normal group (FBG ≤ 105 mg/dl). The OGTT was performed for all women. The fasting and postprandial glucose levels after 1 and 2 hours are depicted in the Table 1.

Table 1. Blood glucose (mg/dl) levels of women enrolled in the study

	Fasting	Postprandial 1hr	Postprandial 2hr
GDM group	121.83 $\pm$ 4.85	195.73 $\pm$ 3.61	153.03 $\pm$ 4.91
Healthy group	98.5 $\pm$ 0.72	138.73 $\pm$ 3.75	118.94 $\pm$ 3.97

Women with high serum glucose showed increased in the fetus weight

Compared to the healthy control, women with high serum glucose showed significant ($p \leq 0.0001$) increased in the fetus weight, which may be one of the reason for C-section delivery. However, B12 deficient women showed decreased in child birth weight as compared to healthy control. The birth weight of the fetus is shown in the Figure 1. About 87.32% GDM women undergone C-section delivery, while only 12.68% normal delivery occurs. Most of the normal child delivery was found in the B12 deficient women and maximum normal child delivery rate was in the healthy control.

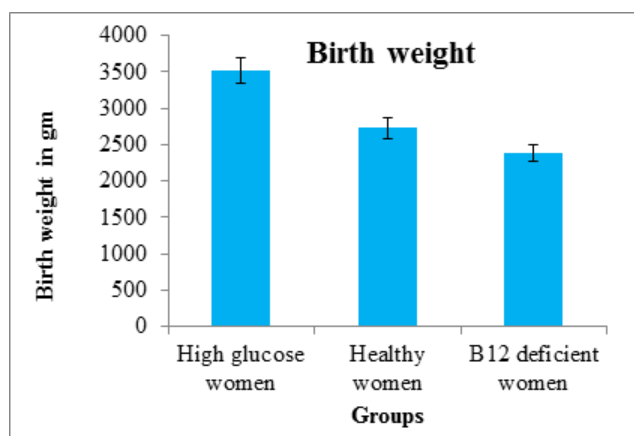


Figure 1: The birth weight of the fetus delivered by enrolled women

Results are represented as mean±standred error. The high glucose women group showed $p<0.01$ as compared to healthy control (unpaired two-tailed test).

Vitamin B12 deficient women showed decreases in the fetus weight

The vitamin B12 content of enrolled women was depicted in the Figure 2. The vitamin B12 content was significantly lower ($222.43\pm48.41\text{pg/ml}$) in the B12 deficient group as compared to healthy control ($492.71\pm52.81\text{ pg/ml}$). It was observed that the women with B12 deficiency lead to the premature delivery. These women are given appropriate supplementation of B12 externally. Hence, none of the deliver child showed any birth defect. From the present study, the fetus birth weight is negatively correlated with the presence of vitamin B12 deficiency.

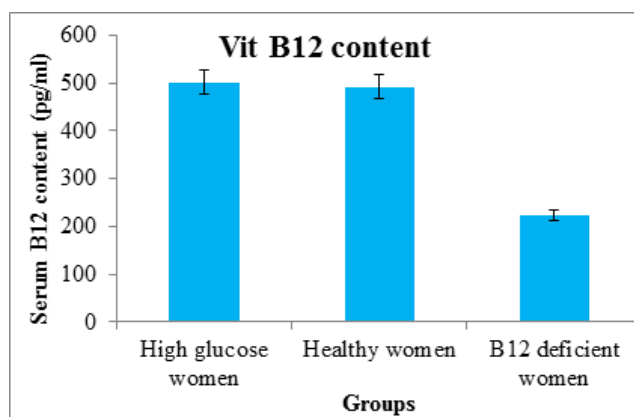


Figure 2: vitamin B12 content of enrolled patients

Results are represented as mean±standred error. The high glucose women group showed $p<0.01$ as compared to healthy control (unpaired two-tailed test).

Discussion

It is well documented that the folate is involved in the functioning of methionine synthase. It is a vitamin B12-dependent enzyme that converts homocysteine to methionine (an important amino acid). Increased folate intake decreases the risk of neural tube defects, other malformations and perhaps, pregnancy complications¹⁵. In the present study, some women showed vitamin B12 deficiency. Increasing evidence suggests that the beneficial effect of folate may be related to improved function of methionine synthase, a vitamin B12-dependent enzyme that converts homocysteine to methionine.

Slight vitamin B12 deficiency is common during pregnancy. About 38%women showed low B12 levels during delivery due to increased fetal demand over gestation¹⁶. Sometimes, B12 deficiency remains unrecognized, if anemia is misguidedly recognized to other causes such as physiologic hemodilution or iron deficiency which may lead to peripheral neuropathy, severe anemia, cognitive decline, and a range of neuropsychiatric manifestations. It may also marked with thrombocytopenia and microangiopathic hemolytic anemia, low platelet count (HELLP) syndrome, elevated liver enzymes, and thrombotic thrombocytopenic¹⁷⁻¹⁹.

Serum glucose shows a major role in fetal growth. However, the normal levels of glucose must be evidently defined in pregnancy and its effect on fetal growth must be evaluated²⁰. In the gestational diabetes, in spite of maintaining a steady state energy throughout the day, it results in tiredness. High glucose level in pregnancy leads to weight gain in pregnancy, pre-eclampsia and baby being overweight in later life. In the present study, some women showed high glucose levels. This might be one of the reason for the overweight child birth. However, Hernandez et al.²⁰ reported that women with glucose values within therapeutic range, often deliver macrosomic infants.

Various studies have reported the positive correlation between maternal serum glucose and amniotic fluid glucose level²¹⁻²⁶. The study by Riskin-Mashiah et al²³ demonstrated the similar association of fasting glucose in the first trimester and the occurrence of complications in pregnancy. Our finding are accordance with these reports²⁴⁻²⁶.

Conclusions

The fetus birth weight is positively correlated with the presence of increased serum glucose levels of the mother. It was positively correlated with the pregnancy complications such as premature birth, increased in fetus weight etc. For anaemic condition in the mother, vitamin B12 deficiency can be one of the key factor and it should be monitored before planning of pregnancy.

Ethical Clearance: The blood was collected from the Al-Karkh Materuity hospital after their investigation. Oral consent was taken before enrolled the patients in the study.

Source of Funding: Self

Conflict of Interest: Nil

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Relaxing Melody from Flute Combined with a Foot Massage Can Reduce Systolic and Diastolic Blood Pressure in Elders

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Abstract

Background: Hypertension in elders is affected by physiological changes in the structure and cardiovascular functions. One alternative of non-pharmacological treatment for hypertension is the combination of foot massage and harp-flute (*kecapi suling*) music therapies, which can give a relaxing sensation in the blood pressure.

Objective: This study aims to observe the effect of the combination of foot massage and *kecapi suling* music therapies against systolic and diastolic blood pressure.

Method: This research uses the pre-experimental design (one group pretest-posttest design). The population was elders with hypertension in Werdha Hargo Dedali Nursing Home in Surabaya. Purposive sampling technique was used to obtain 14 respondents. The independent variables were foot massage and *kecapi suling* music therapies, whereas the dependent variable was the blood pressure reduction. The data were analyzed by using Paired-Samples T-Test with significance value ≤ 0.05 .

Results: The study indicated that the combination of foot massage and *kecapi suling* music therapies affected systolic and diastolic blood pressure reduction in elders with hypertension. The systolic blood pressure average value in the pre-intervention was 154.64 mmHg, while the average value in the post-intervention was 138.86 mmHg. Diastolic blood pressure average value in the pre-intervention was 92.21 mmHg, while the average value in the post-intervention was 88.00 mmHg.

Conclusion: There is an effect of the combination of foot massage and *kecapi suling* music therapies on decreasing blood pressure in elders with hypertension. The decrease in systolic blood pressure occurred in all respondents, while not all respondents experienced diastolic blood pressure decline.

Keywords: Foot massage therapy, *kecapi suling* music, hypertension, elders.

Background

Hypertension becomes a common problem in elders as more than 50% of hypertension patients aged over 60 years old. The disease causes 50% of deaths due to coronary heart disease, and 51% of deaths due to stroke ⁽¹⁾. In Indonesia, hypertension is one of the public health issues. Hypertension is included among the top 10 rank

of the causes of outpatient diseases in hospitals from the group age of 45-64 years and more than 65 years ⁽²⁾. Sufferers with hypertension usually use pharmacological therapy, including captopril, hydrochlorothiazide (HCT), and amlodipine. However, the administration of antihypertensive drugs in elders in an extended period can cause various side effects, including the risk of postural hypotension, kidney impairment, mental and behavioral changes ⁽³⁾.

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Regarding the various side effects that arise from antihypertensive drugs, non-pharmacological treatment can be used as an intervention. Research by Milan (2019) stated that patients with hypertension who use

antihypertensive drugs and followed classical music therapy interventions for 15 minutes/day experienced blood pressure reduction by 80%, while sufferers with hypertension who only use antihypertensive drugs experienced blood pressure reduction by 50% ⁽⁴⁾.

Previous studies in which the elders were given intervention of foot reflexology massage for 15 minutes, showed changes in systolic and diastolic blood pressure in pretest-posttest. Foot reflexology provides stimulation that can cause the body to release hormones such as serotonin, histamine, bradykinin, and a slow-reacting substance. These hormones result in the dilation of capillaries and arterioles, which cause improvements in vascular microcirculation and prompts relaxation effects⁽⁵⁾.

Listening to music at a moderate frequency makes the limbic system activated, receives signals from the limbic cortex and then to the hypothalamus ⁽⁶⁾. Based on previous research where the elderly were given traditional Sundanese *kecapi suling* music therapy for five consecutive days with a duration of 15 minutes, showed that there were differences in systolic and diastolic blood pressure before and after an intervention ⁽⁷⁾. Based on the background above, this study aims to identify systolic and diastolic blood pressure in elders with hypertension before and after the intervention of the combination of foot massage and *kecapi suling* music therapies.

Materials and Method

This study used a pre-experimental research design with one group pre-test to post-test design. This study aims to observe the respondents before and after the intervention⁽⁸⁾. The population in this study was 23 elders with hypertension.

Samples and sample size

The samples and sample size taken in this study were based on the inclusion criteria in this study, namely elders with hypertension aged 60-90 years, with grade II blood pressure (systolic 140-159 mmHg and diastolic 90-99 mmHg) and grade III blood pressure (systolic 160-179 mmHg and diastolic 100-109 mmHg), cooperative, in good condition to collaborate throughout the study, and able to communicate well. Finally, based on the inclusion criteria, the study obtained 14 elders as the samples. The sampling technique used was the non-

probability sampling/purposive sampling ⁽⁵⁾.

Variables

The independent variables in this study were foot massage and *kecapi suling* music therapies. *Kecapi suling* music is a traditional Sundanese music genre which includes a *kecapi*, similar to a harp, and *suling*, similar to a flute. While the dependent variable is the blood pressure reduction in elders.

Research Instruments

The instruments used in this study to measure the independent variables included the Standard Operating Procedure (SOP) of foot massage therapy, SOP of *kecapi suling* music, and SOP for blood pressure measurement. For the dependent variable, the examination used a sphygmomanometer and a stethoscope to measure systolic and diastolic blood pressure.

Data Collection Procedures

The data collection process in this study was grouped into two stages, namely the preparation and the implementation stages. At the preparation stage, the interviews were conducted to the nurses in Werdha Hargo Dedali Nursing Home, Surabaya, Indonesia, to obtain information about the population of elders aged over 60 years with hypertension. The stage was conducted for one week. During the implementation stage, the leading researchers were helped by five volunteer researchers. During the study, the leading and volunteer researchers experimented with the respondents accompanied by nurses at the nursing home. Pretest and posttest were carried out every day for seven consecutive days, namely measuring systolic and diastolic blood pressure using a sphygmomanometer and a stethoscope, for 15 minutes before and after the intervention ⁽⁹⁾.

The respondents were given foot massage therapy and *kecapi suling* music, with medium frequency using earphones, once a day for seven consecutive days with a duration of 15 minutes, starting at 9:00 a.m. at the respondents' desired place. The analyzed data was the pretest on the first day and the posttest on the seventh day. Interventions were conducted to 14 elders at the same time, accompanied by researchers and volunteers for each elder.

Data Analysis

The researchers collected the pretest and post-test data contained with each participant's code and tabulated to inspect any differences in the results before and after the intervention was given. Analyzed data is the pretest on the first day and the posttest obtained on the seventh day. At the data analysis stage, the researchers used a Paired-Samples T-Test with a significance value of $\alpha \leq 0.05$, which means if the Paired-Samples T-Test

resulting in $\alpha \leq 0.05$, then interpreted as there is an effect of giving an intervention of combination of foot massage and *kecapi suling* music therapies against blood pressure in elders with hypertension.

Results

Specific data in this study consisted of systolic and diastolic blood pressure before and after a combination of foot massage and *kecapi suling* music therapies.

Table 1: Observation results of systolic blood pressure values before and after the combination of foot massage and *kecapi suling* music therapies

Respondents	Systolic Blood Pressure (mmHg)		Systolic Blood Pressure Shift
	Pre-Intervention	Post-Intervention	
1.	165 mmHg	142 mmHg	-23
2.	145 mmHg	135 mmHg	-10
3.	160 mmHg	140 mmHg	-20
4.	160 mmHg	145 mmHg	-15
5.	160 mmHg	140 mmHg	-20
6.	155 mmHg	135 mmHg	-20
7.	140 mmHg	136 mmHg	-4
8.	160 mmHg	140 mmHg	-20
9.	160 mmHg	145 mmHg	-20
10.	160mmHg	143 mmHg	-17
11.	145 mmHg	133 mmHg	-12
12.	160 mmHg	145 mmHg	-15
13.	150 mmHg	135 mmHg	-15
Mean	154.64	138.86	
Paired-Samples T-Test p= 0.000			

According to the Table 1, the highest value of systolic blood pressure among 14 elders before being given a combination of foot massage and *kecapi suling* music therapies was 165 mmHg, which indicated moderate hypertension (grade III) and the average value was 154.64 mmHg at grade II. Comparatively, the highest value of systolic blood pressure after being given a combination of foot massage and *kecapi suling* music therapies was 145 mmHg, which indicated mild hypertension (grade

II) and the average value was 138.86 at grade I. The most significant shift in systolic blood pressure was 20 mmHg in 5 respondents. Obtained Paired-Samples T-Test p-value = 0,000, which indicated that there was an effect of the combination of foot massage and *kecapi suling* music therapies on systolic blood pressure in elders with hypertension.

Table 2: Observation results of diastolic blood pressure values before and after the combination of foot massage and *kecapi suling* music therapies.

Respondents	Diastolic Blood Pressure (mmHg)		Blood Pressure Shift
	Pre-Intervensi	Post-Intervensi	
1.	90 mmHg	88 mmHg	-2
2.	95 mmHg	93 mmHg	-2
3.	98 mmHg	90 mmHg	-8
4.	95 mmHg	89 mmHg	-6
5.	90 mmHg	80 mmHg	-10
6.	90 mmHg	83 mmHg	-7
7.	90 mmHg	85 mmHg	-5
8.	85 mmHg	85 mmHg	0
9.	93 mmHg	90 mmHg	-3
10.	90 mmHg	90 mmHg	0
11.	100 mmHg	97 mmHg	-3
12.	95 mmHg	85 mmHg	-10
13.	90 mmHg	90 mmHg	0
14.	90 mmHg	87 mmHg	-3
Mean	92.21	88.00	
Paired-Samples T-Test p = 0.001			

Table 2 shows that among 14 respondents, the values of diastolic blood pressure decreased but did not occur in all respondents. The highest value of diastolic blood pressure before the intervention of the combined foot massage and *kecapi suling* music therapies was 90 mmHg with the average was 92.21 mmHg, which indicated mild hypertension (grade II). Moreover, the average value of diastolic blood pressure after being given the combined foot massage and *kecapi suling* music therapies was 88.00 mmHg, which indicated a high normal blood pressure. The significant shift in diastolic blood pressure is 10 mmHg in two respondents, and no shift indicated for three respondents after the intervention. The result of Paired Samples T-Test was $p = 0.001$, which means no intervention effect of combined foot massage and *kecapi suling* music therapies in diastolic blood pressure in elders with hypertension.

Discussion

Based on the results above, foot massage therapy

sent soothing signals to the central nervous system mediated by peripheral nerves in the legs. The signal instructed the body to reduce the level of tension, which triggered relaxation and improved blood circulation. The stimulation resulting from foot reflexology stimulates the body to release endogenous morphine hormones such as endorphin, enkephalin, and dynorphin while reducing levels of stress hormones such as cortisol, norepinephrine, and dopamine. These hormones cause the capillary dilatation resulting in improvements of microcirculation in blood vessels. This condition stimulates the relaxing effect to stiff muscles, and due to the vasodilation, the shift in blood pressure is affected⁽¹⁰⁾.

The therapeutic effect of foot massage influences the cardiovascular system, which can increase the dilation of blood vessels. The superficial blood vessel wall widens due to a reflex response to a decrease in sympathetic nerve activity, which increases venous blood flow to

the heart and lowers blood pressure⁽¹¹⁾. Increased blood flow in the foot area is proportional to a workout, and when the local circulation is massaged, the blood flow increases to three times than when the circulation is at rest. Moreover, massage therapy also stimulates the release of acetylcholine and histamine. The release of these two substances results in vasomotor activity, thus helping to extend the vasodilation⁽¹²⁾.

Music produces vibrational waves that can cause a stimulus to the acoustic drum⁽¹¹⁾. The stimulus is sent from axons, sensory ascending fibers to neurons, and the reticular activating system (RAS). The stimulus is transmitted by specific nuclei of the thalamus through the area of the autonomic nervous system and the neuroendocrine system. Music can stimulate the body to produce nitric oxide (NO) molecules that work on blood vessel tone. NO is an endothelium-derived relaxing factor that plays an essential role in the regulation of vascular homeostasis. A decrease in NO production results in arterial stiffness and reduces lumen in the blood vessel, which increases blood pressure⁽¹³⁾.

Listening to music makes the limbic system activated, and then the input continues to the hypothalamus. The hypothalamus delivers nerve impulses to the nuclei in the brain stem that control the functioning of the autonomic nervous system, namely the sympathetic and parasympathetic nerves. The parasympathetic nerves are increased, which inhibits the work of the sympathetic nerve, and the endothelial nitric oxide in the blood vessels increases. Nitric oxide has a role as a vascular vasodilator⁽¹⁴⁾. Vascular vasodilation causes enhancement in vascularization, which decreases the blood pressure⁽¹⁵⁾.

Hypertension that occurs in elders is a result of the endothelial system dysfunction, which causes nitric oxide (NO) and functions as a vasodilator begins to diminish in later age. NO has a vital role in smooth muscles proliferation because it is known as a potent vasodilator. The decrease in NO results in stiffness of the arteries, shrinking the lumen in blood vessels, which increases the blood pressure⁽¹⁶⁾. Changes in physiology, structure, and cardiovascular functions due to the aging process also cause interference in the cardiovascular system, including the aortic wall⁽¹⁷⁾.

Blood pressure reduction occurs because of the concentration of plasma catecholamine that influences

the activity of sympatho-adrenergic and also causes the release of stress hormones⁽¹²⁾. The release of stress hormones with a combination of foot massage and *kecapi suling* music therapies arouse a comfortable, calm, and relaxing feeling. It was observed by researchers on the respondents' expression when given a combination of foot massage and *kecapi suling* music therapies. The feeling of relaxation produced a positive final effect on blood pressure, which was the blood pressure reduction in elders with hypertension⁽⁸⁾.

Conclusion

Based on the research results conducted by the researchers to the elders, it can be concluded that there is an effect of the combination foot massage and *kecapi suling* music therapies on the blood pressure reduction in elders with hypertension. The decrease in systolic blood pressure occurred in all respondents, while not all respondents experienced diastolic blood pressure decrease. The average value of systolic blood pressure in the pre-intervention was 154.64 mmHg, while the average value in the post-intervention was 138.86 mmHg. The average value of diastolic blood pressure in the pre-intervention was 92.21 mmHg, while the average value in the post-intervention was 88.00 mmHg.

Research Ethics

This research did not conflict with any research ethics. The researchers have obtained permission from the relevant parties before conducting the research, especially in conducting survey to participants using a questionnaire. This research has been tested ethically and obtained ethical approval with Number 480-KEPK from the Health Research Ethics Committee, Universitas Airlangga, Faculty of Nursing.

Conflict of Interest: The researchers believes that there is no conflict of interest related to this study.

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The Comparisons of Different Abdominal Drawing-in Maneuver During Plank Exercises on Trunk Stability

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ABSTRACT

To measure the thickness of transversus abdominis(TrA), internal oblique(IO), external oblique(EO) and multifidus(MF) and compare the effects on trunk stability according to the performing abdominal drawing-in maneuver during plank exercises. Thirty healthy male and female adults were recruited. Subjects perform the plank exercises after measuring thickness of TrA, IO, EO and MF in resting position. When performing the General plank(GP), General plank with abdominal drawing-in maneuver(GPA), Unstable surface of plank(USP) and Unstable surface of the plank with abdominal drawing-in maneuver(USPA), we measured three times and used the value of measurements. All measurements were used in One way repeated ANOVA. The results of study, resting time and each plank exercises showed significant differences in TrA, IO, MF muscles. In the comparison between each plank exercises, the TrA, IO, MF activation increased because that muscle were thicker than other plank exercises when performing GPA and USPA. These findings suggest that a plank exercise with abdominal drawing-in maneuver is useful way in trunk stability.

Keywords: *Plank exercise, Core stability, Core muscles, Abdominal drawing-in Maneuver, Ultrasonography, Unstable surface*

Introduction

Core is general term for waist area such as abdominal area, pelvis, and muscles located on this area that is involved with balance and movement of body, and maintaining the position area called core muscles. When core muscles are trained, maintaining the balance of body and muscle strength are improved through force path from center of trunk or waist area to upper and lower body¹. Core stability exercise not only improves the flexibility of spine, but is also effective to strengthening trunk muscle and reducing the angle of spinal curvature². Likewise, there are many researches on core stability exercise regarding postures, tools, and surface³⁻⁸. Core Stability muscle plays role on reinforcing muscle strength, improving endurance, and injury prevention and rehabilitation of sports athletes⁵. There is Plank exercise, which is an exercise to enhance core

stability muscles⁹, and it activates the trunk stability muscles¹⁰. Isometric exercise, the plank exercise trains transverse abdominis¹¹, and internal abdominal oblique, which are core stability muscles¹², and it is used as exercise for patient with back pain due to the reason that stability of back comes from core muscle reinforcement during plank exercise². Patients with back pain lack the repositioning sense due to the decline of proprioception, and core muscles of them are weaker than normal that problem occurs on stability of back and pelvis, which are pointed out to be causes of back pain¹³. Therefore, core stability is essential for proper load balance within pelvis and spine, and exercise chain². Muscles that are involved with trunk stability keep the balance during the movement of body, and stabilize the waist¹⁴⁻¹⁵. There are abdominal core muscles such as transverse abdominis, internal abdominal oblique¹⁴ and activation of multifidus stabilize the waist of patients with back pain¹⁶. Especially, transverse abdominis improves the stabilization of core with diaphragm, internal abdominal oblique, and Pelvic Floor Musculature, it creates and controls the intra-abdominal pressure^{7,14}. Also, transverse abdominis and multifidus contract faster than any other muscles in every movement of body to keep the balance of body¹⁷

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It was shown that plank exercise is more effective on unstable surface or narrow contact surface than on stable surface, which increase the muscle activity of core muscle⁵. When waist stabilization exercise was performed on unstable surfaces, in every exercise other than bridge exercise, activity of trunk muscle were increased¹⁸. Abdominal drawing-in method is used to stabilize waist preventing excessive anterior pelvic tilt and lordosis of waist¹⁹⁻²⁰. It was shown that abdominal drawing-in method minimizes the angle of anterior pelvic tilt during the hip extension exercise^{16,21}. There are many researches about the effect of plank exercise, but number of researches on comparison of plank exercise on unstable surface and plank exercise using abdominal drawing-in method is insufficient. Also, existing researches compare the muscle activation using electromyography, yet researches on measuring the thickness of muscle using ultrasonography devices.

Therefore, this research attempts to suggest the effective way for plank exercise with comparison of thickness of transverse abdominis, external abdominal oblique, internal abdominal oblique, and multifidus in each exercise after performing plank on stable surface with abdominal drawing-in method, plank on unstable surface with balancing pads on each arms, plank on unstable surface with abdominal drawing-in method.

Method

Research Participants: Test subjects to this research are 30 healthy young adults without muscular skeletal diseases such as fracture and damage of ligament and muscle, and neurological diseases. Previous to the research, the content and purpose of the research are well informed to test subjects, and after the agreement of research was signed by each of them, the research was conducted as shown in Table 1. This research was conducted with verification of institution review board of Sunmoon University(SM-201605-010-2).

Table 1: General characteristics (n = 30)

Characteristic		Value
Gender	Male	n = 14
	Female	n = 16
Age (years)		19.67 ± 1.52
Height (cm)		168.53 ± 8.78
Weight (kg)		60.77 ± 11.46



Fig. 1: Ultrasonic device eZono3000, linear probe

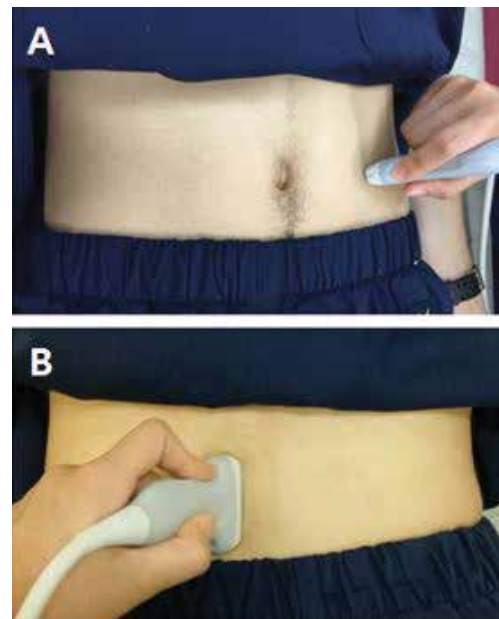


Fig. 2. A: Linear probe measure point of Transverse abdominis, Internal oblique and External oblique B: Linear probe measure point of Multifidus

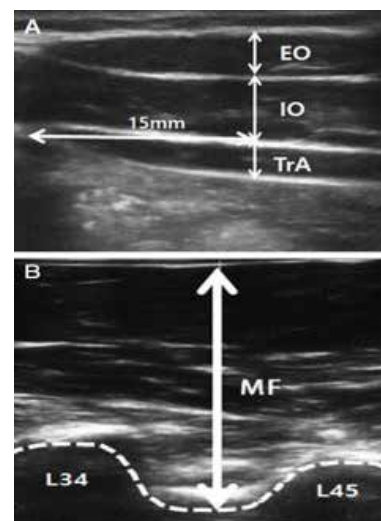


Fig. 3. A : Thickness of Transverse abdominis, Internal oblique and External oblique measure point B : Thickness of Multifidus measure point

Table 2: Methods of Plank exercises

	Exercises
GP	General plank exercise
GPA	General plank exercise with abdominal drawing-in maneuver
USP	Unstable surface of the plank
USPA	Unstable surface of the plank with abdominal drawing-in maneuver



Fig. 4. A: TrA, IO, EO measurement in resting position, B: MF measurement in resting position, C: GP (General plank exercise) D : GPA (General plank exercise with abdominal drawing-in maneuver), E : USP (Unstable surface of the plank) F : USPA (Unstable surface of the plank with abdominal drawing-in maneuver)

Measurement and Procedures: In this research, in order to provide unstable surface, two balance pads (Togu, GTG 400200, Germany, 2010) were used, and eZono 3000(Germany, 2011) ultrasonic device was used to measure the thickness of transverse abdominis, internal abdominal oblique, external abdominal oblique, and multifidus. The frequency was set to 7~10MHz, and linear probe was used in Figure 1. Previous to experiment, during the break before exercise, thickness of transverse abdominis, internal abdominal oblique, and external abdominal oblique were measured from point where it is 15mm apart from aponeurosis vertically²². and thickness of internal abdominal oblique was measured by connecting the transverse abdominis log line. Thickness of multifidus was measured from between L4 and L5²³. From laying down position, during third exhalation, it was measured with ultrasonic wave, and during plank exercise, same procedure was performed 5 as seen in Fig 1, 2, 3. Abdominal drawing-in method training was guided to test subjects that during the exhalation, they pull their bellybuttons upward and lumbar vertebra²⁴(Richardson & Jull, 1995). They maintained it so that they can breathe normally during abdominal drawing-in method²⁵. Test subjects learned through abdominal drawing-in training with real time ultrasonic wave video, which is a visual

Feedback²⁶. Test subjects were guided to bend elbow in 90 degrees and to support surface with lower arm for plank exercise. Scapula was maintained to be stuck out, pelvis and lumbar vertebra were maintained in neutral position, and from ankle to knee, hip, pelvis, spine, and head were maintained position where all of these are in straight line. Arms were spread about the width of shoulders, and feet were spread about the width of pelvis, and ankles were supporting the surface doing dorsiflexion³⁻¹⁸. First measurement was taken during break before exercise(PP)in general plank exercise position(GP). Second measurement was taken in plank position with abdominal drawing-in method added(GPA). Third measurement was taken while two feet were on the center of balance pad to create unstable surface for lower body(USP). Fourth measurements were taken on unstable surface in plank position with abdominal drawing-in method added(USPA) as shown in Table 2 and Fig 4. Experiment was conducted with test subjects having bare feet³ and examiners directed subjects to keep the proper plank position. To maximize the reliability of experiment, for each position, measurements were taken three times and average of them was used as data. To prevent muscle fatigue, two mediations were conducted every other day. In between mediations 10 minute breaks were taken to prevent muscle fatigue. Also, to minimize studying effect of mediation order of experiment, orders were randomized.

Data Analysis

About For data analysis, IBM SPSS/PC ver.22.0 for windows program was used. Shapiro-Wilk was performed for regularity examination, and it satisfied regularity examination. During breaks and each plank exercise, for the comparison regarding thickness change of transverse abdominis, internal abdominal oblique, external abdominal oblique, and multifidus, repeated measure one way repeated ANOVA was used, and for variable difference, Bonferroni method was used as post-hoc analysis. Statistical significance was set to be $p < .05$.

Result

The thickness of TrA, IO, EO and MF was compared before the intervention and after each interventions. As a result of the post hoc test, there were significant difference of Transverse abdominis, Internal oblique, Multifidus on both of PP and each plank exercise, and

between GP and GPA, GP and USPA, GPA and UP, and UP and USPA significant differences were shown.

But, for External oblique, there was not significant difference ($p > .05$) in Fig 5.

Table 3: The comparisons of muscles thickness during Plank exercises (Units : mm) (n = 30)

Exercises Muscles	PP	GP	GPA	USP	USPA	F
TrA	3.43 ± 0.80^a	4.26 ± 1.03	5.66 ± 1.22	4.83 ± 1.17	5.86 ± 1.24	62.37*
IO	6.76 ± 2.03	7.13 ± 2.12	8.01 ± 2.47	7.43 ± 2.49	8.25 ± 2.50	18.05*
EO	4.54 ± 1.23	5.16 ± 1.81	5.27 ± 1.64	4.68 ± 1.57	4.69 ± 1.52	2.107
MF	32.21 ± 4.94	37.65 ± 4.91	39.53 ± 4.88	38.51 ± 4.91	39.81 ± 4.83	13.00*

* $p < .05$, ^amean $\pm$ standard deviation PP: Pre-plank, GP: General plank, GPA: General plank with ADIM, USP: Unstable surface of the plank, USPA: Unstable surface of the plank with ADIM

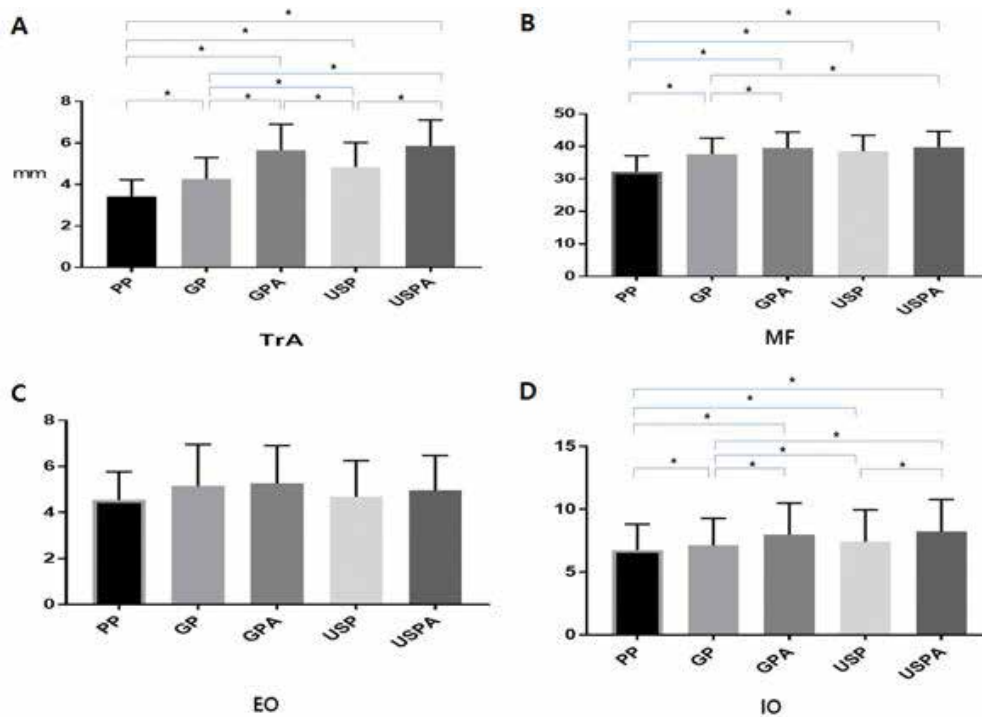


Fig. 5: TrA thickness compared to resting position and each plank exercises B : IO thickness compared to resting position and each plank exercises C: EO TrA thickness compared to resting position and each plank exercises D: MF thickness compared to resting position and each plank exercises

For Transverse abdominis, both on PP and each plank exercise, there was significant difference ($p < .05$), and between GP and GPA, GP and USP, GP and USPA, GPA and USP, and USP and USPA significant differences were shown ($p < .05$) in talbe 3. For Internal abdominal oblique, both on PP and each plank exercise, there was significant difference ($p < .05$), and between GP and GPA, GP and USPA, GPA and USP, and USP and USPA significant differences were shown ($p < .05$) For multifidus, both on PP and each plank exercise, there was significant difference ($p < .05$), and between GP and GPA, GP and USPA significant differences were shown ($p < .05$) in Table 3.

Discussion

This research compared influence on trunk stabilization during plank exercise with abdominal drawing-in added on unstable surface by comparing the thickness of transverse abdominis, external abdominal oblique, internal abdominal oblique, and multifidus. As a result, there was more statistical significant increase with thickness of transverse abdominis, internal abdominal oblique, and multifidus during plank exercise than break. Rather than during GP, during GPA, USP, and USPA, thickness of transverse abdominis, and internal abdominal oblique was significantly increased. During USP, increase of thickness of abdominis, and internal

abdominal oblique is consistent with previous research suggesting that plank exercise on unstable surface had more increase of muscle activity than it on stable surface³⁻⁷. However, only in between GP & GPA, and GP & USPA, multifidus showed significant difference. According to the previous research, it seems to be this result came out due to the fact that plank exercise mainly activates abdominal core muscles, and multifidus is not the main muscle^{9,11,12}. Additionally, the result of this research did not show significant difference of external abdominal oblique during plank exercise, which shows that plank exercise activates core muscle rather than superficial muscles, and external abdominal oblique was not acting as superficial muscle¹³. In the comparison of each plank exercise, during GPA and USPA, thickness of transverse abdominis and internal abdominal oblique were majorly increased. Regarding this, the reason significant difference on thickness of muscle is believed to be that abdominal drawing-in method pulls the abdominal wall inward, which contracts only transverse abdominis and internal abdominal oblique, and increase the abdominal pressure, resulting the waist stabilization training is performed effectively. Kwon referred that abdominal drawing-in method with real time ultrasonic wave feedback increase the activity of transverse abdominis while activity of external abdominal oblique. Also, Hodges reported that during ADIM rather than general waist stabilization exercise was performed, it is more effective to increase the thickness of transverse abdominis and internal abdominal oblique⁹. Therefore, during the plank exercise on stable and unstable exercise, when abdominal drawing-in method is added, thickness of transverse abdominis and internal abdominal oblique, and thickness of external abdominal oblique decreases, which is consistent with the result of the experiment. In other words, it seems to be it leads simultaneous contraction of muscles, core stabilization is relatively more activated, resulting stabilization of trunk rather than during the general plank. Therefore, transverse abdominis and internal abdominal oblique, which are involved with core stabilizing muscle were activated, and it seems to be that plank exercise on stable and unstable surface with abdominal drawing-in method is effective plank exercise in this research. Also, it is suggested that it is effective to stabilize the trunk with simultaneous contraction of abdominal and back muscles due to the fact that during GPA and USPA, Multifidus thickness was increased as well. Next, on the comparison of muscle activity with other mediation added to general plank exercise, there was significant difference on plank exercise with mediation of unstable surface and plank

exercise with ADIM regarding TrA and GP, but between GPA and USP, only TrA had significant difference, and GPA was more effective. This shows that TrA is main expiration muscle on ADIM, when it is compared to IO. There are electromyography and ultrasonography measurement for measuring the activity of core muscles. Another way to measure the core muscle with electromyography may be crossed with other superficial muscles, resulting inaccurate measurement without differentiating activity of each muscle²⁷, ultrasonography with better reliability on thickness evaluation is used for measuring activity of core muscles^{17,28}. Hides(1994) referred that ultrasonic wave was used to evaluate atrophy and hypertrophy directly²⁹, and there are a lot of researches conducted with electromyography during plank, yet not a lot of them with ultrasonography. Therefore, in this research, ultrasonography was used to measure the change of thickness of transverse abdominis, internal abdominal oblique, and multifidus, which are core muscles that play role of stabilization, and it of external abdominal oblique, a superficial muscle. In this research, there are a few limitations. First of all, subjects of this research were healthy male and female who are in 20s to evaluate the muscle activity of core stability muscle of trunk. Therefore, it cannot be generalized to all age group. Also, there were not many test subjects, thus, it will have difficulties to assume that this is the result of this age group. Second, applying balance pad is not the most effective plank exercise on unstable surface. This research suggests additional research on plank exercise with abdominal drawing-in method on unstable surface with various types of balance pad such as suspension and gym balls. Thirdly, in this research thickness of transverse abdominis, internal abdominal oblique, external abdominal oblique, and multifidus were measured on third expiration of each test subject, however, they are not precisely same, resulting another limitation of this research. Lastly, this research was not long-term research, but it is comparison of measurement of muscle thickness with temporary positions, a future research with muscle thickness activity change through long-term core stabilization training.

Conclusion

The results of this study indicate that the thickness and activity of core muscles in GPA and USPA increased more than in other interventions. Therefore, the plank exercise combined ADIM is expected more effective for stabilization of trunk muscles

Ethical Clearance: This research was performed under the approval of Institutional Review Board (IRB) at Sunmoon University (SM-201605-010-2).

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Impact of Transfer Income on Cognitive Impairment in the Elderly

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ABSTRACT

The purpose of this study is to identify and analyze the association of cognitive impairment with the transfer income of the elderly. Cognitive disorder was examined using K-MMSE (Korean mini-mental state examination) in the elderly aged 65 and over who were admitted to the Department of Neurology A and Department of Psychiatry B in Suwon City and Osan City, Gyeonggi-do Province. The transfer income is comprised of private income transfers and public transfer incomes. This survey was conducted from November 2015 to March 2016 and a total of 214 questionnaires were received. Except for 7 unsuitable questionnaires, the rest of the 207 were analyzed with frequency analysis, descriptive statistics, t-test, ANOVA, Pearson correlation analysis and multiple regression analysis using SPSS WIN 20.0. In the correlation analysis of transfer income, there was a statistically significant proportional relation of various allowances, national pension, property income, basic pension, special occupational pension, and personal pension, respectively. Only the basic livelihood security recipients showed an inverse proportional relation. Multiple regression analysis was done to examine the effects of private income transfer on cognitive impairment. The result was that there was a statistically significant proportional relation on various allowance money and property income, respectively. The explanatory power of the model was 31.9%. The public income transfer showed a statistically significant proportional relation in the national pension, special occupation pension, and basic pension, sr. The basic livelihood pension had a statistically significant inverse proportional relation and the explanatory power of the model was 31.1%. The effect of transfer income of the elderly on cognitive impairment was confirmed. The study of public transfer income is necessary to provide alternatives to the existing mental health policy for the elderly. Through more detailed and accurate research using cohort and other types of studies, various approaches to public transfer income of the elderly are suggested.

Keywords: Cognitive impairment, transfer income, elderly, K-MMSE

Introduction

The human life span is continually increasing due to the continuous development of modern medicine and improvements at the socio-economic level. As a result, interest in mental illnesses of the elderly such as dementia, a representative disorder occurring in old age, is increasing. Worldwide, the prevalence of dementia is 5% in elderly people aged 65 and over, and doubles every 5 years thereafter with dementia being prevalent in over half the elderly over 85 years old¹. According to

the documents released by the Ministry of Health and Welfare in 2012, the prevalence of dementia in Korea is also increasing widely, and it is expected to double in number every 20 years from 2030 onward. The Mini-Mental State Examination (MMSE) is widely used in epidemiological studies and clinical studies worldwide as a test tool for assessing cognitive function². In Korea, “Korean Mini-Mental Status Examination” (K-MMSE) and (MMSE-K) “Mini-Mental State Examination for Koreans” are mainly used. Research on identifying and analyzing factors related to cognitive impairment is increasing along with the development of screening tools. It has been reported that demographic characteristics are influential, and depression is reported in other mental disorders³. Studies related to income have not been promoted as much. In Korea, there are no studies on the relationship between income and cognitive impairment of the elderly.

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Inequalities in income and progress have recently led to an increase the polarization in elderly income⁴. The economic situation of the elderly is relatively worsening, and the economic difficulties of the elderly affect their emotions. Studies on the quality of life and income satisfaction of the elderly reveal their satisfaction rate at the highest with a monthly income of over 2 million won⁵. The lower their economic level, the lower the quality of life of the elderly⁶. The more stable economically stable they are, the higher their quality of life and satisfaction⁷. Thus, income is an important factor in the life of the elderly. Studies on the income and cognitive functions of the elderly showed that groups with higher incomes scored higher in cognitive function than those with lower incomes⁸. There's also a study that researched the cognitive function of women over 65 which revealed that income was related to cognitive functions⁹.

The purpose of this study is to provide empirical basic data on the policy measures to improve the quality of life and satisfaction of the elderly by analyzing the effect of transfer income on cognitive impairment among the elderly's income.

Related Research

Cognitive Impairment: Cognitive impairment is a concept which includes high-level processing of all the information received by an organism of human beings. It means the impairment in memories of conscious activities and the impairment in all learning and understanding processes¹⁰. In this study, cognitive impairment was examined using the Korean Mini-Mental State Examination (K-MMSE). The K-MMSE was developed by Folstein et al. in 1975 by amending the items in MMSE. This test has 30 questions with the highest score being 30 points. The questions are about orientation, memory registration, memory recall, attention and calculation, language function, and understanding and area of judgment. 5 points for orientation (time), 5 points for orientation (location), 3 points for memory registration, 3 points for memory recall, 5 points for attention and calculation, and 9 points for language, time and space composition. In this study, the K-MMSE score was considered to be normal for 24 points and above on a scale of 30, slight weak cognitive impairment is for a score of 18 to 23 points, and severe cognitive impairment for scoring below 17 points¹¹. Cronbach's α coefficient was 0.697 in the reliability test measurement tool.

Transfer Income: The transfer income is composed of the subdivision of aggregate factors of the income of the elderly surveyed by Statistics Korea. The amount of allowance for various kinds of allowance surveyed by Statistics Korea in 2011 regarding private income transfer was based on 200,000 won per month and categorized into less than 100,000 won per month; 110,000 won to 200,000 won; 210,000 to 300,000 won; 310,000 to 400,000 won; 410,000 to 500,000 won; and above 510,000 won. This was an average monthly allowance received from all acquaintances, including children, relatives, etc. Property income is based on income generated by the activities of all assets, including movable and real estate. Accordingly, it was classified as below 500,000 won; 510,000 to 1 million won; 1.01 to 1.50 million won; 1.51 to 2 million won; and 2 million won or more. Personal pensions include both pension savings and pension insurance depending on whether there were income deductions or not. 20 years of insurance payment and 20 years of receiving pension were used and categorized into less than 500,000 won; 510,000 won to 1 million won; 1.01 to 1.50 million won; 1.51 to 2 million won; and 2.01 million won or more. The national pension is calculated based on the total amount of payments by the National Pension Service (based on the payers of wages at the end of December 2015) based on the monthly average of 380,000 won and is in units of 200,000 won, categorized into 200,000 won or less; 210,000 to 400,000 won; 410,000 to 600,000 won; 610,000 to 800,000 won; 810,000 to 1 million won; and 1 million won or more. The special occupational pension is given the most by the Government Employees Pension Service, and is divided into units of 500,000 won based on 2 million won. The basic pension recipients were classified as below 200,000 won or less, and none and basic livelihood security recipients as applicable or not applicable.

Method

Research Subjects: The subjects of this study were the elderly people aged 65 years or older who were admitted to the psychiatric department of neurology in Gyeonggi-do. Specialists conducted surveys on the elderly who were examined by K-MMSE. They explained the purpose of the study and conducted surveys regarding transfer income. Surveys and screenings started in November 2015 and lasted for about six months until March 2016. There wasn't a large number of elderly people examined

by the new K-MMSE at each hospital, so it was difficult to collect subjects. 214 questionnaires were collected. Of these, 207 were used for the final analysis as 7 were not suitable for data processing.

Method of Analysis: The collected data were analyzed using SPSS/PC WIN 20.0 statistical program as follows. Frequency analysis was performed to understand the general characteristics of the subjects. A descriptive statistical analysis was conducted to examine the mean and standard deviation of cognitive impairment scores. In order to verify whether there is a difference in cognitive impairment according to the general characteristics and cognitive impairment of the subjects, and transfer income, various methods of comparisons and analyses were conducted. As the method of comparison and analysis, the t-test was used when there were two categories, and one-way ANOVA was used for the three categories. Fourth, correlation analysis was performed through Pearson correlation coefficient to investigate the correlation between cognitive impairments by subject's transfer income. Fifth, multiple regression analysis was conducted to investigate the effect of transfer income on cognitive impairment.

Result and Discussion

General Characteristics of Survey Subjects: Table 1 shows the general characteristics of the survey subjects such as age, sex, household size, residence, education, and religion. The most common age was 75 to 79 years old with 63 participants. The household size for 152 was living together with others, which was three times higher than that of 55 living alone. The highest number of participants had a middle school education at 65 people, and 62 people had no religion. 129 people (62.3%) were normal, 61 people (29.5%) had cognitive impairment, and 17 people (8.2%) had severe cognitive impairment. The overall average of the K-MMSE scores was 23.27 points lower than the previous study

Table 1: General Characteristics of Surveyed Subjects

Category	Value	Frequency	Percentage (%)
Age	65~69	36	17.4
	70~74	58	28.0
	75~79	63	30.4
	80~84	25	12.1
	85~89	19	9.2
	Over 90	6	2.9
Sex	Male	62	30.0
	Female	145	70.0
Living together	Alone	55	26.6
	Together	152	73.4
Residence	Rural	44	21.2
	Small city	66	31.9
	Big city	97	46.9
Education	None	36	17.4
	Elementary School Graduate	61	29.5
	Middle School Graduate	65	31.4
	High School Graduate	28	13.5
	University graduates and above	17	8.2
Religion	No religion	62	30.0
	Christian	61	29.5
	Catholic	30	14.5
	Buddhist	54	26.0
Total		207	100.0

Correlation between General Characteristics and Cognitive Impairment: The results of the analysis of the correlation between general characteristics and cognitive impairment were as shown in Table 2. Cognitive impairment showed a statistically significant proportional relation correlation with educational attainment ($r = 0.573$, $p < 0.01$). There was a statistically significant inverse proportion correlation between age ($r = -0.552$, $p < 0.01$) and residence ($r = -0.157$, $p < 0.05$).

Table 2: Correlation between General Characteristics and Cognitive Impairment

	K-MMSE	Age	Sex	Living together or not	Education	Residence
K-MMSE	1	-.552**	.104	-.121	.573**	-.157*
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$						

Transfer income of Surveyed Individuals: The results of the Transfer income survey are shown in Table 3. Among the factors, various allowance was the highest at

59.9% and there were the most, 39 people, with 201 to 300 thousand won. Property income had 23 people in the range from 501 won to 1,000 thousand won, there were

the most with less than 500 thousand won for personal pension. The national pension was the largest at 410 to 600 thousand won, and the special occupational pension was the highest at 1,501 to 2,000 thousand won. The basic pension was 100 persons under 200 thousand won, and 188 persons and 19 persons were not eligible for basic livelihood security.

Table 3: Characteristics of Income of Surveyed Individuals

Category	Value (thousand ₩)	Frequency	Percentage (%)
Various allowance	None	83	40.1
	≤ 100	13	6.3
	100-200	27	13.0
	201-300	39	18.8
	301-400	23	11.2
	401-500	13	6.3
	Over 500	9	4.3
Property Income	None	152	73.4
	≤ 500	22	10.6
	501-1,000	23	11.1
	1,001-1,500	6	2.9
	1,501-2,000	3	1.4
	Over 2,000	1	0.5
Personal Pension	None	191	92.3
	≤ 500	13	6.3
	Over 501	3	1.4

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National pension	None	151	72.9
	200	10	4.8
	201-400	11	5.3
	401-600	24	11.6
	601-800	8	3.9
	801-1,000	2	1.0
	Over 1,000	1	0.5
Special Occupation Pension	None	195	94.2
	1,000-1,500	3	1.4
	1,501-2,000	8	3.9
	Over 2,000	1	0.5
Basic Pension	None	107	51.7
	≤ 200	100	47.3
Basic livelihood security recipient	Not applicable	188	90.8
	Applicable	19	9.2

Correlation between Transfer Income and Cognitive Impairment: The results of analysis of correlation between cognitive impairment and transfer income are shown in Table 4. Cognitive impairment was significantly associated with age at the time of enrollment ($r = 0.427$, $p < 0.01$), national pension ($r = 0.409$, $p < 0.01$), property income ($r = 0.404$, $R = 0.201$, $p < 0.01$) and personal pension ($r = 0.155$, $p < 0.05$) were statistically significant proportional relation correlations. There was a statistically significant inverse proportion correlation between basic livelihood security recipients ($r = -0.370$, $p < 0.01$).

Table 4: Correlation with Cognitive Impairment by Income

	Tit ¹	Tit ²	Tit ³	Tit ⁴	Tit ⁵	Tit ⁶	Tit ⁷
K-MMSE	0.409**	0.201**	0.319**	-0.370**	0.427**	0.155*	0.404**

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

* Tit¹: National Pension, Tit²: Special Occupation Pension, Tit³: Pension Basic Pension, Tit⁴: Basic Livelihood Security Pension, Tit⁵: Various Allowance, Tit⁶: Personal Pension, Tit⁷: Property Income

The Effects of Private Transfer Income on Cognitive Impairment: The results of multiple regression analysis are shown in Table 5 to examine the effect of private transfer income on cognitive impairment. The various allowance ($\beta = 0.385$, $p = 0.000$), property income ($\beta = 0.361$, $p = 0.000$), respectively, had a statistically significant proportional relation and the explanatory power of the model was 31.9%.

Table 5: The Effects of Private Income on Cognitive Impairment

	Standardization factor	t
(constant)		62.908
Various Allowance	0.385	6.559***
Property Income	0.361	6.182***
Personal Pension	0.059	1.007
R=0.565 R ² =0.319 F=31.744***, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$		

The Effects of Public Income Transfer on Cognitive Impairment: The results of multiple regression analysis are shown in Table 6 to examine the effect of public income transfer on cognitive impairment. National pension ($\beta=0.334$, $p=0.000$), special occupation pension ($\beta=0.136$, $p=0.025$), basic pension ($\beta=0.133$, $p=0.038$), respectively, showed a statistically significant proportional relation effect, and basic livelihood pension ($\beta=-0.282$, $p=0.000$) showed an inverse proportional relation effect, with the explanatory power of the model being 31.1%.

Table 6: Impact of Transfer Income on Cognitive Impairment

	Standardization factor	t
(Constant)		19.758
National Pension	0.334	5.510***
Special occupation pension	0.136	2.251*
Basic Pension	0.133	2.090*
Basic Livelihood Pension	-0.282	-4.673***
R=0.558 R ² =0.311 F=22.782***, *p<0.05, **p<0.01, ***p<0.001		

Conclusion

The transfer income was investigated and analyzed by being subdivided to analyze and understand the effect of the transfer income of the elderly on cognitive impairment. The mean score was 22.87 points for 75 to 79-year olds, which was a sharp drop from the 25.70 points in 70 to 74-year olds. 80 to 84-year olds had a mean score of 22.28, 85 to 89-year olds had a score of 20.52, and those over 90 years old had a score of 16.16. The statistically significant difference decreased as age increased. The average score was the highest for college graduates or higher, followed by high school graduates, middle school graduates, elementary school graduates, and those with no schooling. There was no statistically significant difference in gender, household size, and religion. Gender differences are difficult to interpret since it is not easy to judge whether these dissimilarities are due to biological differences between men and women or whether they come from interaction with social factors such as education and culture. 129 (62.3%) were normal, 61 (29.5%) were cognitively impaired, and 17 (8.2%)

were severely cognitively impaired. This seems to be the result of surveying elderly people who were admitted to neurology and psychiatry departments which specialized in cognitive disorders, rather than general elderly people in urban or rural areas. The prevalence of dementia in Korea in 2012 has been reported by Statistics Korea as 9.18% in the elderly over 65 years of age. This reveals that although MMSE is very useful as a screening test, its use as a diagnostic tool is not appropriate. The total average of K-MMSE of the subjects was 23.27 points.

The average comparison of transfer income showed statistically significant differences in various allowance money, property income, national pension, special occupational pension, basic pension, and basic livelihood security recipients. The amount of allowance was 410,000 to 500,000 won, which was the highest at 26.84 points. Property income was the highest among the total amount of income from all of the income factors, from 1.51 to 2 million won at 29.66 points., and the number of special occupational pensions was high at 27.75 points with 1.51 to 2 million won. The national pension was the highest at 810,000 to 1 million won (29.50 points). The basic pension was less than 200,000 won, at 25.06 points, higher than those without basic pension at 22.54 points. In the correlation analysis by transfer income, there was a statistically significant positive correlation in the order of various allowances, national pension, property income, basic pension, special occupational pension, and personal pension. Only statistically significant (-). This is the current cross-sectional survey that can be viewed as the cognitive functioning status of recipients of basic life security. The average score also varied by about five points. The average score of recipients of basic livelihood security is 19.15 points, which is included in the cognitive impairment group. However, it is necessary to consider the limitation that the frequency is 19 people (9.2%).

In order to examine the effect of private income transfer on cognitive impairment, multiple regression analysis showed that there was a positive statistically significant effect of various pocket money and property income in order. The explanatory power of the model was 31.9%. In order to examine the effect of public transfer income on cognitive impairment, multiple regression analysis showed that there was a statistically significant proportional relation effect in the order of national pension, special occupation pension, and an inverse proportional relation effect for basic livelihood pension,

with the explanatory power of the model being 31.1%. The results of this study show that the effect of the cognitive impairment of elderly people's transfer income is sufficiently confirmed, and sufficient data is meaningful in that it provides basic data on the relationship between the transfer income and the cognitive impairment. However, it is regrettable that the frequency of personal pension is small and that detailed investigation of those with basic livelihood pension is difficult.

Based on the results of the study, the following suggestions are made for the elderly mental health policy. There is a continuing need for research on the relationship between the income of the elderly and cognitive impairment. As can be seen from the results of the study, the transfer income portion of the elderly is proved to be a factor that requires more detailed investigation affecting cognitive impairment rather than merely being a demographic and sociological factor. In order to promote the mental health of the elderly, there is a need to elaborate more precisely and accurately by using a strategic cohort study.

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Perceptions of Child Abuse among the Undergraduate Students in Korea

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ABSTRACT

This study was conducted to analyze the level of perceptions of child by college students. The data was collected from 200 undergraduate students in B universities located in Chungnam by structural questionnaire from May to June, 2017. Parent-Child Conflictive Tactics Scales (CTSPC) developed by Straus was used to understand the perception of child abuse by college students. Data were analyzed using SPSS 18.0. The results show that the average score for child abuse among undergraduate students were 0.81 of 1, respectively. Among the sub-domains of child abuse, physical abuse was 0.89, violent discipline was 0.78, neglect was 0.63, and emotional abuse was 0.44 of 1. And there was significant differences in the perceptions of child abuse among the department ($F=7.009$, $p<.001$) and the grade ($F=5.676$, $p=.001$). There was significant differences in the perceptions of child abuse among the willingness to report child abuse ($t=2.102$, $p=.037$). Therefore, It is necessary to develop education programs to prevent of child abuse and respect for human beings.

Keywords: *Perception, Child abuse, Violent discipline, Emotional abuse, Physical abuse, Neglect*

Introduction

An international study conducted by the World Health Organization in September 2016 revealed that a quarter of adults around the world (one in five women and one in thirteen men) reported having experienced physical abuse during childhood. In addition, approximately 41,000 abused children under 15 years old die every year. Furthermore, a countless number of children experience emotional abuse and neglect ¹.

Statistical data on child abuse in Korea shows that the incidence of child abuse continues to increase every year in accordance with the type of abuse. In particular, reported cases of emotional abuse have soared from fewer than 4,000 in 2013 to 7,197 in 2015, while physical abuse cases have more than doubled, from fewer than 3,000 in 2013 to 6,661 in 2015. Among these,

the abuser has been found to be the father in 5,368 cases, and the mother in 3,456 cases. Thus, there is a much higher number of incidents in which the abusers are the parents than other people, such as institution staff (427 cases). The ages of the victims are distributed as follows: 14.4% 4-6 year-olds, 18.1% 7-9 year-olds, 19.5% 10-12 year-olds, and 22.2% 13-15 year-olds. Thus, the risk of child abuse is relatively higher among 13- to 15-year-olds than in other age groups ².

Child abuse poses behavioral, physical, and emotional hazards as children enter adulthood. Victims may subsequently become assault perpetrators or victims, and they may struggle with depression, smoking, obesity, high-risk sexual behavior, unintended pregnancy, drug abuse, suicide, and even various physical illnesses ³.

Therefore, child abuse is a serious social problem, and the definition and scope of the phenomenon must be precisely grasped to prevent it. It is necessary to examine how child abuse is socially perceived and publicized ⁴. From this perspective, it must be analyzed on socio-cultural, family, and personal levels.

As child abuse has been surfacing as a social issue, national accountability has also come to be emphasized⁵.

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Various media outlets have increasingly been covering child abuse, as these problems have become more than simple domestic affairs. In child abuse cases, the identity of the victim as a child causes many complications. Considering the rising number of child abuse cases, there is a serious lack of awareness of this type of abuse.

While the debate on whether an action qualifies as discipline or abuse goes on, many child victims continue to suffer. The lack of awareness does not only surround child abuse, but also reporting procedures. To prevent cases of child abuse and to help foster a healthier society, national and local governments should make the prevention, discovery, and treatment of child abuse a priority task ⁶.

Various previous studies on child abuse awareness have covered research on mandated reporters^{7,8}. However, there has been insufficient research on university students' perceptions of the phenomenon. To better prevent child abuse, it is necessary to educate and publicize not only mandated reporters, but also university students, who are receiving education on human life ⁵.

The main factor that affects child abuse awareness and reporting is the experience of child abuse prevention education. Child abuse prevention education involves the provision of information on ways to prevent child abuse and to minimize or end the problems caused by child abuse⁹. In a previous study, child abuse prevention education was found to have significant effects on the reporting intentions¹⁰. Furthermore, the child abuse awareness and reporting knowledge levels were higher in those who had received child abuse prevention education than in those who had not¹¹. Moreover, while it is suggested that child abuse prevention education must be provided to university students as well as to mandated reporters¹², statistical research on the status quo of preventive education for university students has been lacking.

It can be inferred that child abuse prevention education not only affects the child abuse reporting intent, but also the recognition of child abuse and the knowledge of reporting procedures, which ultimately contribute to the prevention of child abuse. The present study therefore attempted to collect the data needed to develop a child abuse prevention educational program to improve child abuse awareness and reporting knowledge by understanding college students' degree of awareness of child abuse.

Method

Sample and Data Collection: The data was collected from 200 students in B universities located in Chungnam by structural questionnaire from May to June, 2017.

Instruments: Parent-Child Conflictive Tactics Scales (CTSPC) developed by Straus¹³ was used to understand the perception of child abuse by college students. The scale consists of 27 items. Each sub-domain is violent discipline, emotional abuse, physical abuse, neglect. The Cronbach's α was 0.826.

Data Analysis: The collected data were analyzed with the SPSS 18.0 software program. The general characteristics of the subjects were analyzed by frequency and percentage, and the degree of child abuse was analyzed by mean and standard deviation. T-test and ANOVA were conducted to analyze the differences in child abuse according to the general characteristics of the subjects and the characteristics of child abuse. A scheffe test was done as a post hoc test.

Results

General Characteristics: Table 1 presents the subjects' general characteristics. The percentage of male college students was 32.5%, and that of female college students was 67.5%. Nursing, social welfare, music, and law were 25.0%, respectively 47.0 in the third grade, and 51.0% in the Christian religion.

Table 1: General characteristics

n = 200

Characteristics	Categories	n	%
Gender	Male	65	32.5
	Female	135	67.5
Major	Nursing	50	25.0
	Social welfare	50	25.0
	Music	50	25.0
	Law	50	25.0
Grade	Freshman	38	19.0
	Sophomore	49	24.5
	Junior	94	47.0
	Senior	19	9.5
Religion	Protestant Christians	102	51.0
	Catholics	12	6.0
	Buddhists	1	0.5
	No religion	85	42.5

Characteristic of Child Abuse: Table 2 shows the results of analyzing the characteristics related to child abuse. The severity of child abuse was found to be severe 91.5%, and 81.5% said they did not know the phone number. 48.0% of them knew that child abuse was a crime, 52% did not know it, and 44.5% of them had experience in child abuse education. When they found child abuse, 98.5% of the respondents were willing to report it.

Table 2: Characteristic of child abuse

n = 200

Characteristic of child abuse		n	%
Severity of child abuse	Severe	183	91.5
	usually	14	7.0
	Not bad	3	1.5
Know the child abuse report phone number	Yes	37	18.5
	No	163	81.5
Perceived criminal behavior for child abuse	Yes	96	48.0
	No	104	52.0
Educational experience in child abuse	Yes	89	44.5
	No	111	55.5
Willingness to report child abuse	Yes	197	98.5
	No	3	1.5

The Level of the perceptions of child abuse: The level of perceptions of child abuse among undergraduate students was analyzed in Table 3. The results show that the average score for child abuse among undergraduate students were 0.81 of 1, respectively. Among the sub-domains of child abuse, physical abuse was 0.89, violent discipline was 0.78, neglect was 0.63, and emotional abuse was 0.44 of 1.

Table 3: Level of the perceptions of child abuse

Variable	Min	Max	M.	SD
Child abuse	.04	1.00	.81	.16
violent discipline	.00	1.00	.78	.31
emotional abuse	.00	.56	.44	.15
physical abuse	.00	1.00	.89	.18
neglect	.00	1.00	.63	.32

Differences in the perceptions of child abuse according to the general characteristics: Table 4 shows the analyzed difference in the perceptions of child abuse according to the general characteristics of the subjects.

There was significant differences in the perceptions of child abuse among the department ($F=7.009$, $p<.001$) and the grade ($F=5.676$, $p=.001$). With regard to the department, nursing showed a higher the perceptions of child abuse than music and law, and social welfare than law. In relation to grade, junior and senior showed a higher the perceptions of child abuse than sophomore.

Table 4: Differences in the perceptions of child abuse according to the general characteristics

Categories		Perceptions of child abuse	
		M ± SD	t or F(p)
Gender	Male	.78 ± .18	-1.850 (.066)
	Female	.82 ± .14	
Major	Nursing(a)	.86 ± .11	7.009 (.000)*** a, b > c, d
	Social welfare(b)	.85 ± .11	
	Music(c)	.77 ± .17	
	Law(d)	.75 ± .20	
Grade	Freshman(a)	.81 ± .11	5.676 (.001) B < c, d
	Sophomore(b)	.74 ± .23	
	Junior(c)	.82 ± .13	
	Senior(d)	.89 ± .07	
Religion	Christians	.83 ± .16	1.209 (.308)
	Catholics	.77 ± .24	
	Buddhists	.89 ± .00	
	No religion	.78 ± .14	

*** $p<0.01$

Differences in the perceptions of child abuse according to the characteristic of child abuse: Table 5 shows the analyzed difference in the perceptions of child abuse according to the characteristic of child abuse.

There was significant differences in the perceptions of child abuse among the willingness to report child abuse ($t=2.102$, $p=.037$). When they found child abuse, they reported it higher than not reporting it.

Table 5: Differences in the perceptions of child abuse according to the characteristic of child abuse

Characteristic of child abuse		Perceptions of child abuse	
		M ± SD	t or F(p)
Serious perception of child abuse	Severe	.15 ± .01	1.804 (.167)
	usually	.22 ± .06	
	Not bad	.17 ± .10	

Conted...

Know the child abuse report phone number	Yes	.84 ± .15	1.259 (.209)
	No	.80 ± .16	
Perceived criminal behavior for child abuse	Yes	.82 ± .16	.830 (.408)
	No	.80 ± .16	
Educational experience in child abuse	Yes	.82 ± .14	1.148 (.252)
	No	.79 ± .17	
Willingness to report child abuse	Yes	.81 ± .17	2.102 (.037)*
	No	.62 ± .27	

* p<0.5

Discussion

This study set out to provide the data needed to develop a child abuse prevention educational program to improve child abuse awareness and reporting knowledge by understanding college students' child abuse awareness levels.

The perception of child abuse was high, at 0.81; among the different types, the awareness of physical abuse was the highest (0.89), followed by the awareness of violent discipline (0.88). These results were consistent with those Park's study⁵ on college students' perceptions of child abuse, suggesting that there had been no significant change in the perception of child abuse in 14 years.

When analyzing the difference in child abuse awareness by general characteristics, statistically significant differences were found according to the students' department and grade. Nursing and social welfare students were more aware of child abuse than music and law students. Moreover, junior and senior students showed higher perceptions of child abuse than sophomore students. These results were consistent with the findings of Park⁵, but differed from those of Cho and Chung¹⁴, who had found no differences in the perceptions of child abuse according to the grade or gender. The results of the present study were as follows. It can be inferred that the use of different subjects was accountable for the different results.

When analyzing the perception levels of child abuse according to the characteristics of child abuse, there was a statistically significant difference according to the presence of a reporting intent ($t=2.102$, $p=.037$). These results were

similar to those of a study by Cho and Chung¹⁴, which had shown no statistically significant difference from factors such as prior study or reporting experience.

A study by Kim¹⁵ showed that the amount of child abuse preventive education had a statistically significant effect on the child abuse awareness and reporting intention. In other words, college students' attendance of more child abuse prevention educational programs suggested a stronger reporting intent. These results reflected a study by Kim¹⁰ that had reported that child abuse prevention education affected the child abuse reporting intention, as well as a study by Eichelberger¹⁶ that had shown that child abuse education positively influenced the confidence and reporting intention. Based on the significant differences in intention to report, the results of this study showed that it is necessary to strengthen child abuse prevention education.

Conclusion

The more frequently a subject receives child abuse preventive education, the more sensitive they are to the recognition of child abuse, and this in turn affects their formation of a reporting intent. To promote the active reporting of suspected cases of child abuse, it is therefore necessary to offer continuous child abuse prevention education to university students, and to seek practical measures and policies to improve the awareness of child abuse.

Ethical Clearance: Not required

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Conflict of Interest: The authors declare no conflict of interest.

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Changes of Periodontopathic Bacteria According to Gingival Health, Dental Plaque Control and Toothbrushing Behavior in Adults

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ABSTRACT

Background/Objectives: This study targeted 30 subjects who visited D university from March 15th to June 30th of 2018 for oral care management program, and agreed to participate in study.

Method/Statistical Analysis: The collected data were analyzed using SPSS statistics v.23. One sample t-test was conducted for the oral health environment condition, toothbrushing habits and oral hygiene management. Then, paired t-test was conducted for the changes in the distribution of periodontopathic bacteria depending on toothbrushing habits and oral care behaviors. As for all the statistics, the level of significance was set as $p < 0.05$.

Findings: In regard to the changes in periodontopathic bacteria depending on toothbrushing habits, Aa & Red complex of a group that brushes twice or more in a day was 39.12 pre-education and 24.78 post-education compared to the group that brushes once a day or does not brush. In regard to brushing timing, the group that brushes more than three times daily showed Aa & Red complex of 54.85 pre-education and 29.31 post-education, which showed significant reduction. In regard to the duration of toothbrushing, the group that brushes for more than 3 minutes showed Aa & Red complex of 51.46 pre-education, and 27.61 post-education which showed significant reduction. As for the change of periodontopathic bacteria according to the subjects' oral care behavior, for interdental cleaning, Orange Complex significantly decreased in the group of persons who were using dental floss or interdental brush post-education (89.87) than pre-education (97.94). For tongue cleaning, Aa & Red Complex significantly decreased in the group of persons who cleaned the tongue every day post-education (26.06) than pre-education (47.18).

Improvements/Applications: The overall analysis of research findings showed differences in BOP, CAL and O'Leary Index depending on the gender and marital status. Also, it was shown that periodontopathic bacteria depending on toothbrushing habits and oral care behaviors gets reduced after education, compared to before education. It is considered that toothbrushing education using disclosing agents can motivate the experimenters, since they can directly observe the changes in dental plaque and O'Leary Index.

Keywords: Dental hygiene care, Oral hygiene state, Oral health behavior, Oral microorganisms,

Introduction

Today, as an interest in the quality of life appears as a social issue with the society's acceleration to become an aging society, people's interest in health continues to grow. The weight of oral health in the domain of whole-body health gradually increases¹, and as a factor of oral health affecting whole-body health, as they get older, tooth loss^{2,3,4,5}, due to various different internal and external causes, brings about digestive dysfunction,

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inaccurate pronunciation and deformation of the face because of masticatory function inconvenience, which also causes inconvenience in interpersonal relations.

The concept of oral health is experienced from preschool children to adults through various educational experiences and promotions, and dental medical institutions are assisting the oral care with the latest medical techniques and treatment methods⁶. Toothbrushing, which is the base of oral care, is not an exception, and proper care starting from childhood can promote oral health in adulthood. Toothbrushing behavior is mostly conducted from dental health education program experiences. In order to maintain clean oral environments, proper toothbrushing is the most effective. In addition, reducing dental plaque and tongue fur with appropriate oral hygiene supplementary goods^{7,8}, is also effective. Various oral microbes exist in dental plaques and saliva, including '*Aggregatibacter actinomycetemcomitans*', '*Porphyromonas gingivalis*', '*Prevotella intermedia*', '*Tannerella forsythia*', '*Fusobacterium nucleatum*', '*Capnocytophaga species*', '*Campylobacter rectus*' and etc^{9,10}, which are closely related to gingivitis and periodontal diseases in adults^{11,12}. Toothbrushing method, interdental brushing, dental flossing, mouth rinsing and other methods that have been introduced to the South Korean public for promoting oral health are really helpful when it comes good oral hygiene. Various individual factors such as eating habits, living habits, oral care habits, social factors and systemic factors affect the oral environment conditions, but fundamentally increasing the rate of oral care practice will be effective. Therefore, this study aimed to verify the effect of adults' oral care behaviors and toothbrushing habits on the changes in oral microbes that are related to oral gingivitis and periodontal disease. Individually, in dental plaque control, the toothbrushing method is the most fundamental, which may help prevent oral diseases. In the oral environmental conditions, various oral and external factors act, such as individual eating habits, lifestyle habits, oral care habits, social factors, and universal factors, and basically, as local factors, intraoral factors affect the occurrence of oral diseases. Thus, this study would check oral microbial changes after the education according to gum health status or toothbrushing behavior in the process of the oral care program with adults and utilize them as the basic data for the importance of dental health education and self-care (toothbrushing).

Materials and Method

Study Subjects: This study originally targeted research subjects who visited D university in B city from March 15th to October 30th of 2018 to benefit from the oral health care program. After considering ethical aspects, the purpose and method of the research were explained and the consent for participating in the research was obtained, and a total of 30 research subject who finally completed the program were selected as the research subjects.

The program for dental health care consisted of assessment, judgment, planning, performance, and evaluation. General characteristics included sex, age, and marital status. For gingival health conditions, bleeding on probing (BOP) and clinical attachment level (CAL), and dental plaque index (O'Leary Index) were inspected. For toothbrushing behaviors, the number of times, frequency, intensity, time, and method of toothbrushing were investigated. Concerning oral hygiene care, interdental cleaning and tongue cleaning were investigated.

As an analysis of periodontopathic bacteria, a quantitative analysis was conducted by real-time PCR. Using NEXprep™Cell/TissueGenomic DNA Kit, genomic DNA was extracted according to the manufacturer's instructions. For a quantitative analysis of oral bacteria, PerioGen™PerioReal-TimePCRKit (Microis, Korea) was employed. For the detection of the whole microorganisms existing in the oral cavity, 16s rDNA fragments were amplified, and for the detection of each microorganism, each of about 200 bp DNA fragments were amplified by producing specific primer from functional genes (rgp, waa, and gtf). As the probes used in multiplex real-time PCR, three species (FAM, Cy5, HEX) were selected, of which the wavelength is not overlapped, considering the interference of each other. Four kinds of the panel were constructed by binding three species together respectively from the target bacterial species for the analysis in each reaction, which was shown in Table 1. For real-time PCR reaction solution, the extracted total DNA 2 µL was mixed with each of primer set 10 pmol, probe and buffer solution, and 1 unit Hot-start Taq DNA polymerase (GeneAll, Korea) to produce 20 µL in total. It was seeded in 96-well plates, and then, a quantitative analysis was conducted, using ABI 7500 Fast Real-Time PCR System (Applied Biosystems, Life Technologies, Carlsbad, CA, USA). Based on the characteristics, correlation, dyeing

reaction, formation of colonies, generation of pigment and clinical indicator of causative bacteria that cause periodontal diseases, they are classified into five by color, including Red Complex, Orange Complex, Green Complex, Yellow Complex, and Purple Complex⁹, while this study classified them into two groups, including Red Complex and Orange Complex. Of the subgingival bacteria with a correlation with periodontal diseases, *P. gingivalis*, *T. forsythia*, and *T. denticola* were classified as Red Complex, and it was reported that this complex has strong correlations with the indices of periodontal diseases, like periodontal pocket depth and bleeding while probing⁹. *P. intermedia*, *F. nucleatum*, *P. micra*, and *C. rectum* are Orange Complex, deeply associated with periodontal diseases.

Table 1: The bacteria strains used in this study

Division	Target strain
A Panel	<i>Aggregatibacter actinomycetemcomitans</i> KCTC3698
	<i>Porphyromonas gingivalis</i> KCTC 5352
	<i>Tannerella forsythia</i> KCTC 5666
B Panel	<i>Treponema denticola</i> KCTC 15104
	<i>Prevotella intermedia</i> KCTC 5692
	<i>Fusobacterium nucleatum</i> KCTC 2640
C Panel	<i>Parvimonas micra</i> ATCC 33270
	<i>Campylobacter rectus</i> KCTC 5636
	<i>Eikenella corrodens</i> KCTC 15198
D Panel	<i>Eubacterium codatum</i> KCTC 15015
	<i>Prevotella nigrescens</i> KCTC 5690

Study Methods: The collected data were analyzed using SPSS statistics v.23. One sample t-test was conducted for the oral health environment condition(BOP, CAL,

O'Leary Index), toothbrushing habits(toothbrushing timing, frequency, intensity, duration and method) and oral hygiene management(interdental and tongue cleaning). Then, paired t-test was conducted for the changes in the distribution of periodontopathic bacteria depending on toothbrushing habits and oral care behaviors. As for all the statistics, the level of significance was set as $p < 0.05$.

Result and Discussion

BOP, CAL, O'Leary Index, and the number of periodontopathic bacteria (Aa & Red Complex and Orange Complex) according to the subjects' general characteristics: As a result of an analysis of the average of BOP, CAL, O'Leary Index, and the number of periodontopathic bacteria (Aa & Red Complex, Orange Complex) according to the general characteristics, BOP was higher in men (24.02%) than in women, and by age, it was higher in those over 30 (23.33%) than in those under 29. CAL was more in men (34.28%) than in women, and it was a little more in those over 30 (68.77%) than in those under 29. O'Leary Index was a little higher in women (51.31 points) than in men, and it was higher in those over 30 (54.46 points) than in those under 29. Aa & Red Complex was more in men (36.69) than in women, and Orange Complex, too, was more in men (94.29) than in women. By age, Aa & Red Complex was a little more in those under 29 (36.80) than in those over 30, and Orange Complex was a little more in those over 30 (100.87) than in those under 29. It was interpreted that BOP, CAL, O'Leary Index, and the number of periodontopathic bacteria (Aa & Red Complex, Orange Complex) according to the general characteristics were homogeneous since there were no differences in them in Table 2.

Table 2: General characteristics BOP, CAL, O'Leary Index, and the number of periodontopathic bacteria (Aa & Red Complex and Orange Complex) according to the subjects' general characteristics¹⁾

Division		N	BOP	CAL	O'Leary Index	Aa & Red complex	Orange complex
			Mean	Mean	Mean	Mean	Mean
Sex	Male	19	24.02	34.28	48.69	36.69	94.29
	Female	11	16.71	26.71	51.31	28.47	80.23
Age	<29	21	20.94	63.17	39.15	36.80	87.74
	30≤	9	23.33	68.77	56.46	24.71	100.87
Married	Married	18	23.41	65.39	37.52	26.95	116.48
	Single	12	20.80	71.73	42.03	37.25	80.87

¹⁾: BOP, CAL, O'Leary Index, the number of periodontopathic bacteria (Aa & Red Complex and Orange Complex) are Base values and indicated as the mean (t-test)

Distribution of periodontopathic bacteria according to the subjects' oral hygiene care after the education:

Changes in the periodontopathic bacteria depending on the subject's toothbrushing habits are shown in Table 3. For the group that brushes teeth twice a day or more than twice a day (2pt), Aa & Red complex was 39.12 before education and 24.78 after education, and orange complex was 99.82 before education and 87.77 after education ($p < .05$). As for the group that brushes more than three times a day, after dinner time and before sleeping (4pt), Aa & Red complex was 54.85 before education, and 29.31 after education ($p < .01$), and orange complex was 106.16 before education, and 92.71 after education ($p < .05$). As for the group that brushes for more than 3 minutes (2pt), Aa & Red complex was 51.46

before education, and 27.61 after education ($p < .001$), and orange complex was 104.34 before education and 94.92 after education. For interdental cleaning, in the group of people who used dental floss or interdental brush more than once a day (2pt), Aa & Red Complex was 22.03 before the education and 10.39 after. Orange Complex was 97.94 before the education and 89.87 after ($p < .05$). For tongue cleaning, in those who cleaned the tongue every day (2pt), Aa & Red Complex was 47.18 before the education and 26.06 after ($p < .01$). Orange Complex was 96.10 before the education and 85.26 after. In those who brushed the tongue occasionally (1pt), Aa & Red Complex was 17.15 before the education and 16.53 after. Orange Complex was 106.75 before the education and 84.49 after ($p < .05$).

Table 3: Distribution of periodontopathic bacteria according to the subjects' oral hygiene care after the education

Division		Score	Aa & Red complex			Orange complex		
			Pre-edu	Post-edu	P	Pre-edu	Post-edu	P
Frequency of brushing	Twice a day, or more than twice a day	2 point	39.12	24.78	.015	99.82	87.77	.035
	once a day	1 point	29.80	19.66	.382	113.74	89.20	.409
	Not wiping daily	0 point	-	-	-	61.44	57.27	-
When do you brushing it?	More than three times a day(after dinner)	4 point	54.85	29.31	.002	106.16	92.71	.031
	Twice a day	3 point	36.00	23.01	.320	107.70	100.42	.629
	once a day	2 point	7.83	15.23	.414	82.45	67.72	.429
	Self-defense	1 point	22.35	14.75	.325	107.35	84.90	.263
	At any time, not self-defense	0 point	28.77	30.01	-	29.28	27.89	-
Brushing strength	Smooth	2 point	42.37	30.01	.076	107.90	101.26	.425
	Smooth + give me strength.	1 point	37.71	24.92	.145	105.82	89.26	.108
	Give me strength.	0 point	26.41	10.81	.211	78.61	62.69	.118
Brushing time	More than 3 minutes	2 point	51.46	27.61	.001	104.34	94.92	.190
	2-3 minutes	1 point	22.60	17.81	.541	89.12	76.23	.105
	Less than 1 minute	0 point	30.69	29.50	.760	140.78	104.59	.495
Brushing method	Bath method Other recommended usage	2 point	61.10	28.89	-	139.29	127.23	-
	Horizontal motion or blending method	1 point	32.25	23.67	.106	102.59	91.83	.082
	Vertical motion or rotational motion	0 point	44.07	21.30	.087	87.94	68.54	.162
Interdental cleaning	Use floss and toothbrush once a day	2 point	22.03	10.39	.368	97.94	89.87	.050
	Do interdental cleaning but not daily	1 point	45.80	24.75	.071	92.12	86.97	.722
	No interdental cleaning	0 point	36.88	24.94	.066	101.51	96.18	.062
Tongue cleaning	Daily Wipes	2 point	47.18	26.06	.007	96.10	85.26	.145
	Occasional wipes	1 point	17.15	16.53	.910	106.75	84.49	.024
	Not wiping at all	0 point	44.02	32.18	.598	96.32	107.02	.535

Conclusion

The average of BOP and CAL according to the general characteristics of the subjects was higher in men than in women. The average of BOP was higher in married people than in singles by marital status. The average of CAL was higher in married people than in singles. The average of O'Leary Index was higher in women than in men. By marital status, it was higher in married people than in singles. As for the BOP and O'Leary Index of the frequency of toothbrushing according to the subjects' toothbrushing habits, the score was the highest in those who did not brush teeth every day, and the score of CAL was the highest in those who brushed teeth twice a day, or more than twice a day. In the time of toothbrushing, the BOP score was the highest in those brushed teeth before sleeping. The score of CAL was the highest in those who brushed teeth more than three times a day, before dinner or sleeping. The score of O'Leary Index was the highest in those who brushed teeth anytime, not before sleeping. The BOP of interdental cleaning according to the subjects' oral care behavior was the highest in those who never did interdental cleaning. The scores of CAL and O'Leary Index were the highest in those who did interdental cleaning but not every day. For tongue cleaning, the scores of BOP and CAL were the highest in those who never cleaned the tongue while that of O'Leary Index was the highest in those who did not clean the tongue occasionally. As for changes in the distribution of periodontopathic bacteria in Aa & Red Complex and Orange Complex according to toothbrushing behaviors, all of the frequency of toothbrushing, the number of times, intensity, time and method decreased after the education than before the education. As for changes in the distribution of periodontopathic bacteria in Aa & Red Complex and Orange Complex according to oral care behaviors, interdental cleaning and tongue cleaning decreased after the education than before the education. Overall, Aa & Red Complex and Orange Complex tended to decrease after the education than before, and especially, in toothbrushing behaviors, when they brushed teeth more frequently, e.g. Twice or more than twice a day, and when they brushed teeth for more than three minutes, they significantly decreased, and also, in oral hygiene care, they significantly decreased when they did interdental cleaning or tongue cleaning than when they did not. According to Ha and Choi¹³, the better the health perceived by oneself, the higher the interest in health becomes, and the higher the interest, the higher the practice of the behavior becomes, which

are similar to the results of this study. When the oral care program is applied, individually customized dental health education has a very great potential of motivation, and it is judged that it had an effect on the reduction of Aa & Red Complex and Orange Complex. The overall analysis of research findings showed differences in BOP, CAL (clinical attachment level) and O'Leary Index depending on the gender and marital status. Also, it was shown that periodontopathic bacteria depending on toothbrushing habits and oral care behaviors gets reduced after education, compared to before education. Also, according to a precedent study¹⁴, toothbrushing education using¹⁵ disclosing agents allows direct observation of dental plaque, and therefore motivates experimenters, and fluctuations in O'Leary Index was informed to the patients to allow them to understand the current level of care and how erroneous their toothbrushing habits are. It is considered that toothbrushing education using disclosing agents can motivate the experimenters, since they can directly observe the changes in dental plaque and O'Leary Index.

Therefore, it would be effective if the right method was recognized and applied in toothbrushing behavior and oral hygiene care, and it would be necessary to look for a method that could increase subjects' interest in oral health. There are various toothbrushing methods, and each method has a different effect on the removal of dental plaque^{16,17}. When the effect of transformed Bass method on the removal of dental plaque was compared to that of other toothbrushing methods in Park¹⁸, there was a limitation in interpretation with a statistical method. However, Bass method is effective for removing oral physiotherapy on the lingual region where the dental plaque is easily accumulated and gingivitis is likely to occur, and in this study, too, the score of O'Leary index was the highest when the Bass method and other recommended usages were used. Basically, the rotating method is recommended for people who do not have gum diseases or have clean oral conditions, but the Bass method was more effective for people with gingivitis accompanied by intermittent inflammation. However, there is a limitation to interpret the effects only with the consequences of toothbrushing behaviors. In the future, it would be necessary to make efforts to understand oral care problems by understanding various age groups, whole-body health, and the characteristics of the oral cavity and consistently investigating changes in bacteria according to oral health behaviors or environmental conditions.

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Changes in Toothbrushing Behavior and Knowledge through Dental Health Care Education and Experience for Elementary School Students

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ABSTRACT

Background/Objectives: To form habits through the dental health education for assisting with mid to long-term oral health maintenance of elementary school students, surveys were conducted from March to December of 2018.

Method/Statistical Analysis: The data was encoded then statistically analyzed using SPSS ver. 23.0, and the level of significance was set as 0.05. Cross-tabulation was conducted for the grade distribution depending on the gender, and the frequency analysis was conducted for the existence of oral health recognition, school's oral health education behaviors and changes in toothbrushing behaviors after the oral health education.

Findings: As for dental health education, 74.8% students responded that it is 'helpful' for dental health care, and 71.7% students responded that it is 'helpful' for dental health education usage and method. As for dental health recognition, 'healthy' was the most frequent response, and 49.2% students responded they have experienced 'bleeding from the gum' when toothbrushing. As for the toothbrushing related questions, 35.5% respondents were using rotational method, and 54.1% responded that they brush after lunch. "between 2 to 3 minutes" was the most popular with 33.1%. As for the distribution of correct answers for dental health knowledge before and after education, the correct answers which asked 'if the cause of gum disease is dental plaque' increased after education(89.9%) compared to before (76.1%). The question which asked 'if one should brush teeth before going to sleep', the correct answer was higher after education(98.4%) compared to before (89.6%). The question which asked 'if fruits, milk and vegetables assist with tooth cleanliness', the correct answer was higher after education(88.2%) compared to before(79.4%).

Improvements/Applications: Consequentially, forming proper habits through repeated education and experience opportunity is the main method for changing the behaviors of elementary school students.

Keywords: Dental hygiene care, Oral hygiene state, Dental health education

Introduction

In South Korea, systematic dental health programs have been implemented based on a legal basis of Dental Health Act enacted in 2000, and such programs are

assisting the public rationally manage dental health, and changing their dental health knowledge, attitude and behaviors in order to develop abilities to appropriately manage dental health. In particular, since dental health knowledge obtained during the elementary school days forms the foundation of life-long dental health management, dental health programs for elementary school students are significant for public health science¹.

Elementary school period is a mixed dentition period where baby and permanent teeth are exchanged, and due to such exposures, dental caries can easily occur. Also, issues arising from baby teeth can affect permanent

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teeth, which can possibly lead to tooth eruption disorders and malocclusion. Therefore, oral health education is extremely crucial during this period in order to maintain oral health from elementary school days to adulthood². Ever since the period of preschool, oral health education is mostly conducted by kindergarten teachers, extracurricular related officials and guardians at home. Among characteristics of children, their attitude, belief and behavior towards oral health are very much affected by their parents' socioeconomic factors and oral health behaviors. Currently in South Korea, the mother spends the most amount of time with her children and forms intimate relationships. Therefore, the mother plays a leading role in choosing the timing of visiting the dentist or dental treatments. In such ways, the mother plays the most important role in regard to maintaining and promoting the family's oral health.

Also, according to precedent researches (2012:46-190), proper dental health care behaviors provided by mothers to infants promote the dental health of infants and furthermore allow the children in their childhood form proper dental health management attitudes and habits. Children either do not have dental health education related experiences or do not remember much contents even after receiving education, and continuous implementation of dental health education in the elementary school curriculum is believed to be necessary³. By targeting the students in the upper grade of an elementary school located in Dong-borough of Busan Metropolitan City, the effect of education was grasped by comparing the effect before and after the oral health and toothbrushing education. Based on this, this study aims to serve as the baseline data for the tools and programs of continuous oral health education for elementary school students.

Materials and Method

Study Subjects: By targeting the entire students of a elementary school located in D-borough of B-city from March 20th to December 30th of 2018, their parents consent and students participation were obtained with the help from D-borough's Education Office, and the investigation took place after distributing questionnaires. The survey was conducted two times in total, and they were distributed and collected before and one month after the education. As for the content of education, oral care education and toothbrushing lessons for elementary school students were conducted to confirm the effect before and after the education.

With the educational contents of dental health care education, and toothbrushing education and experiences for elementary school students, the effectiveness of education was verified by comparing the results before and after education.

Study Method: The data was encoded then statistically analyzed using SPSS ver. 23.0, and the level of significance for determining statistical significance was set as 0.05. Cross-tabulation was conducted for the grade distribution depending on the gender, and the frequency analysis was conducted for the existence of oral health recognition, school's oral health education behaviors and changes in toothbrushing behaviors after the oral health education. As for the changes in the oral health knowledge, correct answer percentages were marked before and after the education.

Work Engagement Gender and Grade Distribution of Elementary School Students: The level of satisfaction and behavioral changes in the elementary school students after the oral health care education is shown in Table 1. As for toothbrushing method, 408(35.5%) of the respondents were using the rotational method, and for toothbrushing after lunch, 531(54.1%) responded that they brush after lunch. As for the toothbrushing duration, "between 2 to 3 minutes" was the most popular response with 380(33.1%) respondents, followed by "between 1 ~ 2 minutes" with 356(31.0%) respondents.

Table 1: Dental Health Education Experience of Elementary School Students

Grade	Man	Women
3rd year	47 (8.1)	61(10.4)
4rd year	180(31.1)	154(26.3)
5rd year	164(28.4)	175(29.9)
6rd year	186(32.4)	195(33.4)
Total	577(100.0)	585(100.0)

Dental Health Education Experience of Elementary School Students: General characteristics of elementary school students are shown in Table 2. 990(83.0%) students responded that they have experienced such education programs, and 203(17.0%) students responded that they haven't. In regard to the education program helping with dental health care, 868(74.8%) students responded "helpful", 269(23.2%) students responded "somewhat", and 24(2.1%) students responded that "not helpful". In regard to dental health education usage and method,

833(71.7%) students responded “helpful”, 307(26.4%) students responded “somewhat”, and 21(1.8%) students responded that “not helpful”

Table 2: Dental Health Education Experience of Elementary School Students

Division		N(%)
Awareness of oral health education	Yes	990(83.0)
	No	203(17.0)
Do you think it helps with oral health care?	Be helpful	868(74.8)
	Normal	269(23.2)
	It does not help.	24 (2.1)
Do you think oral health education method is helpful?	Be helpful	833(71.7)
	Normal	307(26.4)
	It does not help.	21 (1.8)

Dental Health Recognition and School's Dental Health Behavior for Elementary School Students:

Dental health recognition and school's dental health behavior are shown in Table 3. In regard to dental health recognition, 606(50.0%) students responded “healthy”, followed by 518(42.7%) students who responded “somewhat”. In regard to having experiences of bleeding while brushing teeth, 598(49.2%) students responded “yes”, while 493(40.6%) students responded “no”. In regard to having experiences of bad breath, 545(45.1%) students responded “yes”, 263(21.8%) students responded “no” and 400(33.1%) students responded “don't know”. In regard to brushing teeth after lunch at school, 681(56.6%) students responded “yes”, while 523(43.4%) students responded “no”. In regard to alternative behaviors to replace toothbrushing, the most frequent answer was “rinsing mouth with water” with 664(61.5%) students.

Table 3: Dental Health Recognition and School's Dental Health Behavior for Elementary School Students

Division		N (%)
Oral Health Status	Oral Health Status	606(50.0)
	Normal	518(42.7)
	Not healthy	89(7.3)
Bleeding on gums when tooth brushing	I do not know	124(10.2)
	There was bleeding.	598(49.2)
	There is no bleeding	493(40.6)

Conted...

Is there a bad breath?	I do not know	400(33.1)
	There was bad breath	545(45.1)
	There is no bad breath	263(21.8)
Do you brush your teeth after lunch at school?	Yes	681(56.6)
	No	523(43.4)
It does replaced by any act that does not brushing after lunch at school?	Do nothing	264(24.5)
	Wash your mouth with water.	664(61.5)
	Chew gum	30(2.8)
	Other	121(11.2)

Changes in Elementary School Student's ToothbrushingBehavior after Dental Health Care:

Elementary school students' level of satisfaction and changes in behaviors are shown in Table 4. As for the method of toothbrushing, 408(35.5%) students answered that they use the rotational method. As for toothbrushing after lunch, 531(54.1%) students answered that they brush their teeth after lunch. In case of the duration of toothbrushing, the most frequent answer was “between 2~3 minutes” with 380(33.1%) students, followed by “between 1~2 minutes” with 356(31.0%) students.

Table 4: Changes in Elementary School Student's ToothbrushingBehavior after Dental Health Care

Division		N (%)
After oral health education do I brushing in some way?	Vertical method	211(18.4)
	Lateral method	81(7.0)
	Fones' method	179(15.6)
	Rolling method	408(35.5)
	Other	270(23.5)
After oral health education do you brushing after lunch?	Yes	531(54.1)
	No	450(45.9)
After oral health education do a few minutes of brushing after lunch?	Less than 1 minute	97(8.4)
	1 minute to less than 2 minutes	356(31.0)
	2 minutes to less than 3 minutes	380(33.1)
	3 minutes to less than 4 minutes	240(20.9)
	More than 4 minutes	44(6.6)

Changes in Elementary School Students' Dental Health Knowledge after Dental Health Care Education: Elementary school students' distribution of correct answers before and after dental health knowledge education is shown in Table 5. To the question of “dental plaque” being the cause of gum diseases, 908(76.1%) students got the answer correct before education, and 1033(89.9%) students got the answer correct after education, which showed improvement. To the question

of “toothbrushing must be done before sleeping”, 1095(89.6%) students got the answer correct before education, and 1131(98.4%) students got the answer correct after education, which showed improvement. To the question of “fruits, milk and vegetables helping with maintaining clean teeth”, 966(79.4%) students got the answer correct before education, and 1013(88.2%) students got the answer correct after education, which showed improvement

Table 5: Changes in Elementary School Students' Dental Health Knowledge after Dental Health Care Education

Question	Percent correct answer	
	Before	After
Dental caries is caused by poor brushing.	1091(89.1)	1079(93.9)
The cause of gum disease is the dental plaque.	908(76.1)	1033(89.9)
When brushing, brush your upper teeth from top to bottom and bottom teeth from bottom to top.	1121(91.8)	1075(93.6)
When brushing, the tongue should be cleaned.	1197(97.7)	1135(98.8)
Brushing should be wiped off before sleeping.	1095(89.6)	1131(98.4)
Fruit, milk, and vegetables are foods that help clean the teeth.	966(79.4)	1013(88.2)
Chocolate, sweets, candy is a food that caused great dental caries.	1177(96.1)	1127(98.1)
Tobacco is harmful to oral health.	1192(97.5)	1115(97.0)
Fluoride-containing toothpaste is effective in preventing Dental caries	1088(89.9)	1120(97.5)
Regular dental examinations have the effect of preventing Dental caries	1160(95.6)	1125(97.9)

Satisfaction and Help after Oral Health Care Education in Elementary School: The level of satisfaction and assistance after oral health care education for elementary school students is shown in Table 6. The satisfaction level of oral health education was the highest among 968 respondents (85.0%) and 960(84.8%) who answered “helpful” in oral health education, followed by 709(62.7%) who answered “easy” in oral health education, followed by 383(38.8%). About 880 respondents (84.9%) answered, “Helping the actual toothbrush was helpful” rather than just teaching.

Conted...

Difficulty in oral health education?	Easy	709(62.7)
	Normal	382(33.8)
	Difficult	40 (3.5)
Was it helpful to brush your teeth in person rather than just teaching?	Be helpful	880(84.9)
	Normal	140(13.5)
	It does not help	17 (1.6)

Conclusion

This study attempted to grasp the effect of education by conducting the oral care education and toothbrushing lessons, and comparing before and after results by targeting elementary school students located in Dong-borough of Busan Metropolitan City, and attempted to induce positive behavioral changes that can improve the students' oral health care abilities through repeated education.

1. As for the general characteristics of elementary school students, 83.0% of the students responded that they have experienced education, compared

Table 6: Satisfaction and Help after Oral Health Care Education in Elementary School

Division		N (%)
Satisfaction of Oral Health Education?	Be satisfied	968(85.0)
	Normal	151(13.2)
	Not satisfy	20 (1.8)
Do you think oral health education helps oral health care?	Be helpful	960(84.8)
	Normal	152(13.4)
	It does not help	20 (1.8)

to 17.0% that haven't. 74.8% of the students responded that education is "helpful" for dental health care, and 71.7% of the students responded that it is "helpful" for dental health education usage and method.

2. Elementary school students' changes in behaviors after dental health care education are as follows. As for the method of toothbrushing, switching to the rotational method was the most frequent. Toothbrushing after lunch was 54.1%, which showed a small decrease. However, as for the duration of brushing teeth, "between 2~3 minutes" was the most frequent response with 33.1%, followed by "between 1~2 minutes" with 31.0%. This implies that more than 60% of the students are brushing teeth for an extended period of time, which shows that the students' dental hygiene behaviors are showing positive tendencies.
3. Elementary school students' distribution of correct answers before and after dental health education was compared, and in regard to dental related healthy eating habits and dental caries prevention methods, the percentage of correct answers for partial dental health knowledge questions increased.
4. The level of satisfaction with oral health education for elementary school students after oral health education and the level of help it gives oral health care were almost the same. The majority of the respondents said that brushing your teeth directly helps rather than just teaching. It is seen as a positive result of direct action.

Since 1999, Korea has set up an oral health center in an elementary school or installed and operated a toothbrushing classroom. However, in elementary schools where it is difficult to provide preventative oral health services, all elementary school students no. It is a continuous project to help improve the oral health of some school-aged children. However, various programs for different grades and oral conditions are needed. It is thought that the difference of awareness of oral health education⁴ among the elementary school students, motivation level⁵, parent's interest^{6,7}, and oral care interest of the health teacher are considered to be important variables of education effect⁸. Continuous repetition education, experience - oriented brushing education, and various media use should be able to reduce the dental caries that are common in school age

children. According to the comprehensive analysis of the findings of this study, providing continuous dental health education programs to elementary school students helps with maintaining the interests in dental health and increasing the percentage of correct answers for the dental health knowledge, although not significant. According to the study by Ahn³, dental health education experience of the parents positively affects the dental health of elementary school students. Also, according to precedent studies, acquisition of dental health^{9,10,11} knowledge and changes in dental health behaviors through dental health education in guardians are the factors that affect children's knowledge, attitude and behaviors for dental health. Oral health habits formed by education on oral health in family living together do not change easily¹². Many studies have reported that caregivers' oral health knowledge and oral health behaviors are factors that affect their children's knowledge, attitudes and behaviors on oral health¹³.

A similar study on dental examination found that parents who are worried about tooth loss often visit dental institutions in case of tooth decay¹⁴, and parents who are concerned about time lag and beauty are often reported to have high rates of use of dental institutions in cases of irregular marriages¹⁵. Oral hygiene education and prevention programs show various results according to local characteristics and are reported in many studies on the need for oral health considering locality and socio-economic characteristics^{16,17}.

This study was limited to conducting dental health education by targeting elementary school students only, and expanding and developing programs for dental health education by including guardians are believed to be necessary. However, positive changes were observed for elementary school students' behaviors towards dental health care, and political measures that can continuously provide and maintain opportunities of dental health education to elementary school students based on practical experiences, in addition to teaching by rote, are necessary in order to positively affect the aspect of students' dental health behaviors.

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A Study of Smart Healthcare Service Model Based on Cloud Platform: Focus on Small and Medium Sized Hospitals

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ABSTRACT

The objective is to propose a cloud hospital information system (cHIS) to allow small and medium sized hospitals to provide smart healthcare services and gain improved competitiveness. The research was conducted on cloud platform-based HIS service, mobile electronic medical record (EMR) service, personal biological record (PBR) service and healthcare big data service. Cloud computing technology was used for the HIS service to minimize the operating cost, IoT was applied to the mobile EMR and PBR services, and big data technology was used for the healthcare big data service to raise the efficiency in the clinical setting. This study examined the measures for promoting the use of cloud computing technology in the healthcare sector. If service providers can provide affordable, high-quality cloud healthcare services, such services will become high in demand despite hindrances. Thus, the architecture and service model of the cHIS were designed to minimize the operating costs through resource pooling achieved by virtualizing the hardware and application programs to promote affordability. Also, CloudSim was used to assess the stability and efficiency in relation to the data access time, service processing time and service wait time. First, the results of the experiment showed that an increase in the cloud storage disk and network bandwidths allows more users to be serviced. Second, it was found that the packet size had little to no impact on the system performance. Third, it was found that cloud-based distributed storage and processing was more efficient than using a web-based database in case of processing large amounts of data. The system presents economic advantages including maximized sharing of resources and minimized costs, enables real-time exchange of healthcare data, and promotes the use of collective intelligence for better healthcare services.

Keywords: Cloud computing, Cloud hospital information system, Virtual machine, Personal biological record (PBR), Electronic medical record (EMR)

Introduction

Recently, mobile technology, Internet of Things (IoT), big data and cloud computing have been bringing forth new changes in the era of the Fourth Industrial Revolution, and these changes have been driving innovation in the service industry with the applications of information and communications technology. The

advances in cloud services, in particular, are allowing users to enjoy ICT-integrated services anywhere, anytime¹. On the other hand, medical advances are increasing the average life expectancy of humans, which has in turn led to a phenomenon called population aging as well as a rise in geriatric diseases and chronic diseases, necessitating changes in the medical service environment^{2,3}.

In line with this trend, research is being carried out to develop smart healthcare services integrated with the hospital information system, mobile technology and mobile communications technology to provide services without any constraints in terms of time and location⁴. However, if such services become common, small- and medium-sized hospitals may lose competitiveness,

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considering they have a limited budget to invest in such cutting-edge systems. There have been discussions on cloud-based healthcare services as a means to mitigate this issue for small and medium sized hospitals, but the proposed information system could not be commercialized, despite being future-oriented, due to technical limitations and information security issues^{5,6,7,8}.

This study proposes a smartphone healthcare service based on a cloud platform, which maximizes the sharing of resources through the virtualization of resources and presents a hospital information system that is affordable yet excellent in quality to provide high-quality services to users, without the issues of security or healthcare information standardization.

Related Research

Concept of Cloud Computing: Cloud computing is defined as “an ICT service model for receiving network services at fast speeds through interactions with service providers for sharing of computer resources such as servers, networks, storage devices, applications and services”^{9,10,11}. The characteristics of clouding services from the user perspective are as follows: first, it is “on-demand self-service,” which means that users can use the computing resources available to the extent they desire anytime; second, it is “broad network access,” allowing users to use computing resources from anywhere simply by accessing the network; third, it is “location-independent resource pooling”; fourth, it is “rapid elasticity,” which allows users to acquire as much resources as they need; and fifth, it is “measured service,” meaning that users are charged according to the extent to which they have used the service¹².

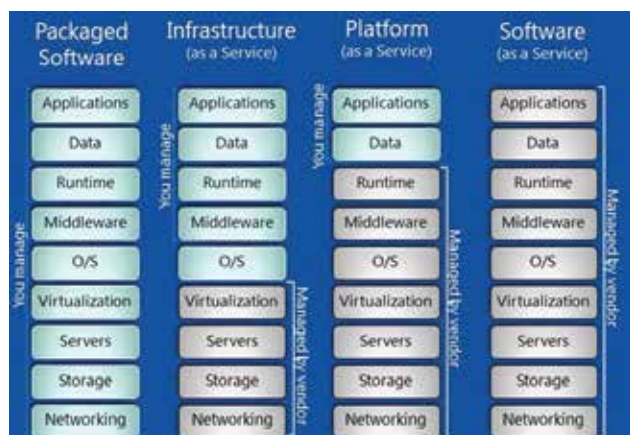


Figure 1: Cloud Computing Service Models

Classification of Cloud Computing: Cloud services may be classified into Infrastructure as a Service (IaaS),

Platform as a Service (PaaS), and Software as a Service (SaaS)^{12,13,14}, as shown in Figure 1. Since the recent medical services emphasize personalization services, a cloud platform service model is emerging that enables user-oriented system configuration in the medical field.

HIS based on Cloud Platform: With the recent advancements of mobile ICT and the advent of the mobile era, WBAN(Wireless Body Area Network) and WWBSs(Wireless wearable biomedical sensors) are revolutionizing the healthcare service environment, and this is expected to lead to IoT-based ubiquitous pervasive computing even for hospital information systems (HIS)¹⁵. Population aging and a rise in geriatric diseases resulting from increased life expectancy and a surge in chronic diseases due to lifestyle changes are being observed worldwide¹⁶. Because of these trends, there is an agreement on the need for medical institutions to not only provide healthcare services for inpatients or outpatients visiting in person, but also offer remote services. To this end, it is necessary to develop a new mobile-based healthcare service model for medical professionals to monitor their patients' daily lives anywhere, anytime and intervene in their health management by connecting to the patients' smartphones using the emerging WWBS and WBAN and linking them with the hospital information system (HIS) via a mobile communications network¹. In order to respond to the changes in the healthcare environment, a new technology for collecting and managing large amounts of data generated in IoT environments is needed.

Method

Overview of cHIS Smart Healthcare System: A cloud hospital information system (cHIS) is expected to further upgrade healthcare services by creating a new market and business area through technological convergence, as the era of IoT that enables things to be connected anywhere, anytime is brought upon by ICT advancements. The architecture of the cloud platform-based smart healthcare system proposed in this study is shown in Figure 2.



Figure 2: Healthcare service system architecture

Configuration of the cHIS service model: cHIS is comprised of cloud platform-based HIS service, Mobile EMR service, personal biological record (PBR) service, and Healthcare Big Data service.

1. Cloud platform-base HIS Service: The cloud platform-based HIS services can be divided into four types: virtual machine technology that maximizes sharing and shared use of computing resources, grid computing technology that supports service stability, security-related technology, and application program.

First, Virtual machine (VM) technology isolates the application program (application programs) into a certain hardware or another VM using virtualization technology as a means to maintain independence. Computing resources comprised of several clusters are pooled, and virtual resources are allocated dynamically according to the requirements of the application programs for shared use. VMs may be classified according to the level of virtualization into process VMs and system VMs, as shown in Figure 3.

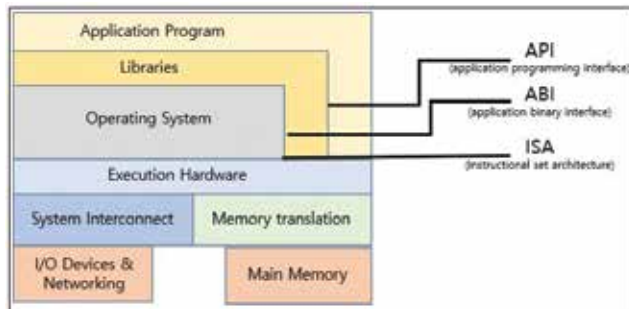


Figure 3: Key Implementation Layers

Second, Grid computing could be defined as a distributed and parallel system designed to satisfy the quality of service demands of users in relation to capability, performance, availability and cost by dynamically sharing, selecting and combining the distributed resources¹⁷. In this study, a single physical server was designed to allow installation of up to sixteen VMs. As shown in Figure 4, the system was designed to have two different servers connected with an L4 switch and two VMs for each server for a total of four VMs to service a single hospital as a means to ensure service stability. Because cHIS must be operated as a fault-tolerant system 24/7 all year round and allow users to access its services anytime, anywhere, a fault-tolerant architecture was realized through network, server and VM redundancies.

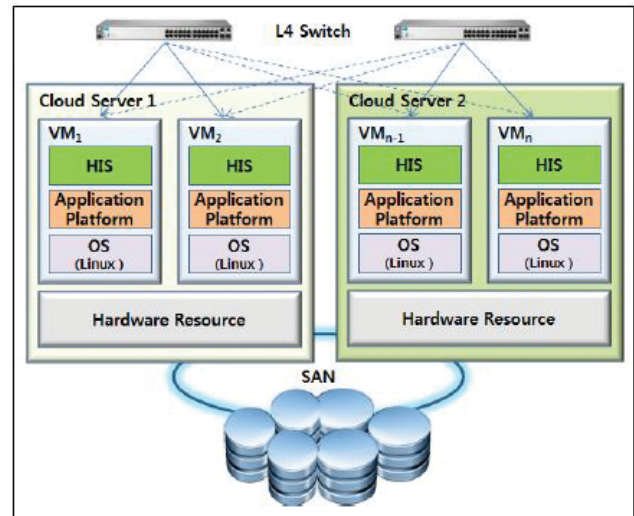


Figure 4: The Structure of cHIS's VM

Third, A cloud service requires a security isolation policy for the purpose of preventing unlawful access, conflict between tenants, as it is a multi-tenant service¹⁸. In the case of the cHIS in question, system VM was adopted and it is set to provide SaaS-type services. Thus, security measures with respect to data and network security, data locality, data integrity, data access, authentication and authorization are needed¹⁹. To this end, the system was designed to operate security policies including a hardware server certificate, virtual server certificate, user certificate, and network device certificate.

The fourth cHIS application, the service-oriented architecture (SOA) and component-based design (CBD) principles were applied. Also, it is important for cloud service providers to minimize the cost of initially setting up a new service model and the maintenance and repair costs for the existing service users. For this purpose, it was ensured that the abstraction, loose coupling, autonomy and statelessness of the services, which are key to the SOA, would be maintained, and the services were divided into a hospital-specific layer (HSL), optional service layer (OSL) and core service layer (CSL), as shown in Figure 5. HSL was designed as a standard component that would be unique to the hospital depending on whether it specializes in acute medical conditions, nursing or rehabilitation, while OSL was designed as a component that could be selected according to the hospital size and the scope of services it provides, and CSL was designed as a core component that must be included in this study.

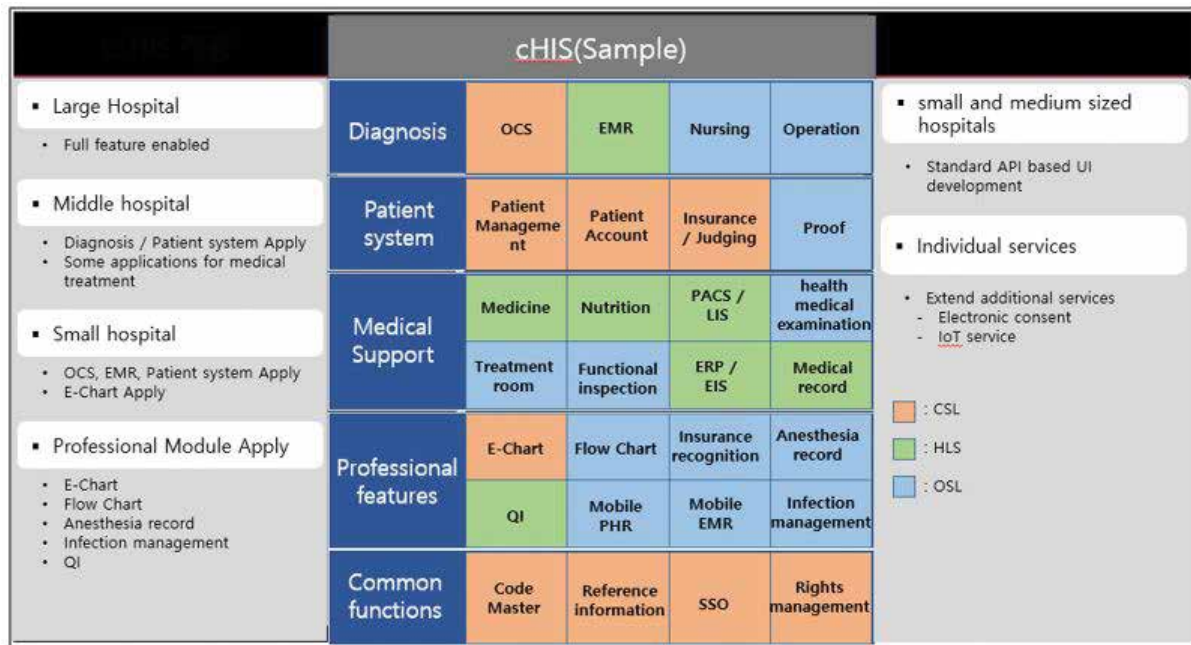


Figure 5: The cHIS Service Components

2. Mobile EMR Service: In order to provide a patient-oriented mobile EMR service, an optimized environment that facilitates the securing and application of optimum content must be provided for a mutual interface between the hospital EMR system and the mobile EMR devices used by the medical staff. In this study a personal health record (PHR) app for management of medical information and personal life logs, an app for chronic disease management, and various other healthcare applications were set up on the cloud to be used in healthcare services and patient management.

3. PBR Service: A personal biological record (PBR) service enables personalized healthcare services for patients by collecting and analyzing their individual biometric information to send the data to the medical institution in question and allowing the medical institution to use the real-time data to make a diagnosis, predict the patient's health condition, take preventive measures, treat the disease and so on accordingly.

4. Healthcare Big Data Service: The healthcare sector is already equipped with the technology to amass digital data and the basic IT infrastructure, and thus there is more interest in how the collected data should be integrated, managed and analyzed. Unless these issues are resolved, big data will be useless in the field of healthcare.

In this study, clinical data extraction and verification measures were prepared centering on diseases for the purpose of collecting clinical, genomic and life log data to be managed as healthcare big data on cloud. In order to apply CDSS technology for AI analysis of healthcare data consisting of genetic, clinical and health information of patients to the cHIS for improved efficiency in the clinical setting, the cloud infrastructure and open platform necessary were designed.

Result

Experiment Environment: An experiment was carried out using CloudSim to prove the efficiency of cHIS in providing smart healthcare services based on a cloud platform. Since cHIS is a cloud system accessed and used by multiple hospitals simultaneously, the most important matter considered in the experiment was the stability of the system in terms of data access time, service processing time, and service wait time. CloudSim is a simulator for simulations of providing services in a cloud computing environment, and it consists of cloud resources as well as a user interface, cloud service and VM service.

Distributed users use equation 1 to support even services from cHIS systems. Equation 1 calculates a packet reception ratio between a user and a server in order to assign a priority according to a service request. Therefore, if you make a reservation, you will be given priority over the receptionist on that day.

$$P = RA + RD \quad (\text{equation 1})$$

Where :

P = Priority

RD = Receive Data

$$RA = \int_{cr}^{\text{out}} (-a(t-b)^2 + c) dt$$

cr = Priority of service requested at the same time

out = When the user's service processing is completed

$$-a(t-b)^2 + c = \text{Packet reception rate}$$

Time allocation is required to give uniform transmission opportunity, and time allocation method is defined using Equation 2.

$$T = \frac{UT \times RT}{ET} \quad (\text{equation 2})$$

Where :

T = Assign Time

UT = Maximum Time

$$RT = \int_{cr}^e (a(t-b)^2 + c) dt$$

$$ET = \sum_{i=0}^n RT_i$$

cr = Time at which to calculate the time allocation

$$e = UT + cr$$

$$a(t-b)^2 + c = \text{Error rate during communication}$$

i = Number of Users

Experiment Result: When small and medium sized hospitals use the cHIS to request a service for patient care, fast response and accurate service processing are highly important. Accordingly, the impact of the cloud disk and network bandwidths on the overall system performance was analyzed in this study by assessing the data packet loss rate according to the data packet size. Also, we experimented on service processing latency and service processing time for the experiment of service processing efficiency requested through each EMR. As a result, an increase in the cloud storage disk bandwidth and the network bandwidth allows a greater number of users to be serviced. However, the results also indicated that a bottleneck may occur in either one of these bandwidths in such cases, and this must be considered when designing the system. Also, the data packet size, which had been expected to have an effect on the system performance, was found to have little to no impact, based on the results of the experiment. This

could be explained by the fact that as the data packet size grows larger, the streaming request time intervals increase, but the delay in each queue also increases, and these two effects cancel each other out.

The results of an experiment comparing the method of integrating and operating solely a web-based database and the method of storing and processing the data in the form of an image using a distributed storage on a cloud system. The results show that the cloud system is more than 20% faster, on average, than the web-based DMBS in processing the service requested by the user. Also, when there is heavy workload, the queue wait time for processing is 3.8% less when it is processed based on cloud, rather than the web-based DMBS. In other words, a prolonged queue wait time for a requested service indicates a delay in service processing, and thus, in the case of large amounts of data, the method of storing and processing data on a cloud-based distributed storage proposed in this study is more efficient than the conventional web-based data storage and management method.

Conclusion

In the healthcare service sector, in particular, there is a surge in demand for new types of services incorporated with advanced ICT including mobile technology for geriatric and chronic diseases that have been on the rise due to population aging. Most small and medium sized hospitals today have set up a healthcare information system independently for management and storage of the related data. However, setting up an information system that can meet the patients' demands for high-quality healthcare services is economically burdensome for such hospitals. In addition, individually established healthcare information systems have low interoperability due to the heterogeneity of the models and tools used. As such, small- and medium-sized hospitals face difficulties in meeting the service demands due to limited business management resources and weak capacity for rendering IT services. Based on these factors, a cloud hospital information system (cHIS) designed to provide smart healthcare services based on a cloud platform was proposed in this study as a means to improve the IT service environment of small and medium-sized hospitals, thereby helping them secure or maintain competitiveness. This proposed architecture presents economic advantages to the users by maximizing the sharing of resources, while minimizing maintenance and repair costs, and a security isolation policy is

implemented to resolve issues concerning security and privacy. To this end, the HIS service requirements of small- and medium-sized hospitals were derived, and the service components were designed from the SOA and CBD perspectives in order to propose an architecture that can minimize the maintenance and repair costs. Thus, a VM architecture for maximized sharing of computing resources and the model for implementation and operation thereof were proposed.

In the case of the system proposed in this study, the data generated at small- and medium-sized hospitals are backed up on a cloud data storage periodically for integration in order to manage the healthcare big data. Web-based data management resolves the issue of heavy loads on the server for the processing of healthcare data, the amount of which increases continually. Lastly, from the aspect of data integrity, a web-based database may lead to Data corruption as a result of diverse types of SQL attacks. Also, even with respect to the data process speed MapReduce is used for data scheduling and load balancing, as the data continue to accumulate, and this resolves the issues of data processing and load balancing. However, the virtualization principle of the logical isolation concept applied to the cHIS requires that some of the EMR features be physically isolated, with an excessive emphasis on privacy, and this is in conflict with the Medical Service Act of Korea. Accordingly, there is a need for a legal framework for the proposed cHIS service in addition to technical supplementations from the ICT perspective. Therefore, it is necessary to improve the level of virtualization and upgrade the system according to the new requirements in a follow-up study.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: The authors declare no conflict of interest.

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Affect of Different Intensities of Queens College Step Tests on Cardiopulmonary Function and Body Composition in Students

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ABSTRACT

Objective: The purpose of this study is to evaluate the effects of Queens's college step test on cardiorespiratory endurance and body composition during aerobic exercise, and to find out the difference when the interval is modified.

Method: Amongst thirty apparently healthy college students, fifteen were randomly assigned to a group (QCST) performing a normal Queens College step test and another fifteen were randomly assigned to a group (mQCST) performing a Queens college test with modified interval. The experiment was conducted three times a week for four weeks. **Findings:** Both groups showed positive enhancement in overall cardiorespiratory function and body composition after the experiment. In the QCST group compared to mQCST, there was an increment of 3.90% in FEV₁. In the mQCST group compared to QCST group, there was a superior improvement of 1.01% in skeletal muscle mass and 2.41% in body fat percentage.

Improvements: A short-term experiment was conducted in randomly assigned groups that did not achieve uniform matching where confounding bias cannot be excluded. Future findings for long-term experiments may include further positive outcomes of cardiorespiratory endurance and body composition changes in the mQCST group.

Keywords: *Queen's college step test, Cardiorespiratory function, Body composition, aerobic capacity, interval training*

Introduction

The essential life supporting organs of the human being are the heart and lung that are closely related anatomically and connected throughout multiple vessels. Therefore, the failure of the lung can lead to drastic physiological impacts on the heart, which in turn may result in additional end organ failures. Hypoxia is the key mechanism of in which the imbalance of physiological homeostasis throughout the cells lead to apoptosis or necrosis and eventually organ failure. Cor pulmonale is where chronic lung diseases can cause heart failure as the chronic state of hypoxia causes the pulmonary vascularity to constrict and lead to persistent pulmonary

hypertension. Pulmonary hypertension exerts pressure on the right ventricle causing right ventricular hypertrophy and dilatation. The pressure overload on the right ventricle deviates the ventricular septum to the left ventricle which eventually decreases the cardiac output. Overall cardiac function decreases as a consequence of the chronic state of lung diseases. Therefore, the relationships between cardiac and pulmonary functions cannot be overestimated and plays an essential role in maintaining the physiological homeostasis and life support.

Monitoring the cardiorespiratory endurance by evaluating the medical status of the patient and determining the factors for the continuous monitoring is the most important step prior to treating the patients with cardiorespiratory diseases. The measurement of cardiorespiratory endurance generally includes exercise stress test with additional radiological evaluations such as computed tomography, X-ray, and ultrasonography. In patients who can endure the strain from the test, maximal exercise test is used to measure the maximal

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functional capacity while submaximal exercise test can be implicated on patients having limits to execute maximal functional capacity. Compared to maximal exercise testing, submaximal exercise testing maybe less accurate due to the indirect calculations of the physical capacity and the oxygen consumption through the peak VO₂. However, due to safety concerns, efficiency over equipment, cost, management, and time are the reasons the submaximal exercise testing is favored.

The submaximal exercise testing utilizes treadmills, bicycles, and step box or walking to measure the physical capacity. Although the Bruce treadmill protocol exploits the running machine to measure the maximal VO₂ of athletes or healthy subjects, it can also be modified for patients with chronic diseases and the old [1,2,3]. Balke treadmill protocol, Noughton protocol, McHenry protocol, Kattus protocol are the modified versions of Bruce treadmill protocol which produces a sufficient level of exercising stress without physiological or biomechanical strain and can be implicated to people with various functional limitations and disabilities and older adults. The strain is leveled out based on the functional capacity of the individual [4]. Submaximal bicycle ergometer tests include Astrand-Ryhming nomogram and YMCA submaximal bicycle test although treadmill tests are preferred [5,6].

The prior exercise stress tests require specific equipment in contrast to walk tests and step tests which has less constriction and holds convenience. Especially, step tests take less space and the short duration makes it convenient compared to other exercise stress tests. Harvard Step Test requires the individual to step up onto, and back down from the 50.8 cm high step at a rate of 30 completed steps per minute (one second up, one second down) for 5 minutes or until exhaustion. Similar tests include YMCA 3-minute Step Test, The Canadian Home Fitness Step Test, Chester Step Test, Sharkey (Forestry) Step Test, and Queens college step test [7, 8]. Queens college step test is the modified version of Harvard step test where the individual steps up and down on the 41.3 cm platform at a rate of 22 steps per minute for females and at 24 steps per minute for males [8]. The individuals are to step using a four-step cadence, 'up-up-down-down' for 3 minutes duration. The athlete stops immediately on completion of the test, and the heart beats are counted for 15 seconds from 5-20 seconds of recovery. This short duration and less strain make the Queens college step test the preferable exercise stress test.

Exercises used in step tests can be converted into an efficient aerobic exercise and this type of regular aerobic exercise can improve cardiorespiratory endurance and metabolism of an individual which can be beneficial to rehabilitating chronic cardiovascular patients [9,10]. According to several meta-analysis and case studies, aerobic exercise has been proved to benefit stroke, Parkinson's disease, dementia, chronic cardiac failure, and chronic obstructive pulmonary disease [11-16]. Therefore, aerobic exercise proves to be an essential tool to physical therapists. However, when conducting exercise stress tests upon patients, additional management and assistance maybe required as well as standardized criteria for the evaluation of functional capacity. Submaximal exercise test is what meets those requirements to evaluate functionally limited patients without physiologic or biomechanical strain in a safe and efficient manner.

Recently, interval training methods such as altering the intensity and frequency of the exercise in aerobic exercising has become popular. Studies suggest applying interval training can improve insulin sensitivity, decrease systolic blood pressure, and increase maximal oxygen consumption in obese patients or over-weighted men [17]. There was also an increase in maximal oxygen consumption in patients with myocardial infarction and improvement of physical capacity and peripheral vascular function in patients with acute coronary disease [18]. There was also an enhancement in myocardial function with effects of decreasing blood pressure in patients with hypertension [19]. Therefore, interval training can be considered as to have an overall health benefit in cardiovascular function as well as lowering body fat.

Our study is aimed to clarify the impact of Queens college step test on cardiorespiratory endurance and body composition when conducted as means of aerobic exercise and in addition to evaluate the differences when applying interval training into Queens college step test.

Table 1: Initial Set of features used for the experimentation

	Value		t
	mQCST(n=15)	QCST(n=15)	
Gender	Male n = 7	Male n = 6	0.71
	Female n = 8	Female n = 9	
Smoking	Male n = 2	Male n = 1	0.28
	Female n = 1	Female n = 0	

Conted...

Age (year)	20.8 ± 3.57	20.87 ± 3.87	0.049
Height (cm)	167.4 ± 7.3	165.2 ± 7.23	-0.829
Weight (kg)	64.36 ± 10.8	63.24 ± 15.9	-0.226

Values indicate mean ± standard deviation, * $p < 0.05$, mQCST : Group performing Queens college test with modified interval, QCST : Group performing Queens college step test



Figure 1: Queens college step test exercise A-E

Method

Total of thirty healthy college students who do not have or were treated for cardiovascular diseases, do not have orthopedic related diseases or were not undergo surgery from the same socioeconomic background, having age range from nineteen to thirty one were recruited for the study on basis of random sampling from Asan, Republic of Korea. The experimental protocol was fully explained to participants and the research was based on agreement of every single participant. Table 1 shows the physical features of the subjects.

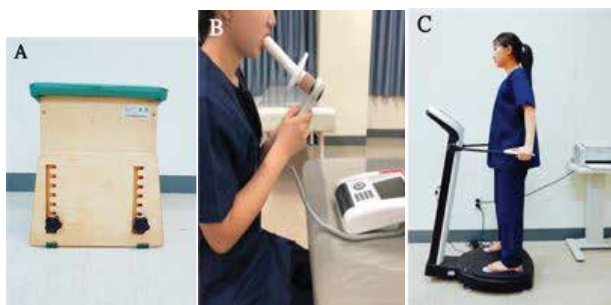


Figure 2: Measurement A) Step box B) Spirometry C) Bio Impedance assessment compare

Research Method: Amongst thirty subjects, fifteen were randomly assigned to a group (QCST) performing a normal Queens college step test and another fifteen were randomly assigned to a group (mQCST) performing a Queens college test with modified interval. In both groups, individuals stepped up and down on a 41.3 cm platform. The subjects were to step using a four-

step cadence, 'up-up-down-down' for 3 minutes per repetition which was conducted three times a week for four weeks Figure 1 A-E. Subjects were put to rest for 5 minutes after each repetition.

In the QCST group the subjects stepped at a rate of 88 beats per minute for females and at 96 beats per minute for males. In the mQCST group the subjects stepped in three different stages of intensities for three minutes, one minute for each phase. For females, moderate intensity at a rate of 88 beats per minute for one minute, high intensity at a rate of 108 beats per minute for one minute, and mild intensity at a rate 68 beats per minute for one minute. For males, moderate intensity at a rate of 96 beats per minute for one minute, high intensity at a rate of 116 beats per minute for one minute, and mild intensity at a rate 76 beats per minute for one minute. This research was performed under the approval of Institutional Review Board (IRB) at Sunmoon University (SM-201804-024-1)

Data Analysis: In this research, descriptive statistics were used in order to analyze the mean and standard deviation (SD) of each variable. Statistical analysis was conducted through SPSS/PC ver.22.0 for windows program (SPSS INC. Chicago.IL). Reliability and validity were measured using independent samples t-test and paired samples t-test. Independent samples t-test was used to compare measurements between group performing Queens college test with modified interval and group performing Queens college step test. Paired samples t-test was used for the post hoc analysis and the statistical valid level was set to $p < 0.05$. The overall research process is shown in Figure 3.

Result and Discussion

In the QCST group compared to mQCST, FEV_1 was improved by 3.90 %. In the mQCST group compared to QCST group, there was a greater improvement of 1.01% in skeletal muscle mass and 2.41% in body fat percentage, indicating a significant change in body composition when performing mQCST and respiratory function improvement when performing QCST. In the QCST group, body fat percentage improved from 24.64% to 23.51%, FEV_1 increased from 2.85% to 2.96% ($p < 0.05$). But skeletal muscle mass, body fat mass, BMI, waist-hip Ratio, visceral fat percentage, obesity degree, FVC (L), FEV_1 / FVC (%), FEV_1 / FVC_p (%), PEF (L/sec), PEF (%) were not significant

differences before and after ($p > 0.05$). In the mQCST group, skeletal muscle mass increased from 26.9% to 27.53%, body fat percentage decreased from 28.07% to 27.46% ($p < 0.05$). But body fat mass, BMI, waist-hip Ratio, visceral fat percentage, obesity degree, FVC (L), FEV₁ (L), FEV₁ (%), FEV₁ /FVC (%), FEV₁ /FVCp (%), PEF (L/sec), PEF (%) showed no reliable differences before and after ($p > 0.05$) in Table 2, Table 3.

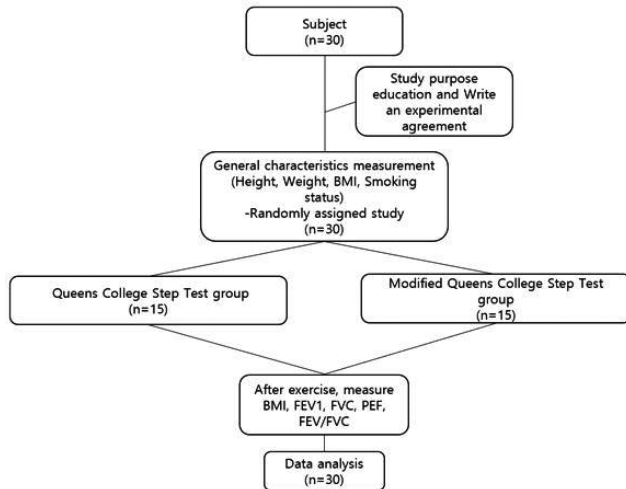


Figure 3: Flow diagram of subject experimental protocol

This study was to evaluate the comparison of cardiorespiratory endurance and body composition based on the implication of interval training in mQCST group and the QCST group. Current studies propose the functionality of submaximal exercise tests to predict the heartrate, blood pressure and maximal oxygen capacity, however, there are few studies that propose these tests as means of aerobic exercise [9]. Submaximal exercise tests include Rockport 1mile walk test or 1mile jogging test, modified Bruce treadmill test, single stage submaximal treadmill walk test, YMCA submaximal bicycle test, Queens college step test, and 6 minute walk test. Amongst numerous submaximal exercise tests, Queens college step test is the most standardized test widely used and provides advantages in terms of safety, cost, efficiency, convenience, and time [20]. Therefore, this study selected Queens college step test as a method of exercising and contrasts it with the modified interval training in various aspects.

Table 2: Bio Impedance assessment compare

		mQCST (n = 15)	QCST (n = 15)	t
Skeletal Muscle Mass (kg)	Pre	26.9 ± 6.6	24.8 ± 6.7	-0.86
	Post	27.53 ± 6.7	25.13 ± 6.68	-0.98
	t	-3.12*	-2.12	

Conted...

Body Fat Mass(kg)	Pre	15.81 ± 7.58	18.21 ± 9.38	0.77
	Post	15.13 ± 7.36	17.77 ± 9.15	0.87
	t	1.83	1.48	
BMI (kg/ m ²)	Pre	22.91 ± 3.21	22.97 ± 4.6	0.04
	Post	23.01 ± 3.34	22.98 ± 4.45	-0.02
	t	-1.07	-0.15	
Body Fat Percentage (%)	Pre	28.07 ± 9.64	24.64 ± 10.08	0.95
	Post	27.46 ± 9.4	23.51 ± 9.65	1.13
	t	2.47*	1.40*	
Waist-hip Ratio (%)	Pre	0.83 ± 0.03	0.86 ± 0.06	1.49
	Post	0.82 ± 0.03	0.85 ± 0.06	1.59
	t	1.13	1.00	
Visceral Fat Percentage	Pre	6.27 ± 4.1	7.60 ± 4.90	0.81
	Post	5.73 ± 3.71	7.20 ± 4.91	0.92
	t	2.09	2.10	
Obesity degree (%)	Pre	106.67 ± 14.90	107.4 ± 20.96	0.11
	Post	107.07 ± 15.41	107.47 ± 20.21	0.06
	t	-1.0	-0.15	

Table 3: Comparison of respiratory function between mQCST and QCST

		mQCST (n = 15)	QCST (n = 15)	t
FVC (L)	Pre	3.74 ± 0.73	3.21 ± 0.76	-1.94
	Post	3.72 ± 0.71	3.38 ± 0.81	-1.22
	t	0.24	-1.90	
FEV ₁ (L)	Pre	3.15 ± 0.66	2.85 ± 0.61	-1.29
	Post	3.15 ± 0.64	2.96 ± 0.64	-0.82
	t	0.08	-2.20*	
FEV ₁ (%)	Pre	87.47 ± 13.02	81.47 ± 13.23	-1.25
	Post	91.0 ± 12.95	85.60 ± 13.05	-1.14
	t	-0.80	-2.84*	
FEV ₁ /FVC (%)	Pre	83.87 ± 7.34	88.80 ± 5.81	2.04
	Post	84.07 ± 6.90	87.6 ± 6.45	1.45
	t	-0.08	0.98	
FEV ₁ /FVCp (%)	Pre	99.47 ± 8.57	105 ± 7.87	1.84
	Post	100.73 ± 7.22	103.87 ± 7.69	1.51
	t	-0.43	0.83	
PEF (L/sec)	Pre	6.99 ± 1.62	6.62 ± 2.33	-0.51
	Post	6.98 ± 1.48	7.01 ± 2.15	0.04
	t	0.04	-1.48	
PEF (%)	Pre	83.13 ± 15.25	81.07 ± 19.68	-0.32
	Post	84.87 ± 15.89	85.20 ± 15.72	0.06
	t	-0.48	-1.33	

Results showed significant change in body composition when performing mQCST and respiratory function improvement when performing QCST as well as improvement of cardiorespiratory endurance and body composition after the experiment within each group. Olson et al suggest step tests facilitate loss of body fat and promote cardiovascular and metabolic responses [9]. Our study also lies with the results from prior studies in terms of improvement of metabolism and cardiopulmonary functionality.

Prior studies that implicated High Intensity Interval Training (HIIT) suggested improvements in pulmonary functional capacities. Wormgoor et al suggested the effects on reducing body fat and subcutaneous fat [21]. Our studies also comply to the previous studies in reducing body fat, increasing skeletal muscle mass, and reducing visceral fat level.

Limitations to this study are that control variables related to daily activity that may have an impact on the results were not controlled. The height of participants varied greatly compared to the standardized height of platform which produced measurement bias. Also, a short duration of four weeks of the study cannot be generalized into long term outcomes. Future studies require better control of control variables by either matching or through crossover studies to reduce confounding bias.

Conclusion

The purpose of this study was to evaluate the effects of Queens college step test on cardiorespiratory endurance and body composition during aerobic exercise, and to find out the difference when the interval was modified. Results implied improvement in body composition when performing mQCST and respiratory function when performing QCST in addition to improvement of cardiorespiratory endurance and body composition after the experiment within each group. This suggests that altering Queens college step test into various exercise programs by modifying intervals with HIIT can provide significant improvements in cardiorespiratory endurance and body composition.

Ethical Clearance: This research was performed under the approval of Institutional Review Board (IRB) at Sunmoon University (SM-201804-024-1)

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Conflict of Interest: Nil

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A Study on the Effects of Functional Emotions Occurring at the Workplace on the Resting Activities and Emotional Recovery

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ABSTRACT

Managers within the company must indirectly propose to their subordinates who may be less capable of performing their duties rather than bluntly pointing out their work performance so that they could accept their lack of performance capability through work and organizational life, while offering help for them to enhance their performance through training in and outside of company. It will also be necessary to actively provide time and support for the cost of watching movies in group and game leagues, etc., within the department. Furthermore, it will be necessary to make facility investments to ensure that they could watch movies, play games, listen to music, and exercise during their break time by providing in-house resting areas.

Keywords: Work performance, psychological characteristics, emotional recovery, stress, recreational activities

Introduction

To enhance productivity, they improve working environment and plan the space considering convenience for the workers. Resting facilities are also acknowledged as an important space for improving productivity in this context. If resting in the industrial society were a concept created through a clear distinction from working hours, and if the division of space were also an appropriate form, resting in a modern corporate environment would appear in a more diversified and free form^[1]. If employees experience stress while they are in contact with colleagues within the organization, they could be led to a poor work performance. Consequently, phenomena of disharmony such as intention to change job and reduced organizational performance would emerge^[2]. Steelworks of Korea operates a program through which professional psychologists find the requesting departments and listen to issues of the employees through the "Mobile Psychological Lecture."^[3] However, despite such efforts at work, work related stress may cause weight gains, as well as diseases such as cardiovascular disease and diabetes^[4].

For enterprises, management of organizational stress is needed when caused by promotion, relationship with colleagues and superior officers, customer management, service management, and accidents. If it is not performed, stress may cause changes in emotions, mood, emotional behaviors within the organizations, and sentiments, whereby organizational performance and state of emotion affect work satisfaction^[1]. As such, the psychological and emotional characteristics which are caused by work performance at the workplace lead to personal issues from the workplace problems. However, there is still a lack of research on emotional recovery. From this perspective, the purpose of this study is as follows.

First, we intend to understand various psychological and emotional characteristics of human being which occur during work performance.

Second, I would analyze actual data based on research result.

Lastly, we intend to propose implications for the improvement of employee management, work performance capability, and welfare system for managers within company through the proposed result.

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Theoretical Considerations

Shame: Shame is far much more painful than a sense of guilt, and is an occurrence of widespread depreciation of self, yielding retraction and impotence^[5].

Jealousy: The concept called jealousy is divided into the two dimensions of benign envy and malicious envy, which includes negative emotions such as anger^[6].

Anger: Anger refers to growing angry by indignation in the meaning of Chinese characters. It is an emotion which results from resistance to denying or impeding the realization of one's own desire^[7].

Watching Movies: Since a product called watching movie carries a characteristic which depends on experience, demand is unclear, is an experience good, and is a durable good^[8].

Therefore, given this thesis, the following hypotheses were set.

H1: Shame will be reduced through watching movies.

H2: Jealousy will be reduced through watching movies.

H3: Anger will be reduced through watching movies.

Using Games: Online games also play a positive role in relieving stress and maintaining relationship with colleagues. Furthermore, games ensure constant communication through interactions with each game participant. In this process, the relationship with colleagues also develops^[9].

Therefore, given this thesis, the following hypotheses were set.

H4: Shame will be reduced through using games.

H5: Jealousy will be reduced through using games.

H6: Anger will be reduced through using games.

Listening to Music: Listening to music, among music therapies, is a non-invasive method which is effectively used for relaxation and anxiety reduction^[10].

Therefore, given this thesis, the following hypotheses were set.

H7: Shame will be reduced through listening to music.

H8: Jealousy will be reduced through listening to music.

H9: Anger will be reduced through listening to music.

Emotional Recovery: There exists a difference between the actual emotion by which one decides oneself for the interpersonal relationship within organization and

effective work performance and the emotion required, at which time, it may be said to be a personal effort to control and express emotions one experiences^[11].

Therefore, given this thesis, the following hypotheses were set.

H10: Watching motives will have a positive impact on emotional recovery.

H11: Using games will have a positive impact on emotional recovery

H12: Listening to music will have a positive impact on emotional recovery

Research Design

Research Model: For an empirical analysis of this study, we intend to identify the impact relationship such as the research model of [Figure 1] while focusing on the previous studies of shame, jealousy, anger, watching movies, using games, listening to music, and emotional recovery.

Operational Definition and Measurement: In this study, operational definitions were formed based on the following previous studies. For shame, H.Y. Choi(2006)^[5] was referenced, for jealousy, K.W. Park et al.(2016)^[6] was referenced, for anger, D.G. Kim (2014)^[7] was referenced, for watching movies, B.S. Jeon (2002)^[8] was referenced, for using games, Y.K. Cho (2009)^[9] was referenced, for listening to music, D.Y. Lee et al.(2010)^[10] was referenced, and lastly, for emotional recovery, H.N. Choi et al.(2016)^[11] was referenced for revision and supplementation to suit this study. For general matters, the study of J.H. Lee (2017)^[12] was referenced for use.

Data Collection and Analysis

In terms of the data collection and analysis method, judgment sampling method out of the non-probability sampling methods was used for survey. Therefore, those currently serving their employers were surveyed. Of them, 303 copies excluding 24 copies of the questionnaire inappropriate for analysis were analyzed as the valid samples. The collected valid sample was confirmed by the Cronbach's α coefficient for validating reliability, and the feasibility was validated by using the Confirmatory Factor Analysis to ensure the internal feasibility of the judgement feasibility and acceptance

feasibility. And as for the general characteristics of the survey subject, frequency analysis was used. After which,

the suitability of the structural equation model and the causal relationship for each concept were validated.

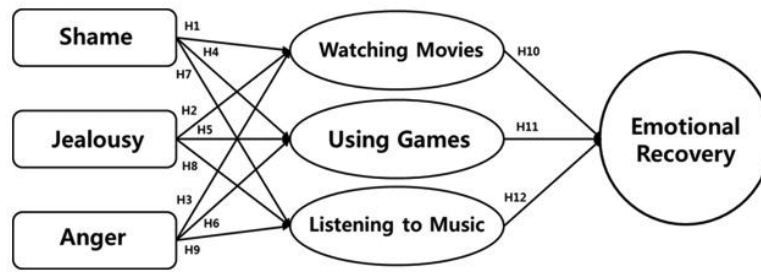


Figure 1: Hypothetical Model

Empirical Analysis

General characteristics of survey subjects

Table 1: Details the general characteristics of the survey subject.

Table 1: General characteristics of participants

Item	Division	Frequency (number of person)	%	Item	Division	Frequency (number of person)	%
Gender	Male	122	40.3	Marriage status	Yes	215	71.0
	Female	181	59.7		No	88	29.0
Age	Under 20 years old	5	1.7	Staff	Less than 5 people	43	14.2
	20 ~ 29 years old	74	24.4		6 to 9 people	25	8.3
	30 ~ 39 years old	56	18.5		10 to 19 people	48	15.8
	40 ~ 49 years old	97	32.0		20 to 39 people	91	30.0
	Over 50 years old	71	23.4		More than 40 people	96	31.7
Educational background	High school graduation	112	37.0	Number of children	0 person	110	36.3
	2-year university graduation	115	38.0		One person	46	15.2
	4-year university graduation	69	22.8		Two person	108	35.6
	Graduate M.A and above	7	2.3		Three person	39	12.9
Income	Less than 1,000,000 won	5	1.7	Industry	A manufacturing Industry	62	20.5
	1,000,000 won ~ Less than 1,500,000 won	28	9.2		Distribution Industry	43	14.2
	1,500,000 won ~ Less than 2,000,000 won	88	29.0		Service Industry	101	33.3
	2,000,000 won ~ Less than 2,500,000 won	103	34.0		The construction Industry	20	6.6
	More than 2,500,000 won	79	26.1		Etc	77	25.4
Total				303	100		

Variables and Reliability and Validity Verification:

Before an empirical analysis, the reliability and validity of the data collected were validated. The reliability and feasibility were measured through the analysis of Cronbach's Alpha coefficient and exploratory factor regarding the items of measurement

The measured items used for this study yielded 0.927 or more as in [Table 2]. If a Cronbach's Alpha coefficient is 0.6 or more, it is acknowledged to be reliable^[13].

In the light of standard, reliability seems to be sufficient.

The confirmatory factor analysis was performed to analyze the validity of the constructs. The confirmatory factor analysis is intended to analyze a measurement model to test the convergent validity and discriminant validity of the constructs. And if and when the factor load is over 0.4%, the correlation between the factor and the constituent variable is considered to be high^[14, 15, 16]. The concept validity of the constructs used for this study is provided as in [Table 2] and is also analyzed to have sufficient validity. All of the average variance extracted (AVE) yielded 0.5 or greater, and the questionnaires were analyzed to represent research items.

Table 2: Results of confirmatory factor analysis

Constructs	Question	Std. Loadings	Error Variance	t-value	p-value	Cronbach's Alpha	CR	AVE
Shame	Shame1	.880	.206	-	-	.929	0.838	0.721
	Shame2	.777	.326	***(.001)	.927			
Jealousy	Jealousy1	.876	.199	23.112	***(.001)	.926	0.939	0.836
	Jealousy2	.934	.132	***(.001)	.924			
	Jealousy3	.913	.154	-	.924			
Anger	Anger1	.609	.407	11.021	***(.001)	.926	0.670	0.504
	Anger2	.637	.358	-	.925			
Watching Movies	Watching Movies1	.908	.153	-	-	.921	0.963	0.898
	Watching Movies2	.975	.038	***(.001)	.921			
	Watching Movies3	.930	.110	***(.001)	.921			
Using Games	Using Games1	.951	.096	-	-	.921	0.977	0.933
	Using Games2	.993	.013	***(.001)	.921			
	Using Games3	.952	.092	***(.001)	.922			
Listening to Music	Listening to Music1	.934	.130	-	-	.922	0.924	0.858
	Listening to Music2	.918	.154	***(.001)	.923			
Emotional Recovery	Emotional Recovery1	.902	.183	-	-	.921	0.869	0.769
	Emotional Recovery2	.855	.281	***(.001)	.921			

A correlation analysis was performed as in [Table 3] to approximately test what direction and relationship the variables used for this study had following the confirmatory factor analysis. It appeared that variables had significant relationship between each other overall speaking.

Table 3: Correlation of matrix

Variable	Shame	Jealousy	Anger	Watching Movies	Using Games	Listening to Music	Emotional Recovery
Shame	1						
Jealousy	.680* (.059)	1					
Anger	.551* (.044)	.686* (.047)	1				
Watching Movies	.183* (.046)	.305* (.047)	.426* (.039)	1			

Conted...

Using Games	.147* (.051)	.284* (.053)	.422* (.044)	.635* (.058)	1		
Listening to Music	.317* (.054)	.374* (.055)	.418* (.044)	.648* (.059)	.543* (.062)	1	
Emotional Recovery	.279* (.052)	.389* (.054)	.483* (.044)	.810* (.062)	.693* (.065)	.698* (.066)	1

Notice) *p.01

Notice) () Estimate Value Meaning

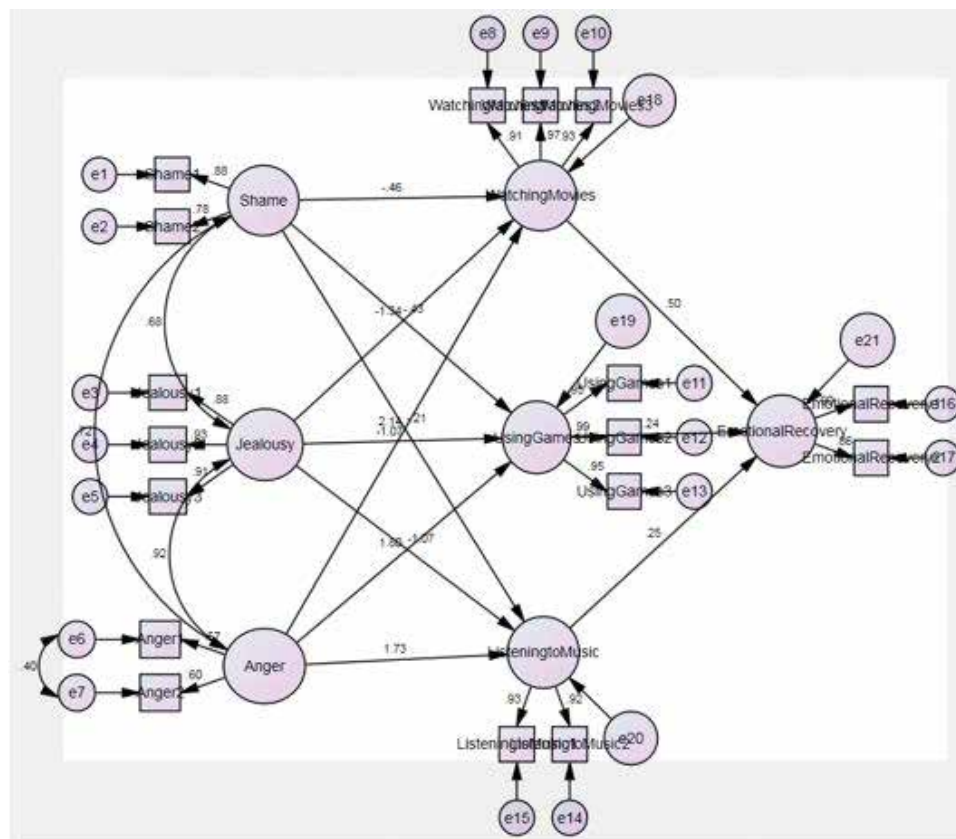
Model Analysis and Hypothesis Testing

Structural Equation Model and Path Coefficient: To analyze the structural equation model, shame, jealousy, and anger were set as potential exogenous variables, while watching movies, using games, and listening to music were set as endogenous variables, and emotional recovery was set as endogenous variable.

The overall fitness index of the model proposed in this study is as provided in [Figure 2]. It was $X^2=271.907$, $d.f=103$, $p=.000$, $X^2/d.f=2.640$, $RMR=.039$, $RMSEA=.074$, $GFI=.907$, $AGFI=.861$, $PGFI=.610$, $NFI=.949$, $RFI=.933$, $IFI=.968$, $TLI=.957$, and $CFI=.968$, and if compared to the reference value,

it presented a satisfactory figure. That is, in terms of the fitness, $X^2/d.f$ appeared to be less than 3, while GFI, AGFI, NFI, RFI, IFI, TLI, and CFI were mostly larger than 0.9, and RMR appears to be lower than 0.05, and so overall speaking, it may be determined to be a model which may be used to test the hypothesis of this study.

Verification of research hypothesis: [Table 4] provides the summarized testing results for 12 hypotheses set in the structural relationship. Among the entire research hypotheses, 6 hypotheses were adopted whose p-Value appeared to be lower than 0.05 and the t-Value appeared to be in the same direction of setting hypothesis. The testing result of the research hypothesis via the structural equation is as follows.



$X^2=271.907$, $d.f=103$, $p=.000$, $X^2/d.f=2.640$, $RMR=.039$, $RMSEA=.074$, $GFI=.907$, $AGFI=.861$, $PGFI=.610$, $NFI=.949$, $RFI=.933$, $IFI=.968$, $TLI=.957$, $CFI=.968$

Figure 2: Path coefficients of Model

The relationship between shame and watching movies ($\beta=-.46$, $t=-1.774$, $p=.076$), and that of anger and watching movies ($\beta=2.14$, $t=4.609$, $p=.000$) did not appear to be statistically significant, and so hypotheses 1 and 3 were rejected. However, the relationship between jealousy and watching movies ($\beta=-1.34$, $t=-3.095$, $p=.002$) is statistically significant and negative, so hypothesis 2 was adopted.

The relationship between shame and using games ($\beta=-.43$, $t=-1.946$, $p=.052$) and that of anger and using games ($\beta=1.80$, $t=4.586$, $p=.000$) did not appear to be statistically significant, so hypotheses 4 and 6 were rejected. However, hypothesis 5 was adopted since the relationship between jealousy and using games ($\beta=-1.07$, $t=-2.892$, $p=.004$) is statistically significant and negative.

The relationship between shame and listening to music ($\beta=-.21$, $t=-.995$, $p=.320$) and that of anger and listening to music ($\beta=1.73$, $t=4.562$, $p=.000$) did not appear to be statistically significant, so hypotheses 7 and 9 were rejected. However, hypothesis 8 was adopted since the relationship between jealousy and listening to music ($\beta=-1.07$, $t=-2.978$, $p=.003$) was statistically significant and negative.

The relationship between watching movies and emotional recovery ($\beta=.50$, $t=8.452$, $p=.000$), that of using games and emotional recovery ($\beta=.24$, $t=4.745$, $p=.000$), and that of listening to music and emotional recovery ($\beta=.25$, $t=4.569$, $p=.000$) are statistically positive, so hypotheses 10, 11, and 12 were adopted.

Conclusion

This study has implications as follows.

First, it shows that shame does not significantly affect watching movies, using games, and listening to music. The result of such analysis indicates that the employees desire to avoid contact services with customers as they are pointed out by their superior officers that they lack performance skills or that they do not perform well by the customers. Therefore, workers endeavor to overcome their shame by watching movies, using games and listening to music on their own, yet these 3 recreational and hobbies alone are not enough to overcome the difficulties. Therefore, managers within the company need to indirectly propose to their subordinates so that they could accept the fact that they

lack performance skills through work and organizational life rather than bluntly pointing them out, and moreover, help them enhance work performance via training in and outside of the company.

Second, jealousy appears to have a significant impact on watching movies, using games, and listening to music. The result of such analysis indicates that while the employees lose their joy and interest in their work life given the competition from other departments or their omission from promotion, they are overcoming the difficulties of their work life by watching movies, using games, and listening to music. Therefore, managers within the company will need to actively provide time and support to pay for watching movies in group or play game league within the department to which their subordinates are affiliated. Furthermore, they will need to invest in facilities to enable watching movies, using games, and listening to music during their break times.

Third, anger did not appear to have a significant impact on watching movies, using games, and listening to music. The result of such analysis indicates that employees are enraged when they are angered as they fail to perform well in the line of duty or if they are embarrassed by their superior officers that they are not handling work properly amidst their colleagues and customers. So while they endeavor to relieve of their rage through watching movies, using games, and listening to music, it is apparent that the then situation continues to hover their head, and their rage does not fade away. Therefore, managers at the company will need to enable their subordinates to use exercise facilities to help them move their body during their break times by recognizing that they are under stress. Furthermore, if one makes a mistake, they will need to talk to them about it in a quiet space privately.

Finally, the relationship between watching movies and emotional recovery, that of using games and emotional recovery, and that of listening to music and emotional recovery appears to have a significant impact. The results of such analysis indicate that Pygmalion effect is achieved whereby employees believe that they can perform well through watching movies, using games, and listening to music. In addition, they are also building a positive perception that the counterpart who caused shame, jealousy, and anger will someday apologize and compensate. Accordingly, managers at the company will need to continuously deploy new movies, games, and

music in the resting areas so that their subordinates can enjoy various movies, games, and music. Furthermore, they will need to monitor which colleagues and superior officers caused troubles while subordinates perform work and provide time and support to pay for their recreational activities and hobbies in a natural way.

Regardless of how this study endeavored to propose meaningful results and implications, there continue to be issues to be solved moving forward. Studies will need to be conducted by dividing the assailants who caused shame and situations, situations which caused anger, and subjects in detail. Furthermore, it will be necessary to divide and approach the relationship of impact between the emotional recovery and recreational activities and hobbies by identifying the latter, which are mainly enjoyed by those employed on top of watching movies, using games, and listening to music.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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The Effect of Experiencing School Violence Victimization and Stress on School Life Adaptation of Adolescents: The Moderated Mediation Model of a Growth Mindset

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ABSTRACT

Background/Objectives: The purpose of this study was to investigate the moderating effect of growth mindset on the mediating effect of stress on relationship between school violence victimization and school adaptation.

Method/Statistical Analysis: The subjects of this study were 1,250 students living in H and S city of Chungnam-do, Korea. The collected data are analyzed using correlation analysis, frequency analysis, and moderating mediation effect.

Findings: First, the correlation analysis showed a positive correlation between school violence victimization and stress, growth mindset and school adaptation. And, the school violence victimization was negatively correlated with a growth mindset and school adaptation, and stress was negatively correlated with a growth mindset and school adaptation. Second, the stress mediated the relationship between school violence victimization experiences and school adaptation. Third, growth mindset moderated the relationship between stress and school adaptation. Fourth, growth mindset moderated the mediating relationship of stress between school violence victimization and school adaptation.

Improvements/Applications: Finally, based on the results of this study, it was suggested that the program to improve their growth mindset should be developed to increase school adaptation. In addition, we discussed regional comparisons through nationwide sampling, research on various age groups, and directions for research targeting only vulnerable groups.

Keywords: *Experience of school violence victimization, Stress, School life adaptation, Growth mindset, Moderated Mediation Effect*

Introduction

School violence is defined as an act involving damage to the body, mind or property by means of injury, assault, imprisonment, treatment, kidnapping and luring, defamation, insult, intimidation, forced or compulsory

errands and sexual violence, bullying, and obscene and violent information using information networks to reach students within or outside the school¹. School violence is one of the four major evilness designated by the government and is becoming a social problem beyond the school fence. According to a recent survey conducted in Korea, 8.5% of elementary, middle, and high school students responded that they had experienced school violence². By school level, 11.1% of elementary school students, 10.0% of middle school students, and 4.2% of high school students experienced violence at school. Thus, the lower the school level, the higher the chance of experiencing violence. Specifically, 33.9% experienced abuse, 16.2% were involved in money laundering, and 11.4% were bullies³.

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Studies on the effects of school violence on the school maladjustment of victims have mainly focused on finding the cause through the psychological characteristics or behavior of the student victims. Experiencing violence in school increases students' stress and if an individual experiences repeated school violence, the stress is increased, resulting in school maladjustment⁴. In particular, the higher the grade, the greater the stress level of students who experienced school violence differed from those students who did not experience violence⁵. These stresses were most often seen in adolescents experiencing school violence and these students manifested greater difficulties adapting to school life compared to those who had not experienced school violence.

This research focused on exploring the problems not adequately explained to students who were generally well-adapted to school life after experiencing school violence. In addition, there is still a lack of research on what factors contribute to school adaptation in school violence victims. In this study, we were interested in the influence of students' growth mindsets as a moderating variable.

Dweck⁶ divided the mindset of the individual into fixed and growth mindsets. People with a fixed mindset believe that his qualities and talents do not change, while a growth mindset is a belief that one's talent and intelligence can be improved with effort⁷. Considering the findings that a growth mindset affects the motivation pattern, it is expected that mindset will have a significant impact to moderate the stress in the relationship between school violence experiences and school adaptation. Specifically, it is expected that a growth mindset will have a positive impact but that a fixed mindset will have a negative impact.

Previous studies have only examined the relationship between the personal damage caused by school violence and self-esteem, school-related stress, and human rights and their effects but studies examining the moderating effects or mediating effects of specific psychological variables are lacking. Therefore, it is necessary to study the effects of stress and a growth mindset on the relationship between students' experiences of school violence and school adaptation. In particular, although the growth mindset of students is an important factor in their growth process, sufficient research has not been conducted.

Therefore, the purpose of this study was to investigate the moderated mediation effect of the growth

mindset on the mediating effect of stress between the experience of school violence and school adaptation.

This study investigated the following research questions: First, is there any difference in school adaptation according to general characteristics? Second, what is the correlation between the main variables? Third, does youth's growth mindsets moderate the mediating effect of stress on the relationship between school violence victimization and school adaptation?

It is expected that the students' growth mindsets will play an important role in positively adapting to individual growth, change, and school life. Therefore, the results of this study can suggest the practical implications, as well as the theoretical implications, of mitigating the stress of the school violence victimization experience and to maintain a smooth school life.

Method

Research Model: Based on the previous research, the research model for the mediating effect of stress and the moderating mediation effect of growth mindset in the relationship between the experience of school violence victimization and school life adaptation, was established in [Figure 1].

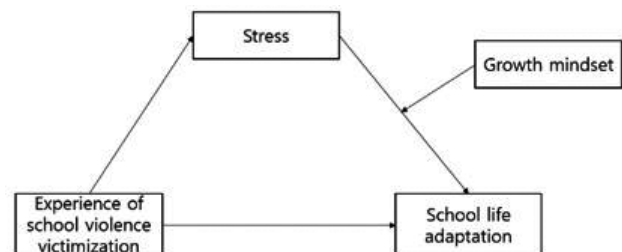


Figure 1: Research model

Study Subjects: The subjects of this study were a total of 1,250 students from elementary, middle, and high schools in H and S city in Chungcheongnam-do. The survey was conducted from November 2018 to January 2019. A total of 1,176 copies of the collected questionnaires were used for the final analysis. Surveys from students who responded inappropriately were excluded from the analyses.

There were 532 male students (45.2%) and 644 female students (54.8%). There were 246 students (20.9%) in elementary school, 458 students (38.9%) in middle school, and 472 students (40.1%) in high school. Of the participants, 243 (20.7%) were high achievers,

632(53.7%) were middle achievers, and 281(23.9%) were low achievers.

Research Tools

School Violence Victimization Experience: In order to measure the school violence victimization experiences, we modified and supplemented the items used by Olweus⁸ with seven zitems related to the victimization experience. This scale consisted of questions related to the experience of verbal violence, physical violence, money laundering, bullying, coercion, sexual violence, and cyber violence. A total of seven items were rated on a 5-point Likert scale from 1 = not at all to 5 = highly agree. The higher the score, the higher the school violence victimization experience. In this study, the reliability of the scale determined by Cronbach's α was 0.854.

Stress: In order to measure stress in the adolescents, we used the BEPSI-K (Brief Encounter Psychosocial Instrument-Korean), which is the Korean Version Stress Measurement Tool used by Lee et al.⁹. It consists of five items and each item is rated on a 5-point Likert scale from 1 = not at all to 5 = highly agree. The higher the score, the higher the stress. The Cronbach's alpha value for this scale was 0.866.

Growth Mindset: We used the growth mindset scale developed by Dweck¹⁰ and translated by Lee et al.¹¹. This scale consists of two sub-factors, four items on the growth mindset about intelligence and four items on the growth mindset about personality. Each item is rated on a 5-point Likert scale from 1 = not at all to 5 = highly agree. The higher the score, the higher the growth mindset. In this study, Cronbach's α for this scale was 0.734 for intelligence and 0.660 for personality.

School Life Adaptation: School life adaptation was measured using the scale used by Kim¹². This scale is divided into four sub-factors and consists of 20 items, each of which consists of five items on teacher relationships, peer relationships, school classes, and school rules. Each item is rated on a 5-point Likert scale from 1 = not at all to 5 = highly agree. The higher the score, the higher the adaptation to school life. The reliability of this scale, Cronbach's α , was found to be 0.820 for teacher relationships, 0.826 for peer relationships, 0.784 for school classes, and 0.762 for school rules.

General Characteristics: Gender, school level, academic achievement, family type, and family income were measured.

Data Analysis: The collected data were analyzed using SPSS Win 23.0 and SPSS PROCESS Macro. The Student's t-test and ANOVA were used to analyze the differences in school adaptation according to the general characteristics of the subjects and Duncan/Dunnett T3 was used for post-tests. In addition, correlation analyses were performed to identify the correlation between the main variables used in the study. Model 14 of the SPSS PROCESS Macro proposed by Hayes (2018) was used to determine the moderated mediation effect.

Results and Discussion

Correlation of Main Variables: The results of correlation analysis showed that the experience of school violence victimization was positively correlated with stress, a growth mindset was positively correlated with school adaptation, the experience of school violence victimization was negatively correlated with a growth mindset and school adaptation, and stress was negatively correlated with a growth mindset and school adaptation. Among these, a growth mindset and school adaptation ($r = 0.373$, $p < 0.01$) showed the highest correlation, followed by the experience of school violence victimization and school adaptation ($r = 0.01$), and stress and school adaptation ($r = -0.234$, $p < 0.01$). The overall correlation coefficients ranged from -0.333 to 0.373 and there was no multicollinearity of the major variables.

The results of the correlation analysis between the main variables are shown in [Table 1].

Table 1: Correlation Coefficients between Major Variables

	1.	2.	3.	4.
1. Experience of school violence victimization	1			
2. Stress	.174**	1		
3. Growth mindset	-.121**	-.162**	1	
4. School life adaptation	-.333**	-.234**	.373**	1
Average	1.16	2.68	3.50	3.61
Standard Deviation	.34	1.02	.68	.57

** $p < 0.01$

The Moderated Mediation Effects of a Growth Mindset on the Relationship between the Experience of School Violence Victimization and School Life Adaptation through Stress: In order to test whether the mediating effect of stress was moderated by a growth mindset in the relationship between students' school violence victimization experiences and school adaptation, we analyzed Model 14 of the SPSS PROCESS macro proposed by Hayes and the results are shown in [Figure 2] and [Table 2].

According to the results of the analysis, school violence victimization experiences had a statistically significant positive effect on stress ($\beta = 0.5375$, $p < 0.001$) and stress had a significant negative effect on school adaptation ($\beta = 0.0776$, $p < 0.001$). In addition, school violence victimization experiences had a significant negative effect on school adaptation ($\beta = -0.4331$, $p < 0.001$). School violence victimization experiences have a significant effect on stress and stress has a significant effect on school adaptation. Thus, stress played a mediating role between school violence victimization experiences and school adaptation. This is consistent with a previous study which reported that school violence victimization experiences increased students' stress and caused school maladjustment¹³. In the school environment, peer bullying, schoolwork pressure, perceived unfair treatment by teachers, fear and anxiety of failure, and negative feelings about school are major stresses for adolescents¹⁴. Especially, adolescents with school violence victimization experiences and those with overlapping victimization experiences feel a high degree of stress and this manifests as school maladaptation.

In contrast, the interaction between stress and a growth mindset had a significant effect on school adaptation ($\beta = -0.0496$, $p < 0.001$). These results indicate that the school violence victimization experience had a meaningful relationship to reduce school adaptation by mediating the variable of stress. This means that the effect of stress on school adaptation, the dependent variable, depended on the growth mindset, which was the moderating variable. A student with a growth mindset is different from a student with a fixed mindset in their goal orientation, achievement standards, belief in effort, attitude toward failure, view of challenges and obstacles, reaction to criticism, and opinions about the success of others¹⁵. As a result, students with a growth mindset were reported to have an adaptive motivation style which helped them adjust to school life, while those with a fixed mindset had a maladaptive motivation style¹⁶. To increase students' growth mindset in order to improve their school adaptation, we need to find ways to lower stress and improve psychological well-being.

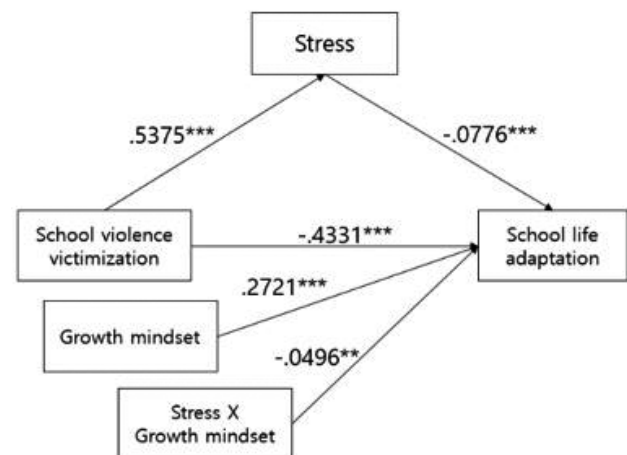


Figure 2: Statistical Model of the Moderated Mediation Effect of a Growth Mindset

Table 2: The Moderating Effect of a Growth Mindset on the Relationship between Stress and School Adaptation

Variables			Effect	SE	t-value	p
Mediating variable model (Dependent variable: Stress)						
Constant			-.6296	.0983	-6.4023	.0000
School violence victimization	→	Stress	.5375	.0804	6.6833	.0000
Dependence variable model (Dependent variable: School life adaptation)						
Constant			4.1144	.0498	82.6128	.0000
School violence victimization	→	School life adaptation	-.4331	.0408	-10.6229	.0000
Stress	→	School life adaptation	.0776	.0142	-5.4865	.0000
Growth mindset	→	School life adaptation	.2721	.0210	12.9505	.0000
Stress × Growth mindset	→	School life adaptation	-.0496	.0184	-2.6926	.0072

The significance domain for the entire range of the moderating variable was analyzed using the Johnson-Neyman method. As shown in [Table 3], the conditional effect according to the moderating variable value was significant. This means that the relationship between stress and school adaptation was moderated in a region

where the growth mindset was higher than -0.7596. The rate of a significant moderating effect among the research subjects was 92.5%, and 7.5% showed no significant moderating effect. This means that the higher the growth mindset, the less the negative effect of stress on school adaptation.

Table 3: The Moderating Area according to a Growth Mindset

Growth	mindset	Effect	se	t p	LLCI*	ULCI**
-2.5015	.0464	.0488	.9506	.3420	-.0494	.1423
:						
-.9015	-.0329	.0223	-1.4747	.1406	.0767	.0109
-.7596	-.0400	.0204	-1.9619	.0500	.0799	.0000
-.7015	-.0428	.0196	-2.1843	.0291	-.0813	-.0044
:						
1.4985	-.1520	.0304	-4.9973	.0000	-.2116	-.0923

*LLCI = The lower limit of the indirect effect within the 95% confidence interval

**ULCI = The higher limit of the indirect effect within the 95% confidence interval

To confirm the shape of a growth mindset according to the moderating effect, the graph in [Figure 3] was generated. The moderating variable, growth mindset, was divided into three groups: high, medium, and low. School adaptation according to stress was higher in the order of high, medium, and low growth mindsets. In other words, the effect of stress on school adaptation showed that the higher the growth mindset, the higher the school adaptation.

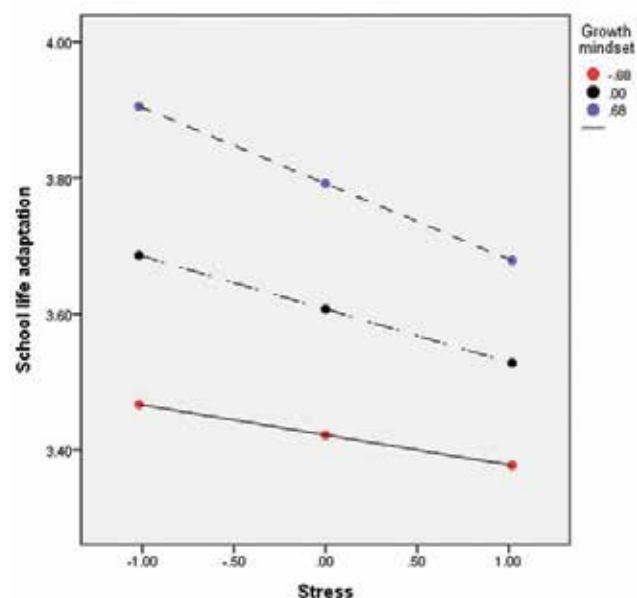


Figure 3: The Moderating Effect of Growth Mindset on the Relationship between Stress and School Adaptation

Finally, the conditional indirect effect of the independent variables on the dependent variables according to the specific values of the moderating variables is shown in [Table 4]. The conditional indirect effect of a growth mindset on stress (school violence victimization experience → stress → school adaptation) was significant in the range from M to M + 1SD.

Table 4: The Moderated Mediation Effect of a Growth Mindset in the Relationship between School Violence Victimization Experience and School Adaptation

Conditional indirect effect	β	Boot Se	LLCI*	ULCI**
M-1SD(-.6788)	-.0236	.0151	-.0562	.0033
M(.0000)	-.0417	.0106	-.0653	-.0233
M+1SD(.6788)	-.0598	.0138	-.0895	-.0355

*LLCI=The lower limit of the indirect effect within the 95% confidence interval

**ULCI=The higher limit of the indirect effect within the 95% confidence interval

The results of the moderated mediation effect analysis showed that the growth mindset regulated the influence of the increased stress on school adaptation due to the experience of school violence victimization. Most previous studies have focused on the relationship between stress and school adaptation¹⁷ but this study showed that the growth mindset can mitigate the negative

effect of stress on school adaptation. These studies are very rare. Based on the results of this study, programs should be developed to overcome stress and improve school adaptation through activities which can improve the growth mindset when adolescents' school violence victimization experiences affect school adaptation through stress.

Conclusion

The purpose of this study was to investigate whether a growth mindset moderated the influence of increased stress on school adaptation due to the experience of school violence victimization. The results showed that stress mediated the relationship between school violence victimization experiences and school adaptation, and a growth mindset moderated the relationship between stress and school adaptation, and moderated the mediating effect when stress affected school adaptation. Based on the results of this study, ways to improve students' adaptation to school were discussed.

Based on the limitations of this study, suggestions for future research are as follows: First, this study was limited to students in the Chungnam area. In the future, nationwide sampling should be done and thus, regional comparisons should be possible. Second, in this study, the differences in school adaptation according to gender were verified but did not show results consistent with previous studies. In the future, the psychological and behavioral factors affecting school adaptation according to gender should be analyzed concretely and the relation with the growth mindset showing the moderating effect in this study should also be investigated. Third, this study examined a growth mindset as a psychological variable affecting students' stress relief but research should also be conducted to analyze the influence on school adaptation by positive psychological factors, such as happiness, hope, and grit. Despite these limitations, this study was the first to reveal the moderated mediation effects of a growth mindset on students' school adaptation. Therefore, this study is meaningful in that it provided new basic data for the development of a growth mindset improvement program to improve the school adaptation of students.

Ethical Clearance: Not required

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Conflict of Interest: The authors declare no conflict of interest.

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Mother's Babyface and Children's Happiness: The Dual Mediating Effects of Self-Efficacy and Resilience

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ABSTRACT

Background/Objectives: The purpose of this study was to analyze the dual mediating effects of self-efficacy and resilience in the effects of mother's babyface on their children's happiness.

Method/Statistical Analysis: Data were collected through surveys. The surveys were conducted for mothers of children attending in elementary and junior high schools. 307 copies were used for the final analysis. SPSS PC + Win. 23 and SPSS PROCESS macro 3.1 were used to analyze descriptive statistics, frequency analysis, reliability analysis, correlation analysis, and double mediation effect analysis.

Findings: Research findings were as follows. First, there was a significant positive correlation among mother's babyface, self-efficacy, resilience, and happiness. Second, the indirect effect of self-efficacy was verified in the relationship between mother's babyface, and happiness of children. On the other hand, indirect effects of resilience did not appear in the relationship between mother's babyface and children's happiness. Indirect effects of self-efficacy and resilience on the relationship between mother's babyface, and children's happiness were verified.

Improvements/Applications: These results can be applied to increase children's happiness by using mothers' variables such as mother's babyface, self-efficacy and resilience.

Keywords: *Mother's babyface, Happiness, Self-efficacy, Resilience, Dual Mediating Effects*

Introduction

Happiness is the greatest goal that humans pursue. This happiness is the cognitive and emotional evaluation of life and is defined as the degree of positive judgment of an individual's qualitative level of life, rather than a momentary feeling or mood, and more like a relatively constant sense of security^{1,2}. It also means to feel satisfied and pleased with life, and to feel and think that life is worthwhile.³ These components of happiness have been consistently studied, including cognitive life satisfaction, frequent positive emotions, and low frequency negative emotions.¹

In addition, Lee et al.⁴ reported that from qualitative research, Korean and Canadian students responded that family, important relationships with others, and personal ability as the most frequent elements of happiness, which differed in their rankings. Similar factors have been extracted in a study on the components of happy life in Korean adults.⁵ In relation to children, Lee⁶ developed the Infant Happiness Scale and suggested nine components such as immersion, spirituality, and life satisfaction, as components of the scale. This happiness is not only the diversity of definition, but also the diversity of components, and academicians are also accepting it.

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Studies have shown that children's happiness is ranked low. According to the International Comparison of Happiness Index in 2017, Korean children and adolescents feel material happiness is the second highest in the world, while subjective well-being is the lowest in the 20th rank.⁷ Therefore, the problem of improving the happiness of Korean children is imperative and must be studied

The most important factor promoting the child's happiness is the parent factor. Parents are members of society who produce children within the primary group of families, play primary responsibilities and roles in the socialization of their children, and affect all aspects of their children's lives. However, recent studies have shown that mother's babyface and appearance management behavior, affect not only their own development, but also their children's development.^{8,9}

The face is particularly important for human adaptation to a particular environment, because the face expresses much information that is crucial for a successful social relationship.¹⁰ The mother's babyface is the face of an adult with the characteristics of a baby face, and a psychology that makes her to appear to be younger than her actual age.¹¹ In this way, while it started from a psychological desire, there are studies that the mother's babyface helps to form a positive image of her relative to how others perceive her.

Adults with young faces are perceived as a fixed idea, in that they are relatively more trustworthy, honest, kind, and warm relative to adults with mature faces in legal, business, and political contexts.^{9,12-14} Also, there is a study by Chang and Chen¹⁵ that investigated how a doctor's babyface affected people's perception and judgment before and after the occurrence of medical fraud. The physician with the babyface showed higher expectation, satisfaction, and intended fulfillment of the patient than the adult face doctor. These mother's babyface effects are defined as the schematic theory, and people use the scheme mother's babyface stereotypes to evaluate and judge others.^{16,17}

In addition, According to subject relationship theorists, infants with a positive image of their mother are emotionally well controlled,¹⁸ able to correctly perceive and express their own emotions, and be proud of them.¹⁹ Positive image formation of the infant to the parents has a positive influence on the infant's environment, and the infant's social and emotional development. Therefore, it is also crucial to identify if the mother's babyface affects the children's happiness.

Variables affecting the happiness of the child are self-efficacy. Self-efficacy is not a perceived skill, but a belief in an ability to do what he or she can in any situation. It is not about beliefs associated with an performing certain actions. This is about beliefs associated with an ability to integrate and harmonize skills and abilities in changing and challenging situations.²⁰

Another variable that affects children's happiness is resilience. Resilience is a very abstract and complex concept. It is defined as the ability to return to the former adaptation level, after losing the function when an individual experiences adversity or difficulty,²¹ the power to take all forms of adversity and difficulties that come upon as a stepping stone,²² the positive strength to overcome, and adversity to overcome a hard life and adversity,²³ and the cognitive ability to overcome crisis or adversity, and return to a happy or positive state.²⁴

People with high resilience do not perceive risk factors as negative or threatening positives, but rather often give positive values to the risks they face.²⁵ In addition, a person with a high resilience sees himself or herself with an opportunity to mature in search of positive meaning and positive values in the process of overcoming suffering and adversity.²⁶ It is necessary to identify mothers' impact on their children in the high resilience of mothers.

On the other hand, domestic studies on the mother's babyface are mainly focused on the make-up technique,²⁷ and the study that mother's babyface image make-up indirectly affects happiness via makeup motive and appearance management behavior.¹¹ There is also a study that the interaction of mother's babyface image make-up awareness and appearance management behavior, has a significant effect on subjective well-being.¹¹ However, since research on the mother's babyface is at the beginning stage, there is no study about the relationship between the mother's babyface and children's happiness.

In addition, based on the previous research, it is predicted that mother's babyface will directly affect the happiness of children, but it is also meaningful to understand if resilience and efficacy mediate these relations. According to previous studies,²⁷ resilience and self-efficacy have been reported to play a mediating role, although they have direct effects. Therefore in this study, we tried to understand the serial double mediating effects of the resilience and efficacy.

The purpose of this study was to analyze the dual mediating effects of self-efficacy and resilience in the effects of mother's babyface on their children's happiness. To achieve this goal, research questions were set as follows. First, what is the correlation between mother's babyface, efficacy, resilience and children's happiness? Second, does self-efficacy and resilience mediate the relationship between mother's babyface and children's happiness in a double serial fashion?

Method

Research Model: To determine if self-efficacy and resilience mediate in the relationship between mother's babyface and children's happiness, we developed the following research model based on previous studies. [Figure 1].

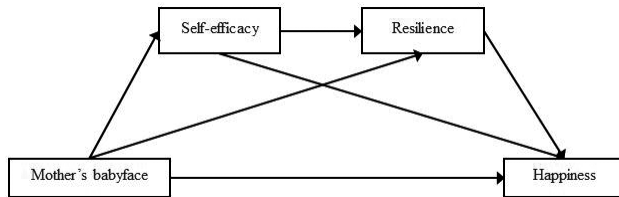


Figure 1: Research model

Survey subjects and methods of data collection:

Data were collected through surveys. The surveys were conducted for mothers of children attending in elementary and junior high schools in T county, Chungcheongnam-do, June-July, 2018. The questionnaire was distributed to 350 mothers and collected after 1-2 weeks. 307 copies were used for the final analysis except for the unfair responses.

Research Tools

Mother's Babyface: Based on 6 items of face image scale developed by Song,³² 6 items used by Park³³ and image management behavior developed by Park³³ we developed the question, sought the expert advice to secure facial validity, tested reliability, and finally developed the mother's babyface scale. Each item was rated on a 5-point Likert scale from "1=not at all" to "5=very agree". The higher the score, the higher the level of mother's babyface. In this study, the Cronbach alpha for negative evaluation was .93

Self-efficacy: The self-efficacy scale (SES) developed by Sherer et al.³⁴ was modified, and used to suit the subject of the application. The scale consists of 23 items and consists of two subscales: general self-efficacy 17 items and social self-efficacy 6 items in interpersonal relationship. Each item was rated on a 5-point Likert scale from "1=not at all" to "5=very agree". The higher the score, the higher the self-efficacy. In this study, the Cronbach alpha for negative evaluation was .912

Resilience: Based on the Resilience Quotient Test (RQT) of Reivich and Shatte,²⁸ we used the Korean Resilience

Quotient-53 (KRQ-53) modified by Kim.²⁹ The scale consists of 53 items and is divided into three sub-factors: self-control ability, interpersonal ability, and affirmative ability. Each item was rated on a 5-point Likert scale from "1=not at all" to "5=very agree". The higher the score, the higher the recovery power. In this study, the Cronbach alpha for negative evaluation was .912

Happiness: To measure the child's happiness, the Infant Happiness scale developed and validated by Lee⁶ was used. This scale is intended to respond to the degree of happiness of a child whose parents are originally attending an early childhood education program, and has nine sub-factors: commitment, health, spirituality, peer relationship, teacher relationship, cognition and achievement, emotion. It consists of 36 items and each item was rated on a 5-point Likert scale from "1=not at all" to "5=very agree". The higher the score, the higher the happiness of the child perceived by the parent. In this study, the Cronbach alpha for negative evaluation was .944.

Data Analysis: In this study, we used SPSS PC + Win. 21.0 and SPSS PROCESS macro 3.2. First, to analyze the general characteristics of the subject, frequency analysis was used, to analyse the internal consistency reliability coefficient, Cronbach's α was used, and to determine the correlation between the variables, Pearson's correlation coefficient was used. Second, we used the SPSS PROCESS macro proposed by Hayes³⁰ to identify the mediating effect of efficacy and resilience in the relationship between mother's babyface and children's happiness. The serial double mediation effect test used bootstrap. The number of samples was set at 5,000, and the confidence interval was set to 95%.

Results and Discussion

Correlation analysis was performed to determine the correlation between variables. There was a significant positive correlation among mother's babyface, self-efficacy, resilience, and happiness. In particular, the correlation coefficient between self-efficacy and resilience was the highest at $r = .827$, followed by resilience and happiness at $r = .707$. Descriptive statistics of all variables showed that the average score exceeded the median score of 3.

Table 1: Analysis of correlation and descriptive statistics

	1	2	3	4	M	SD
1.Mother's babyface	1				3.1382	0.77568
2.Self-efficacy	.508**	1			3.456	0.66487
3.Resilience	.435**	.827**	1		3.5825	0.59795
4.Happiness	.515**	.707**	.651**	1	3.7044	0.57646

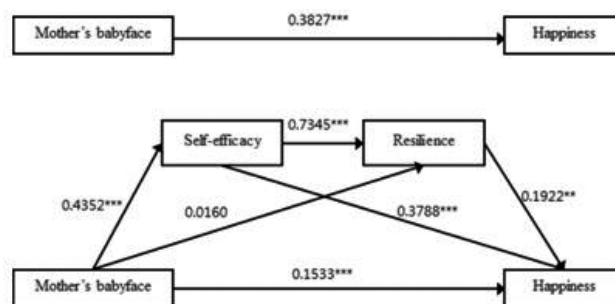
**p<.01

To examine the serial dual mediating effect of self-efficacy and resilience in the relationship between mother's babyface and children's happiness SPSS PROCESS macro model 6 proposed by Hayes³⁷ was used. As a result of analysis, and self-efficacy also had a significant effect on the children's happiness (0.4352, p<.001), and efficacy had a significant effect on resilience (0.7345, p<.001). In addition, while mother's babyface did not have a significant effect on resilience (0.0160, p>.05), resilience had a significant effect on child's happiness (0.1922, p<.01).

On the other hand, the total effect of the path between mother's babyface and the child's happiness was 0.3827 (p<.001), while the direct effect of the path between mother's babyface and the children's happiness was reduced to 0.1533(p<.001). Mother's babyface has a significant effect on self-efficacy, which then has a significant effect on resilience, and resilience has a significant effect on children's happiness. In addition, the total effect of pathways between mother's babyface and happiness are greater than direct effects. Those results

means that there is a dual mediation effect. Therefore, dual mediation effect, that is, indirect effect was verified.

These results are based on the assumption in the previous study that efficacy affects resilience, and that these two variables mediate in the relationship between mother's babyface and children's happiness. As a result of the analysis, the dual mediation effect was verified. Therefore, it is also effective to use the double-mediated relationship of efficacy and resilience as well as the mother's babyface to enhance children's happiness.



p<.01, *p<.001

Figure 2: Result of path analysis**Table 2: Result of path analysis**

Variable	Effect	SE	t-value	p	LLCI	ULCI
Mediating variable model (Dependent variable: self-efficacy)						
Constance	2.0903	.1367	15.2941	.0000	1.8213	2.3592
Mother's babyface	.4352	.0423	10.2927	.0000	.3520	.5184
Mediating variable model (Dependent variable: resilience)						
Constance	.9937	.1067	9.3158	.0000	.7838	1.2036
Mother's babyface	.0160	.0288	.5566	.5782	-.0407	.0727
Self-efficacy	.7345	.0336	21.8485	.0000	.6684	.8007
Dependent variable model (Dependent variable: Happiness)						
Constance	1.2255	.1403	8.7323	.0000	.9493	1.5017
Mother's babyface	.1533	.0335	4.5818	.0000	.0875	.2191
Self-efficacy	.3788	.0625	6.0565	.0000	.2557	.5019
Resilience	.1922	.0666	2.8880	.0042	.0612	.3232

Table 3 shows the indirect effects of self-efficacy and resilience using bootstrap. There is no zero in the upper and lower limits of bootstrap in indirect effect 1. Therefore, the indirect effect of self-efficacy was verified. On the other hand, indirect effects of resilience in the relationship between mother's babyface and children's happiness did not show any indirect effect because there is zero in the upper and lower limits of bootstrap. The indirect effect of self-efficacy and resilience in the relationship between mother's babyface and children's

happiness was confirmed, because there was no zero in the upper and lower limits of bootstrap. Therefore, the dual mediating effect were verified.

These results are in agreement with previous research that resilience and efficacy play mediating roles.³⁸ Therefore, this study identified one path that mother's babyface affects self-efficacy, self-efficacy affects resilience and finally resilience affects children's happiness. It is necessary to develop a specific program that can enhance the happiness of children by using this path.

Table 3: The indirect effect of self-efficacy and resilience

Path	Effect	Boot SE	BootLLCI	BootULCI
Total effect	.2294	.0310	.1682	.2887
Ind 1: Mother's babyface → Self-efficacy → Happiness	.1649	.0349	.0977	.2356
Ind 2: Mother's babyface → Resilience → Happiness	.0031	.0065	-.0094	.0172
Ind 3: Mother's babyface → Self-efficacy → Resilience → Happiness	.0614	.0228	.0186	.1064

Conclusion

The purpose of this study was to analyze the dual mediation effect of self-efficacy and resilience in the effects of mother's babyface on their children's happiness. First, there was a significant positive correlation among mother's babyface, self-efficacy, resilience and happiness. Second, the indirect effect of self-efficacy was verified in the relationship between mother's babyface and children's happiness. On the other hand, the indirect effects of resilience did not appear in the relationship between mother's babyface and children's happiness. The indirect effects of self-efficacy and resilience on the relationship between mother's babyface and children's happiness were verified.

Based on the results of the study, the following suggestions for future research are presented. First, it is necessary to develop a variety of programs that can enhance children's happiness through the recognition of the importance of mother's babyface and management of mother's babyface. Second, it is necessary to collect and study mothers of the whole country, to expand generalization possibility of the results of the research. Third, self-efficacy and resilience were used as a mediator between the mother's babyface and children's happiness, but it is also desirable to analyze the mediating effect by using other positive variables in future studies.

Despite the limitations of this study, this study is meaningful in that it is the first study to analyze the

mediating variable by putting positive psychological variables in the relationship between mother's happiness and children's happiness.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Dual Mediating Effect of Spousal Support and Child Support in the Effects of Marital Intimacy on the Spousal Caregiving Awareness

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ABSTRACT

The purpose of this study is to identify the dual mediating effects of child support and spousal support in the effects of marital intimacy, on the spouse caregiving awareness targeting the middle to high elderly, noted as having the age of 45 years or older. The subjects of this study were middle to high elderly participants having the age of 45 years or older, and who were found to be residing in the Chungnam region, Korea. The survey was conducted from July to August 2018. To determine the dual mediation effect of spousal support and child support in the effects of marital intimacy on the spouse caregiving awareness, a SPSS PROCESS macro model 6 proposed by Hayes (2018) was used.

The marital intimacy had a significant positive effect on the child support, spouse support, and spouse caregiving awareness. In addition, child support had a positive effect on the spousal support, and the spousal support had a positive effect on the spouse caregiving awareness. However, the effect of child support on spouse caregiving awareness was noted as not as significant. In addition, the total effect of marital intimacy on spouse caregiving awareness was $\beta=.7043$ which had a positive effect. The direct effect of marital intimacy on spouse caregiving awareness was $\beta=.3431$ which was noted as being lower than the total effect. Therefore, it can be seen that the mediating effects of child support and spousal support are significant in this case as measured during the study. And, the bootstrap was used to verify the simple and dual mediating effects of child support and spouse support. The dual mediating effect of child support and spousal support in the effects of marital intimacy on the spouse caregiving awareness was subsequently verified in this case. In the case of having low caregiving awareness due to a low sense of intimacy with the spouse, in addition to improving the caregiving awareness by improving intimacy with the spouse, a method for improving child support and spousal support should be actively reviewed as a way to find interventions to increase this level of support in a marriage.

Keywords: Spousal support, Child support, Marital intimacy, Caregiving awareness, Dual mediating effect

Introduction

It is important to note that Korea's birth rate is expected to decline from 8.4% in 2015 to 6.1% in 2065, and according to resident registration demographics, as of August 2017, the population over 65 years old has exceeded 14% of the total population and Korea, which

shows that the nation has entered into the phase of an aging society within 17 years since the start of aging began in 2000¹. Currently, the supporting awareness for residents and individuals in Korean society is shifting from the eldest son to self or family, to the government and society as a whole². Even the value of the elderly is also changing into a more independent pursuit of life, rather than relying on their child thus in the future, spouses will be more likely to take care of their own needs, rather than their children being expected to care for the parents in the parent's twilight years. Even in a study in the United States has reported that the spouse of the elderly has become more of a general and primary

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caregiver, as opposed to just facilitating the relationship as a spouse alone³. Considering this social change, it is likely that marital support will be the main form of support in Korean society in the future years. Therefore, this study focuses on the study of spousal caregiving awareness.

First, it is predicted that the intimate relationship between husband and wife will play an important role in the caregiving awareness of the individuals who are parties to the marriage. In this context, the word intimate is derived from the Latin intimacy, which means inner, or the inner most⁴. In this sense, the factor of marital intimacy includes social, affective, mental, intellectual, sexual, and aesthetic and entertainment factors⁵, and encompasses affection, gender, expressiveness, coherence, conflict resolution, compatibleness, autonomy and identity⁶. In addition, it has claimed that additional factors should also be included in this discussion, such as cognitive, emotional, sexual, mutual sharing information and dedication, etc., as are applied to the marital relationship, and are composed as a sub-factor in this case of review⁷.

While few studies have identified the importance of marital intimacy in spousal support, this study goes a step further to identify the areas of support in the marital relationship. According to the study of Cho⁸, it was noted that the husband had higher emotional caregiving awareness on the wife when the cognitive intimacy and sexual intimacy was seen to be higher, and the wife had higher caregiving awareness in all areas such as emotional intimacy, cognitive intimacy, sexual intimacy, etc., when the cognitive intimacy on the husband was measured as being higher. In addition, although the study has targeted university students, even in the study of attachment to parents, conflict and sense of parental support, and parental caregiving awareness, it has shown that the stronger the attachment to parents with less conflict, the parental caregiving awareness was noted as significantly higher in those cases⁹. Even for a study on intimacy and caregiving awareness between married daughters and their mothers¹⁰, the higher the intimacy with their mother, the overall caregiving awareness such as economic caregiving awareness and physical caregiving awareness was shown to be significantly high in those cases as well. In addition, when the relationship of the couple seems closer, in other words, the relationship between the couple at the time of support was intimate, this provided fewer burdens against the

receiving of the support¹¹. Through these prior studies, the marital intimacy is expected to have a positive effect on spousal caregiving awareness.

Meanwhile, child support and spousal support will mediate the relationship between marital intimacy and caregiving awareness in most cases. Centered on one individual, social support refers to help that an individual receives from family, relatives, neighbors, and experts surrounding an individual¹², and it is considered the manifestation of positive support for individuals through interaction with supportive others, where an individual meets his or her physical, mental, and material needs by receiving social support through an interaction with social relations. Among various social supports, this study has focused on the support from the spouse and child, where the spousal support as an aspect of social support, and can also be considered as a means to a social support within marital relations that provides help, care, and support to others in similar situations¹³. Spousal support as the most important source of social support that is found and is seen in a marriage means that the responsive behavior of the couple is a positive influence on the needs of each spouse. In addition, the social support of their children not only have a positive effect on the psychological well-being of the elderly¹⁴, but it was reported that there is also an effect of mitigating maladjustment for the elderly¹⁵, and the support of the child is an indispensable factor of support in the life of the elderly.

This social support not only positively affects the quality of life of the elderly, but also plays a role in reducing or cushioning negative influences in stressful situations as may be experienced by an individual, such as with an illness¹⁶. In other words, when an individual undergoes some stimulation or crisis, the cognitive interpretation of the individual on such fact should be made to be less shocking, in order that one can recover from such a life crisis, and by playing a role in controlling the impact on the heretofore unexpected life change that can occur in a human life, which is a continuation of change and crisis, whereby it allows humans to equilibrate and maintain a balanced and positive result for mental and physical health¹⁷.

When looking at the empirical research, it was reported that a supportive response based on an accurate understanding of the spouse's needs improves the satisfaction and intimacy of the spouse¹⁸. It was claimed that spousal support reduces the stressors of life as experienced by an individual, and has an effect

of enhancing satisfaction and well-being, while also increasing the marital satisfaction, improving marital quality, and reducing depressive symptoms and mood disorders in potentially affected individuals¹⁹. In particular, the spousal support, as an aggressive approach to understanding and helping each other in marital relations, is the most influential variable on determining factors related to the marital intimacy²⁰.

Social support of a child is a variable that affects the quality of life of the elderly as a leading factor for reducing the likelihood of a direct or undesirable experience, or by playing the role as a buffer for such experience²¹. This brings an understanding that such social support has a positive effect, especially on the elderly as compared to other age groups. Social support eliminates the social isolation that the elderly may experience in this situation, and provides the sense of belonging and makes one feel that they are the subject of interest. In addition, the elderly can benefit through sharing worries or problems with others by communicating their growing concerns over issues in their lives, through social support resources²². Therefore, the child support and spousal support are expected to be a dual mediator in the effects of marital intimacy on the spousal caregiving awareness.

Therefore, the purpose this study is to identify the dual mediating effects of child support and spousal support in the effects of marital intimacy, on the spouse caregiving awareness targeting the middle to high elderly, noted as having the age of 45 years or older.

Method

Study subjects and data collection procedures:

The subjects of this study were middle to high elderly participants having the age of 45 years or older, and who were found to be residing in the Chungnam region, Korea. The survey was conducted from July to August 2018, where the questionnaires were distributed to the general residents and collected afterwards. Finally, the data of 400 middle to high elderly people were obtained for this study.

In terms of sociodemographic characteristics, 44.5% were women and 55.5% were men, and the age group was 42~90 years with an average of 63.55 years. For the level of education, it is noted that the percentage of high school graduates (32.5%) was the highest, followed by college graduates (28.0%), elementary graduates

(17.5%), and middle school graduates (14.3%). For determining the numbers of participants who were married, the variable marital status was noted, whereby married participants accounted for 93.5% of the total, and the majority of the study participants were married. For noting the residence of the participants, it is noted that 55.5% of the participants lived in the city and 44.5% lived in rural areas.

Measurement Tools: The measurement tools used in this study are shown in Table 1.

Table 1: Measurement Tools

Variable	Contents	Measurement Method
Dependent variable	Spousal caregiving awareness	The caregiving awareness has used the scale of Kim ²³ . A total of 9 items were measured using a 5-point Likert-type scale and the reliability is Cronbach's alpha value of .925.
Independent variable	Marital intimacy	Marital intimacy has used the scale of Lee ²⁴ . A total of 15 questions were measured using a 5-point Likert-type scale, and Cronbach's alpha value is .867.
Mediate variable	Social support	The social support measurement tool developed by Park ¹² as used by changing it to spousal and child support. Each item was composed of 22 items on the 5-point Likert scale, and the Cronbach's alpha value for spousal support was .901 and the child support was .867.

Analysis Method: To determine the dual mediation effect of spousal support and child support in the effects of marital intimacy on the spouse caregiving awareness, a SPSS PROCESS macro model 6 proposed by Hayes (2018) was used. The bootstrap was used to verify the mediator effect, and during the verification, the sample size was set to 5,000 samples, and the confidence interval was set at 95%. Also, the reliability and frequency analysis of the scale were performed using a SPSS Win 2.10.

Result and Discussion

Dual mediating effect of spouse support and child support in the effects of spouse intimacy on the spouse caregiving awareness: To verify the dual mediating effect of spouse support and child support in the relationship between spouse intimacy and spouse caregiving awareness, a SPSS PROCESS macro proposed by Hayes (2018) was used for the analysis. As a result, as shown in Figure 1, Figure 2 and Table 2, the marital intimacy had a significant positive effect on the child support ($\beta = .1577$, $p < .0001$), spouse support ($\beta = .5368$, $p < .0001$), and spouse caregiving awareness ($\beta = .3431$, $p < .0001$). In addition, child support had a positive effect ($\beta = .3658$, $p < .0001$) on the spousal support, and the spousal support had a positive effect ($\beta = .6057$, $p < .0001$) on the spouse caregiving awareness. However, the effect of child support on spouse caregiving awareness was noted as not as significant ($\beta = .0073$, $p = .9049$).

In addition, the total effect of marital intimacy on spouse caregiving awareness was $\beta = .7043$ ($p < .001$) which had a positive effect. The direct effect of marital intimacy on spouse caregiving awareness was $\beta = .3431$ ($p < .001$) which was noted as being lower than the total effect. Therefore, it can be seen that the mediating effects of child support and spousal support are significant in this case as measured during the study.

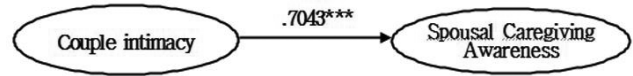


Figure 1: Influence of marital intimacy on spousal caregiving awareness

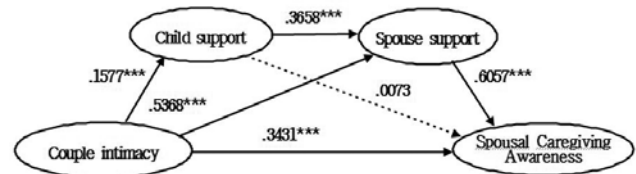


Figure 2: Dual Mediation Effect of Child Support and Spouse Support

Table 2: Verification of dual mediation effect of child support and spouse support

	β	se	t	p	LLCI	ULCI
Mediation model (dependent: child support)						
constant	3.0179	.1166	25.8847	.0000	2.7887	3.2471
Couple intimacy	.1577	.0343	4.6044	.0000	.0904	.2251
	β	se	t	p	LLCI	ULCI
Mediation model (dependent: spousal support)						
constant	.3885	.1674	2.3215	.0208	.0595	.7176
Couple intimacy	.5368	.0308	17.4227	.0000	.4762	.5973
Child support	.3658	.0439	8.3266	.0000	.2794	.4521
	β	se	t	p	LLCI	ULCI
Mediation model (dependent: spousal caregiving awareness)						
constant	.6149	.2158	2.8494	.0046	.1906	1.0391
Couple intimacy	.3431	.0524	6.5458	.0000	.2400	.4461
Child support	.0073	.0610	.1196	.9049	-.1126	.1272
Spouse support	.6057	.0643	9.4228	.0000	.4793	.7320

In this study, the bootstrap was used to verify the simple and dual mediating effects of child support and spouse support. As a result of verification, in the path between marital intimacy $\rightarrow$ child support $\rightarrow$ spousal caregiving awareness, the mediating effect of child support has shown the presence of 0 in between the lower limit and upper limit value (-.0232 ~ .0308) of bootstrap, and for that reason it was not significant. On the other hand, in between the path of marital intimacy $\rightarrow$ spouse

support $\rightarrow$ spouse caregiving awareness, the mediating effect of spousal support has not shown the presence of 0 in between the lower limit and upper limit value (.2065 ~ .4583) of bootstrap, and therefore it was found to be significant. Lastly, as a result of examining the dual mediating effect of child support and spousal support, in between the path of marital intimacy $\rightarrow$ child support $\rightarrow$ spouse support $\rightarrow$ spouse caregiving awareness, it has not shown the presence of 0 in between the lower limit and

upper limit value (.0125 ~ .0726) of bootstrap, and thus it was found to be significant. Therefore, the dual mediating effect of child support and spousal support in the effects

of marital intimacy on the spouse caregiving awareness was subsequently verified in this case (Table 3).

Table 3: Verification of indirect effects of child support and spouse support

	β	Boot E	Boot LLCI	Boot ULCI
TOTAL	.3612	.0683	.2375	.5052
Couple intimacy → Child support → Spousal Caregiving Awareness	.0011	.0135	-.0232	.0308
Couple intimacy → Spouse support → Spousal Caregiving Awareness	.3251	.0639	.2065	.4583
Couple intimacy → Child support → Spouse support → Spousal Caregiving Awareness	.0349	.0154	.0125	.0726

Conclusion

The purpose this study is to identify the dual mediating effects of child support and spousal support in the effects of marital intimacy, and on the spouse caregiving awareness, as it is seen targeting the middle to high elderly having the age of 45 years or older. To achieve this, the survey was conducted from July to August 2018 and finally, the data of 400 middle to high elderly people were obtained.

As a result of analyzing the dual mediating effect, the dual mediating effect of child support and spouse support was verified, as noted in the relationship between marital intimacy and spouse caregiving awareness. Therefore, in the case of having low caregiving awareness due to a low sense of intimacy with the spouse, in addition to improving the caregiving awareness by improving intimacy with the spouse, a method for improving child support and spousal support should be actively reviewed as a way to find interventions to increase this level of support in a marriage. In addition, because child support has a positive effect on spousal support, one of the most important ways to improve the caregiving awareness on the spouse is receiving a high level of support from the child, thus it can be seen that the relationship between the child and the elderly is important as reviewed in most cases.

Ethical Clearance: Not required

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Conflict of Interest: Nil

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A Study on the Psychological Characteristics of Rural Life on the Continuity of Rural Life

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ABSTRACT

Interest and care for the people around the farming village to maintain the continuity of rural life. Efforts are also needed to create younger farming villages by providing various facilities of convenience to help ensure the young people's settlement for rural life and also by organizing communities for those pursuing rural life. In addition, since pursuing rural life, it will be necessary to secure the profitability of crops by continuously participating in various agricultural education and visiting farming villages in advanced countries for securing economic power. The government and local governments will need to provide all facilities which help all people to easily settle for rural life by creating an environment similar to the cities through the environmental improvement projects of farming villages. Those pursuing rural life will need to explore various ways of communicating with their family and offer them opportunities to experience farming.

Keywords: Rural life, living facilities, pride, adaptability, farming life

Introduction

Rural life refers to making return to farm. During the traditional era where agriculture was the focus. Today's rural life took the form of livelihood since the currency crisis in the late 1990s and the form of retirees' life entering the 2000s. Thereafter, in the latter of the 2000s, the number of the young people pursuing rural life increased^[1]. Given this situation, the population returning to farming and farming village among the baby boom generation has been largely increasing, so they are expected to serve as a new source of energy source for agriculture and farming area^[2]. In Japan, rural areas where the population is consistently decreasing care much more about attracting the senior citizens of great wealth than attracting businesses, while actively pursuing it as part of the campaign to revive the region^[3]. In Korea, communities are exploring ways to attract more urban retirees to the region for those pursuing rural life as a new alternative to the declining rural population, and many

researchers are also actively promoting the benefits of attracting retirees to the communities^[4]. As of 2017, the population pursuing rural life and returning to farming villages exceeded 500,000, approaching 520,000. Over the 5 years from 2013 until 2017, an average growth rate of around 3% was shown^[5]. However, they advise that those who fail their rural life should think about cultural differences between the rural area and the city. Urban people care very much about their privacy, are clear about ownership of others, and dislike having their privacy infringed upon. In the rural area, such values and the surrounding environment are not well organized, so they consider the relationship to be a failure^[6]. As such, people are increasingly interested in rural life, but the research on psychological characteristics after pursuing rural life has not been conducted yet. From this viewpoint, this study has the following purposes.

First, we intend to identify the characteristics of rural life on the psychological characteristics after pursuing rural life.

Second, we intend to present a research model focused on the identified characteristics.

Finally, through an empirical analysis, we intend to present implications for the continuity of rural life for those pursuing rural life.

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Theoretical Considerations

The People Around: The individualistic behavior of rural life might come in conflict with the community customs and the order of rural society. In addition, due to the excessive territoriality of rural residents(indigenous peoples), some experience difficulties with settling for rural life^[7].

Economic Power: However, after the rural life, a certain level of income is required to pursue basic living, and the relationship with village residents must be good to ensure that life at village could be continued. In addition, even without income, if one has a good relationship with village residents, one could making a living by taking on small jobs they offer^[8].

Living Facilities: Furthermore, if the urban senior citizens would migrate following the improvement of living facilities in the rural areas which fell behind, the local economy would be activated following the simultaneous growth in the production and consumer classes, while the improvement of living facilities will further accelerate. Moreover, the quality of life in rural areas may also be improved^[9].

Family Relations: Therefore, rural life needs to be seen not simply as an individual's occupational transition, but as a transition for the entire family's life^[10].

Pride: Therefore, after rural life, it expresses the extent to which one feels fit to pursue rural life by perceiving oneself as meaningful, effective and very valuable with one's role or activity being important^[11].

Under such a thesis, the following research hypotheses were set.

H1: Marginal men will have a positive impact on pride.

H2: Economic strength will have a positive impact on pride.

H3: Living facilities will have a positive impact on pride.

H4: Family relationship will have a positive impact on pride.

Adaptability: In order for those pursuing rural life to adapt to the rural area, they will need to cooperate with someone to obtain information, exchange help, and mobilize emotional and physical resources, whose process includes the trust and network of others^[12].

Under such a thesis, the following research hypotheses were set.

H5: Marginal men will have a positive impact on adaptability.

H6: Economic strength will have a positive impact on adaptability.

H7: Living facilities will have a positive impact on adaptability.

H8: Family relationships will have a positive(+) impact on adaptability.

Satisfaction: In general, satisfaction is such a strongly subjective concept demonstrating a positive, supportive, and satisfactory attitude towards life, which also means satisfaction towards various and complex areas of life^[13].

Under such a thesis, the following research hypotheses were set.

H9: Pride will have a positive impact on satisfaction.

H10: Adaptability will have a positive impact on satisfaction.

Research Design

Research Model: To perform the empirical analysis of this study, we intend to identify the relationship of influence as with the research model of [Figure 1]

Operational Definition and Measurement: In this study, operational definition was formed based on the following previous researches conducted in order. For marginal men, D.S. Park(2016)^[7] was referenced, for economic strength, K.H. Kim et al.(2018)^[8], for living facilities, S.T. Moon et al.(2016)^[9], for family relationship, J.H. Sung(2013)^[10], for pride, M.J. Kim et al.(2006)^[11], for adaptability, S.H. Hong et al.(2012)^[12], and lastly, for satisfaction, K.S. Park et al.(2012)^[13] was referenced, following which correction and supplementation were made to suite this research as a matter of formation. For general matters, the research of J.H. Lee(2017)^[14] was referenced for use.

Data Collection and Analysis: As for the data collection and analysis method, judgment sampling method among the non-probability sampling methods was used for survey. Therefore, those currently pursuing rural life were surveyed.

Of which, 451 copies excluding 12 copies of the questionnaire inappropriate for analysis were analyzed as the valid samples.

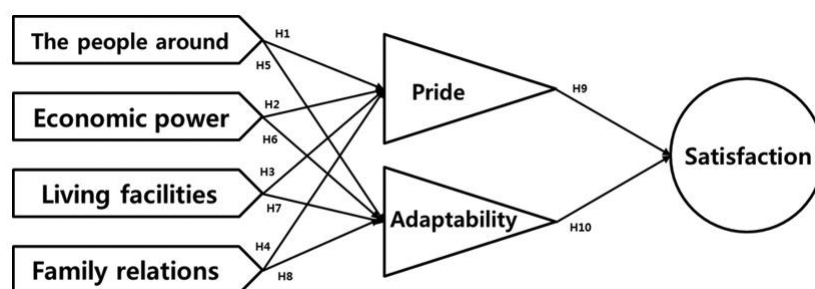


Figure 1: Hypothetical Model

The collected valid sample was verified by the Cronbach's α coefficient for validating reliability, and the feasibility was validated by using the Confirmatory Factor Analysis to ensure that the internal feasibility of the judgement feasibility and acceptance feasibility. For the general characteristics of the survey subject, frequency analysis was used. Thereafter, the fitness of the structural equation model and the causality for each concept were validated.

Empirical Analysis

General characteristics of survey subjects

[Table 1] illustrates general characteristics of the survey subject.

Table 1: General characteristics of participants

Item	Division	Frequency (number of person)	%	Item	Division	Frequency (number of person)	%
Gender	Male	408	90.5	Dwelling period after returning to farming	Less than 1 years	55	12.2
	Female	43	9.5		Less than 1 to 3 years	89	19.7
Age	20 ~ 29 years old	29	6.4		Less than 3 to 5 years	116	25.7
	30 ~ 39 years old	40	8.9		Less than 5 to 7 years	84	18.6
	40 ~ 49 years old	53	11.8		Less than 7 to 9 years	59	13.1
	50 ~ 59 years old	190	42.1		More than 9 years	48	10.6
	Over 60 years old	139	30.8		A single family	2	0.4
				Number of residents after returning to farming	A two-person family	225	49.9
Educational background	Less than Junior High school graduation	1	0.2		A three-member family	112	24.8
	High school graduation	130	28.8		A family of four	108	23.9
	2-year university graduation	39	8.6		A family of five or more	4	1.0
	4-year university graduation	277	61.4		Less than 100 million	46	10.2
	Graduate M.A and above	4	0.9		Less than 100 to 200 million	120	26.6
Income	Less than 1,500,000 won	23	5.1	Migration amount	Less than 200 to 300 million	108	23.9
	1,500,000 won ~ Less than 2,000,000 won	41	9.1		Less than 300 to 400 million	51	11.3
	2,000,000 won ~ Less than 2,500,000 won	160	35.5		Less than 500 to 600 million	62	13.7
	2,500,000 won ~ Less than 3,000,000 won	141	31.3		Less than 700 to 800 million	17	3.8
	3,000,000 won ~ Less than 3,500,000 won	66	14.6		Less than 900 to 1000 million	27	6.0
	More than 3,500,000 won	20	4.4				

Conted...

A place where one lives after one's return to farming	A newly built house	161	35.7	Type of return farming	Over a billion	20	4.4
	Purchase of farm houses	55	12.2		U type	280	62.1
	Rent of Farmhouses	113	25.1		J type	133	29.5
	Apartment purchase	64	14.2		I type	38	8.4
	Apartment lease	39	8.6		-	-	-
	Etc	19	4.2		-	-	-
	Total						451

Variables and Reliability and Validity Verification: The measured items used in this study turned out to be 0.815 or greater as in [Table 2]. A Cronbach's Alpha coefficient of 0.6 or higher is deemed to be reliable^[15]. This is deemed to be sufficient in terms of reliability when viewed against the standard.

If the factor load is 0.4% or higher, the correlation between the factor and the constituent variable is deemed to be high^[16, 17, 18]. The concept feasibility of the constructs used for this study is illustrated as in [Table 2] and is also analyzed to have sufficient feasibility. The average variance extracted (AVE) turned out to be 0.5 or higher, and the questionnaires were analyzed to be representative of research item.

Table 2: Results of confirmatory factor analysis

Constructs	Question	Std. Loadings	Error Variance	t-value	p-value	Cronbach's Alpha	CR	AVE
The people around	The people around 1	.646	.231	-	***(.001)	.807	0.743	0.591
	The people around 2	.595	.302	8.570	***(.001)	.802		
Economic Power	Economic Power 1	.632	.310	-	***(.001)	.799	0.667	0.501
	Economic Power 2	.576	.417	9.331	***(.001)	.802		
Living facilities	Living facilities 1	.668	.288	9.990	***(.001)	.802	0.759	0.611
	Living facilities 2	.689	.298	-	***(.001)	.800		
Family relations	Family relations 1	.647	.272	8.944	***(.001)	.807	0.739	0.586
	Family relations 2	.643	.315	-	-	.803		
Pride	Pride 1	.554	.272	-	-	.805	0.789	0.557
	Pride 2	.588	.366	7.917	***(.001)	.802		
	Pride 3	.706	.277	8.002	***(.001)	.797		
Adaptability	Adaptability 1	.593	.361	10.036	***(.001)	.798	0.667	0.501
	Adaptability 2	.577	.322	-	-	.801		
Satisfaction	Satisfaction 1	.599	.324	-	-	.816	0.665	0.500
	Satisfaction 2	.698	.522	4.502	***(.001)	.827		

A correlation analysis was performed as in [Table 3] to review what directions and relationships are had by the variables used for this study after the confirmatory factor analysis was performed. Overall, it turned out that variables had significant relationship among themselves.

Table 3: Correlation of matrix

Variable	The people around	Economic Power	Living facilities	Family relations	Pride	Adaptability	Satisfaction
The people around	1						
Economic Power	.741* (.019)	1					

Conted...

Living facilities	.445* (.0174)	.711* (.024)	1				
Family relations	.460* (.016)	.494* (.021)	.631* (.024)	1			
Pride	.565* (.013)	.552* (.016)	.584* (.018)	.753* (.019)	1		
Adaptability	.519* (.017)	.648* (.022)	.634* (.024)	.512* (.021)	.767* (.019)	1	
Satisfaction	.434* (.016)	.403* (.020)	.256* (.019)	.094* (.017)	.149* (.013)	.353* (.019)	1

Notice) *p.01

Notice) () Estimate Value Meaning

Model Analysis and Hypothesis Testing

Structural Equation Model and Path Coefficient: In order to analyze the structural equation model, marginal men, economic strength, living facilities, and family relationship were set as potential exogenous variables, whereas pride and adaptability were set as endogenous variables, whereas satisfaction was set as endogenous variables.

The overall fitness index of the model presented in this study is $X^2=91.833$, d.f=70, $p=.041$, $X^2/d.f=1.312$, RMR=.020, RMSEA=.026, GFI=.974, AGFI=.955, PGFI=.568, NFI=.940, RFI=.909, IFI=.985, TLI=.977, and CFI=.985, and when compared to the reference value, the figure turned out to be like satisfaction. That is, for the fitness, $X^2/d.f$ turned out to be less than 3, whereas GFI, AGFI, NFI, RFI, IFI, TLI, and CFI turned out to be larger than 0.9, whereas RMR also turned out to be lower than 0.05. Overall, it may be deemed to be a model which could be used to validate the hypotheses of this study.

Verification of research hypothesis: [Table 4] illustrates a summary of the results of validating the 10 hypotheses set in the structural relationship. The 5 hypotheses were adopted among all hypotheses of the study, whose p-Value turned out to be less than 0.05 and whose t-Value turned out to be in a positive direction. The results of validating the research hypothesis through the structural equation are as follows.

Since the relationship between marginal men and pride ($\beta=2.05$, $t=2.101$, $p=.036$) and that of marginal men and adaptability ($\beta=2.07$, $t=2.429$, $p=.015$) turned out to be a significant, positive relationship statistically, hypotheses 1 and 5 were adopted. Since the relationship between economic strength and pride ($\beta=-2.73$, $t=-1.852$, $p=.064$) and that of economic strength and adaptability ($\beta=-2.46$, $t=-1.952$, $p=.051$) did not turn out to be a significant relationship statistically, hypotheses 2 and 7 were dismissed.

Table 4: Results of hypothetical path model

Hypothesis	Path	Path coefficient	Estimate	Standardized Estimate	t-value	p-value	Supported
H1	The people around → Pride	20.5	1.759	2.051	2.101	.036	Adoption
H2	Economic Power → Pride	-2.73	-2.092	-2.729	-1.852	.064	Rejection
H3	Living facilities → Pride	1.89	1.267	1.888	2.026	.043	Adoption
H4	Family relations → Pride	.02	.016	.021	.071	.943	Rejection
H5	The people around → Adaptability	20.7	20150	2.065	2.429	.015	Adoption
H6	Economic Power → Adaptability	-2.46	-2.287	-2.457	-1.952	.051	Rejection
H7	Living facilities → Adaptability	1.87	1.519	1.865	2.357	.018	Adoption
H8	Family relations → Adaptability	-.20	-.177	-.198	-.652	.514	Rejection
H9	Pride → Satisfaction	-1.49	-1.680	-1.492	-2.110	.035	Rejection
H10	Adaptability → Satisfaction	1.80	1.667	1.798	2.550	.011	Adoption

***p0.01

Since the relationship between living facilities and pride ($\beta=1.89$, $t=2.026$, $p=.043$) and that of living facilities and adaptability ($\beta=1.87$, $t=2.357$, $p=.018$) turned out to be a significant, positive relationship statistically, hypotheses 3 and 7 were adopted.

Since the relationship between family relationship and pride ($\beta=.02$, $t=0.071$, $p=.943$) and that of family relationship and adaptability ($\beta=-.20$, $t=-0.652$, $p=.514$) did not turn out to be a significant relationship statistically, hypotheses 4 and 8 were dismissed.

Since the relationship between pride and satisfaction ($\beta=-1.49$, $t=-2.110$, $p=.035$) did not turn out to be a significant relationship statistically, hypothesis 9 was dismissed. However, since the relationship between adaptability and satisfaction ($\beta=1.80$, $t=2.550$, $p=.011$) turned out to be a significant, positive relationship statistically, hypothesis 10 was adopted.

Conclusion

The implications of this study are as follows.

First, marginal men turned out to have a significant impact on pride and adaptability. According to such analytical result, those pursuing rural life may determine that the relationship with marginal men may be helpful to pride and adaptability. Therefore, interest and care are need to ensure that marginal men maintain the continuity of rural life, and various information about rural life needs to be provided.

Second, economic strength turned out to have no significant impact on pride and adaptability. According to such analytical result, economic strength to a certain extent needs to be secured to continue rural life after pursuing rural life in order to acquire adaptability for rural life and leisure for time. Therefore, it will be necessary to secure the profitability of the crops by continuously participating in various agricultural education and field trips to rural areas of advanced countries for securing the economic strength after pursuing rural life.

Third, living facilities turned out to have a significant impact on pride and adaptability. According to such analytical result, those pursuing rural life may be determined to desire to continuously pursue rural life in an environment similar to the living facilities within the city. Therefore, the government and local governments will need to provide all facilities to allow all people to can easily settle for rural life by creating an environment similar to the city through the environmental improvement projects of the rural area.

Fourth, family relationship did not turn out to have a significant impact on pride and adaptability. According

to such analytical result, continued discussion and cooperation with family are necessary even before and after pursuing rural life, and active support and sponsorship of family are necessary to ensure that they have conviction about the settlement for rural life.

Lastly, while pride did not turn out to have a significant impact on satisfaction, adaptability did turn out to have a significant impact on satisfaction. According to such analytical result, those pursuing rural life heightened their pride in pursuing rural life after pursuing rural life, while raising their joy in education for rural life, satisfaction for the natural environment, and securing economic strength through crops and profits. Therefore, those pursuing rural life will need to secure expert knowledge to ensure continued satisfaction, go on field trips to the farms of advanced countries, expand sales routes, and gain training and experiences of variety such as ways of making sales on the Internet and marketing online.

While this study has made many efforts to present meaningful results and implications, there still exist issues yet unresolved.

First, since the farming activity is the main economic strength after pursuing rural life, it will be necessary to study the economic strength after pursuing rural life in line with the characteristics of each agricultural crop by considering the geographical, soil and climatic environments.

Second, it will necessary to study the influence of family constituents(children, aged parents, and spouses, etc.) who are intimately related to rural life and the settlement for rural life in details. Furthermore, since those pursuing rural life will be classified into the senior citizens, young generation, and the middle aged, matters of consideration will likely emerge in variety, so detailed studies will need to be conducted with a focus on the age.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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The Affects of Different Nordic Hamstring Exercise in Normal Adults

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ABSTRACT

Objective: The purpose of this study was to investigate the effect of Nordic hamstring exercise group with Nordic hamstring exercise group that was doing resistance movements together on the hamstring muscle by comparing the measurement of fascicle length(FL), muscle thickness(MT), of hamstring muscle and the size of the pennation angle(PA) after a certain period of intervention.

Method: This study was conducted by recruiting 20 physically healthy adult males and 21 females who agreed to participate in this study after the preliminary study. The training group(TG) that did the Nordic hamstring exercise and resistance movement together(RNHE) and the controlled group(CG) that did Nordic hamstring exercise(NHE) were measured for hamstring muscle 6 weeks after exercise intervention according to the predetermined protocol for 5 weeks and after 3 weeks of tracing observation, they were measured to compare the prognosis after 9 weeks. All measurements in the experiment were conducted in repeated measured ANOVA, and t-test was used to compare the two groups.

Findings: The result of the experiment showed statistically significant differences in the FL, MT, of hamstring muscle and the size of the PA in both groups. In addition, the FL of hamstring muscle and the size of the PA showed significant differences in 6 weeks and 9 weeks.

Improvements: In conclusion, it was confirmed that applying RNHE has effect in the MT and FL of hamstring muscle and the size of the PA, and this can be an even more effective exercise intervention that can lower the risk of hamstring injury when applied to athletes.

Keywords: Nordic hamstring exercise, Resistance, Pennation angle, Fascicle length, Muscle

Introduction

These days, people have more time they spend for leisure life and a big part of leisure life consists of exercise. Hamstring muscles play a crucial role in many daily activities such as walking, running, jumping, and controlling the movement of the trunk^[1,2]. Additionally, during the gait cycle, hamstring muscle stabilizes the knee and helps generation of movements^[3,4]. This muscle is generally recognized for knee flexion, but it is a muscle that exerts a strong force on hip extension while the torso muscle contracts and the knee extends^[3,5]. Injury in the

hamstring muscle (HSI) is commonly occurring injuries when exercising such as sprinting at maximum speed or sudden acceleration, and this also occurs often when exercising outdoor^[6]. In addition, it can also occur in the latter half of the swinging phase when doing a short-distance running^[6,7]. Twelve percent of leg injuries are injuries to hamstring muscles^[8]. Risk factors for HSI include age, The effect of nordic hamstring exercise with resistance to hamstring muscle presence of previous injuries, balance of physical strength, flexibility, fatigue and eccentricity strength. Among these, the long head of Biceps femoris of hamstring is where injuries to hamstring muscles occur most frequently and it account for 53%~68%.^[6,9] According to recent studies, there have been various opinions proposed for prevention of hamstring injuries^[10]. First, in case of eccentricity exercise, the thickness of the hamstring muscles increases and prevents injury^[11]. NHE, a type of eccentricity exercise, causes greater activation of muscle strength when compared to

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other exercises^[12], and is also used in the rehabilitation process for HSI^[13], and is also one of the exercise methods used for prevention. In addition, the NHE can increase the muscle strength of the hamstring muscles and it is seen as reducing the risk of injuries to hamstring muscles. If the force on the eccentricity of hamstring muscle increases^[14,15], muscle complexes move and stretch during contraction, so this is constantly suggested as a way to prevent injury to hamstring muscles. In addition, we could see the result that the force of the eccentric muscle was improved^[16], and the kinematic muscle and nerve muscle were optimized^[8] through the NHE. Additionally, muscles could grow through this exercise^[4], and we could see that the amount of muscle rather than fiber length was increased. Finally, when NHE is performed, we can see that muscle activity was increased through muscle activation with EMG^[1,17]. Through this, we can see that the exercise is effective for preventing injuries. Resistance exercise significantly increases muscle mass and strength, and muscle endurance and physical abilities are also improved^[18]. In addition, it increases basic metabolism by increasing the muscle mass and increases energy expenditure and improves physical fitness^[19]. In previous studies, resistance exercise has been established as an effective exercise method for the development of each muscle, and it is also used for prevention of injuries and rehabilitation for musculoskeletal system^[20]. In addition, resistance exercise can strengthen muscle strength for a short period of time^[21], and it increases MT and FL and it obtained the result that it makes balance more stable^[22]. Therefore, we tried to compare NHE by applying NHE which is one kind of eccentric exercise, together with resistance exercise.

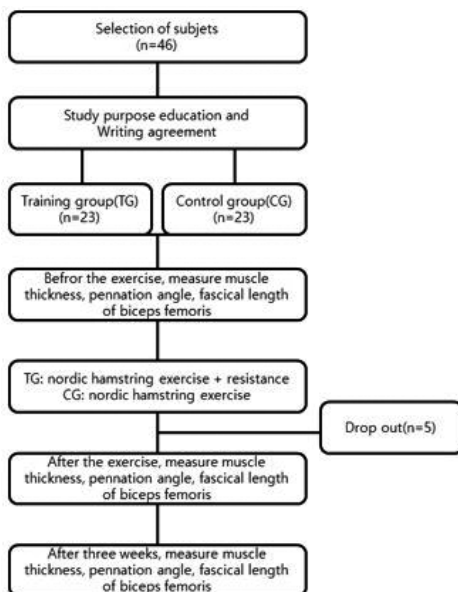


Figure 1: Experimental flow chart

Method

Subjects: The subjects for this study were a total of 46 people consisting of 23 healthy adult male and 23 healthy adult female students attending S university in Asan, Chungcheongnam-do. Before proceeding with this study, subjects were fully informed about the purpose and method of the study, and: people 1) with experiences in the past with hamstring injury or currently having hamstring injury, 2) who have a herniated cervical disc or 3) who are unable to perform this exercise due to lack of muscle strength were excluded. After obtaining consents from the subjects for participation, consent forms were prepared and things proceeded. The general characteristics of the subjects are as follows in Table 1. This study was approved by Sunmoon University Institutional Review Board(SM-201705-019-2). The overall research process is as in Figure 1.

Table 1: General characteristics (N = 41)

Group	TG (n = 17)	CG (n = 24)
Age	21.53 ± 2.24	20.46 ± 0.59
Height	167.59 ± 10.00	167.67 ± 9.42
Weight	64.59 ± 14.43	64.29 ± 14.53

All values are mean ± standard deviation

TG: Training group, CG: Control group

Research equipment and location: Ultrasonography (ezono3000, Germany, 2011) was used to examine changes in the PA, FL and MT of biceps femoris muscle. The equipment used by setting at image mode Basic, frequency 12MHz, and image depth 8cm. The subjects were all wearing shorts for measurement, and their postures were measured in the same posture by setting the hip flexion at 0° and the knee flexure at 0° while in a lying down position. The measurement location was moved probing to outside and it was observed to distad along the outer side of muscle semitendinosus of biceps mectiocephalus to head of fibula. As for resistance devices of the experimental group, a multi-pulley exercise system X-TRAINER(X- 3D, 2010) was used and the resistance weight was set to 80% of 1RM of the subject and applied to the exercise. In addition, the metronome was used for accurate experimentation, and it was used to match the beat so that it would go down slowly after sustaining for 5 seconds and come back up.

Experiment Procedure: The subjects were randomly divided into TG and CG in the week before the start of full-scale exercise, and in order to compare before and after, both groups were measured for the PA, FL and MT

of biceps femoris muscle. After all the measurements were completed, they had time to explain to the subjects what the NHE was which will be carried out for the next six weeks and how the exercise would be proceeded. The frequency and the number of times of NHE were set equally as in table 2 according to the predetermined protocol for both the TG and the CG. The rest time was also applied the same for both groups for 2 minutes after one set. The TG and the CG had time to watch the video related to NHE before exercising and practiced until the correct posture was attained. The starting position of NHE is a half-knee posture in a kneeling position after correctly aligning the body. The leader holds the subject's ankle and fixes the subject's leg to the ground during exercise. The subject slowly descends for 5 seconds in matching the metronome beat, then stands up by again pushing oneself up from the ground. The TG set their own resistance weights, and applied resistance and NHE simultaneously. Going down and up movement matching the metronome beat exactly was recognized as number 1. The CG had been applied with only NHE, and the method is the same as the TG. After 6 weeks of exercise which was carried out according to the protocol were completed, the two groups were measured for the PA, FL and MT of biceps femoris muscle. The measurement method and location were measured in the same way at the same location as before the experiment. Additional measurements were taken to see which group had the longer lasting exercise effect by not having any exercises for 3 weeks after measuring was completed. The measurement method and location were also in the same way at the same position as before and after exercise.

Table 2: Effects of different Nordic exercise (N = 41)

		Training group	Control group	t
MT (cm)	0 week	2.13 ± 0.72	2.08 ± 0.28	0.50
	6 week	2.32 ± 0.08	2.20 ± 0.29	1.26
	9 week	2.21 ± 0.08	2.12 ± 0.28	0.89
	F	94.73	15.28	
PA (°)	0 week	14.29 ± 2.09	14.58 ± 1.91	-0.46
	6 week	11.06 ± 1.82	12.29 ± 1.98	-2.04*
	9 week	12.12 ± 2.15	13.58 ± 1.67	-2.46*
	F	155.97	50.49	
FL (cm)	0 week	8.67 ± 0.1	8.10 ± 0.16	0.29
	6 week	10.80 ± 0.16	9.68 ± 0.14	5.41*
	9 week	9.60 ± 0.19	8.72 ± 0.17	3.40*
	F	295.03	497.88	

*p<.05; MT = muscle thickness, PA= pennation angle, FL = fascicle length

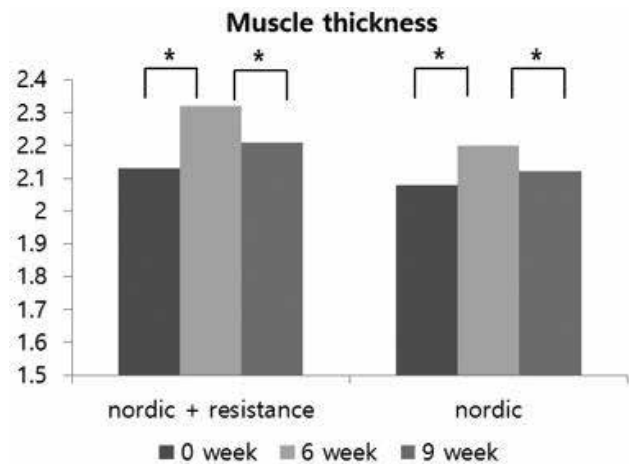


Figure 2: Muscle thickness

Statistical Analysis: All measurements were statistically analyzed by using SPSS/PC ver 22.0 for Windows program (SPSS INC, Chicago, IL) for analysis of study data. The CG, which only performed the normal NHE, and the TG which had RNHE used One-way repeated ANOVA in order to find out the result value for the PA, FL and MT of biceps femoris muscle before exercise (0 week), during exercise (6 weeks) and after exercise (9 weeks), and in order to see the difference between the group, independent t-test was used. Finally, Bonferroni was used for the post-test of the study when significant differences were found in one-way repeated ANOVA. Statistical significance of all analyzes was set at p <.05.

Result

To investigate the changes in the PA, FL and MT of biceps femoris muscle, ultrasonography diagnostic equipment was used to measure, and One-way repeated ANOVA and independent t-test were used to compare the significant levels in table 3.

Muscle Thickness: The TG with RNHE showed significant difference at 0 week, 6 weeks, and 9 weeks (p <.05) when comparing within the group. As shown in Figure 2, when the CG that only applied the general NHE was compared within the group at 0 week, 6 weeks and 9 weeks, it showed significant differences as well (p<.05). There was no significant difference when comparing between the TG and CG at 0 and 6 weeks (p>.05), and there was also no significant difference at 6 and 9 weeks (p>.05).

Penntaion Angle: In this research, descriptive statistics were used in order to analyze the mean and standard

deviation (SD) of each variable. Statistical analysis was conducted through SPSS/PC ver.22.0 for windows program (SPSS INC) When comparing the TG and the CG within the group, both groups showed significant differences at 0 week, 6 weeks and 9 weeks as in [figure 3] ($p < .05$). Additionally, when the two groups were compared, there were significant differences between the group in the measured results in 6 weeks after exercise intervention was completed ($p < .05$), and after having trace observation for 3 weeks, there were significant differences in the measured results in 9 weeks ($p < .05$).

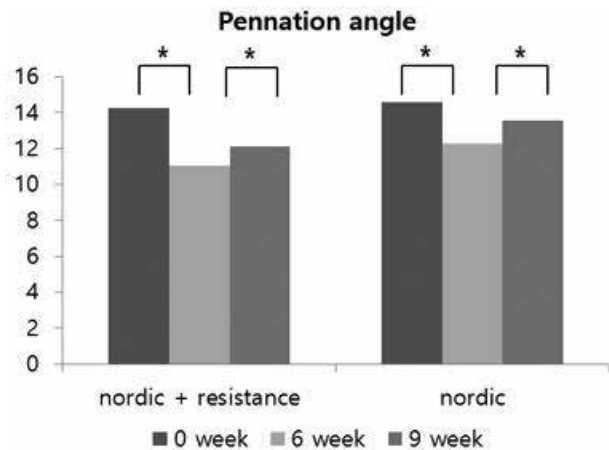


Figure 3: Pennation angle

Fascicle Length: When comparing the TG and the CG within the group, both groups showed significant differences at 0 week, 6 weeks and 9 weeks ($p < .05$) in figure 4. Additionally, when the two groups were compared, there were significant differences between the group in the measured results in 6 weeks after exercise intervention was completed ($p < .05$), and after having trace observation for 3 weeks, there were significant differences in the measured results in 9 weeks ($p < .05$).

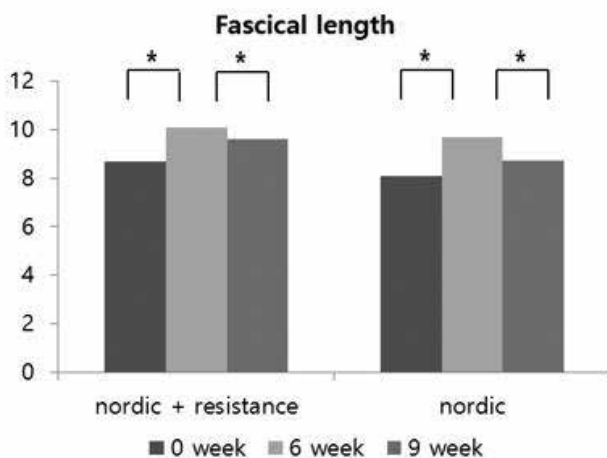


Figure 4: Fascical length

Discussion

This study used ultrasonography diagnostic equipment to measure in order to investigate the effect on the PA, FL and MT of biceps femoris muscle when applying NHE which is well known as injury prevention exercise and resistance exercise together. The results of this study showed significant differences in the PA, FL and MT when measuring biceps femoris muscle at 0 week, 6 weeks and 9 weeks for both the CG that carried out general NHE only and the TG which applied RNHE. When compared the differences between the two groups, there was no significant difference in the thickness of muscle at 0 week and 6 weeks, but there were significant differences for the PA and FL. Additionally, even when comparing 6 week and 9 weeks, there were significant differences in the PA and FL, but there was no significant difference in the MT. If NHE which was one of the eccentricity exercises was applied already continuously in previous studies, it was reported that MT and FL of biceps femoris muscle were increased and the size of the PA was reduced [23, 24]. Even in this study, we could observe that the MT and FL were increased and the size of the PA was decreased by exercise intervention for 6 weeks. In this study, the result that the FL was extended as the result of intervening NHE for 6 weeks is due to the fact that eccentricity exercise was used according to the previous studies in resisting outside force by generating the strength of muscles and increasing the FL [24]. In this study, the NHE group and the RNHE group both had significant increases in the FL, but when the two groups were compared, the group that applied resistance exercise show more increases. According to Tara et al. it seems because resistance and eccentricity exercises increase the FL of biceps femoris muscle, the result showed more significant differences when applying resistance exercise along with the eccentricity exercises compared to applying just eccentricity exercises [25]. In addition, when comparing the group that RNHE group and the normal NHE group, we can observe that the TG with the resistance exercise showed more significant reduction in result compared to the CG. Breno et al reported that NHE for 4 weeks have a big effect on the change of MT [23]. Therefore, although there was no significant difference in the MT between the two groups, because there were significant differences in the FL and the size of the PA, it is suggested that if resistance exercise is applied along with NHE to prevent injuries to athletes it will be more effect in maximizing the effect of exercise.

However, this study has some limitations. First, it is difficult to generalize the results of the study to patients or various age groups because it was conducted with 41 healthy adult men and women in their 20s. Second, we only observed biceps femoris muscle of hamstring muscles, but we did not observed the changes in muscle semitendinosus and muscle semimembranosus which are the remaining muscles. Therefore, it would be necessary to further study the change of each muscle by observing all the muscles of hamstring muscles.

Conclusion

This study compared changes in the PA, FL and MT of muscles of biceps femoris muscle after 6 weeks of intervention and observed the prognosis at 9 weeks after 3 weeks of trace observation. As a result, when comparing within the group for each group, there were no significant differences for both groups in the PA, FL and MT of muscles of biceps femoris muscle. However, there were significant differences in the PA and FL at 6 and 9 weeks when comparing the TG and CG were compared. Therefore, if exercise is applied to athletes for prevention of injuries, it seems RNHE will be more effective in preventing injuries.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: The authors declare no conflict of interest.

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The Effect of Employment Stress and Growth Mindset on the Happiness of Korean College Students: The Moderated Mediation Model of Grit

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ABSTRACT

Background/Objectives: The purpose of this study was to verify the moderated mediation effect of grit on the mediating effect of growth mindset in the relationship between employment stress and happiness in 364 college students in Korea.

Method/Statistical Analysis: For statistical analyses, reliability analysis, correlation analysis, and moderated mediation effect analysis were performed using SPSS Win.21.0 and PROCESS macro for SPSS version 3.2.

Findings: The results of the study showed a statistically significant correlation between happiness and growth mindset and grit. Employment stress was negatively correlated with happiness, growth mindset, and grit. In addition, the grit of college students moderated the relationship between employment stress and happiness via the growth mindset.

Improvements/Applications: These results will be used as a new model for grit to control the emotional stress of college students through the growth mindset.

Keywords: *Employment stress, Growth mindset, Happiness, Moderated mediation, Grit, PROCESS macro*

Introduction

With the continued difficulties of the Korean economy, the economic growth rate and job insecurity have led to serious youth unemployment. In the third quarter of 2018, according to the Economical Active Population Survey, the unemployment rate among people in their 20s was 9.4%, while the unemployment rate of college graduates was 9.1%, and the employment rate of people in their 20s was 58.3%, which means that the total employment rate was less than 61.1 percent¹. Although many policy efforts have been made to solve the youth employment difficulties at the national level,

employment stress is becoming more and more common in college students who recognize that a college education does not guarantee employment. Many college students are faced with the greatest stress due to their academic, career, and employment problems², and it is difficult for them to separate college stress from employment stress because it is an extension of the process of preparing for employment. As such, employment is a major concern and a major source of stress for college students and psychological difficulties are also a cause for concern. In particular, it is necessary to pay attention to the relationship between employment stress and happiness because the employment stress of college students is closely related to the desire to live a stable life or a happy life through a better job³. In the same context, previous research on employment stress and the happiness of college students reported that as they experienced more stress from work-related anxieties and conflicts, happiness decreased³⁻⁶, and they found ways to promote happiness in response to the situations threatening their happiness.

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However, even in an individual in the same stressful situation as another person, the results can vary depending on each individual's psychological resources. For example, mindset, a way to perceive one's ability and grit, manifested as patience and enthusiasm for achieving long-term goals, may be important factors in maintaining high happiness in spite of stressful situations. According to previous research, such as that by Cury et al.⁷ and Yeager et al.⁸, the way an individual perceives their ability plays a decisive role in the success of that person. In other words, a person with a growth mindset⁹ who believes that he/she can improve his/her abilities through training, sees difficult situations as an opportunity to improve him/herself by exerting more effort, thereby, leading to better results. In this paper, we will consider the growth mindset as a mediator in the relationship between employment stress and happiness and examine the possibility of its role as a protective factor.

Grit is defined as a persistent effort to achieve long-term goals and a passion to consistently maintain goals¹⁰. Because career decisions and career choices are not made as single decisions at a particular point in time, but rather a series of decision-making processes over a relatively long period of time¹¹, an attribute of grit is expected to be important for university students experiencing employment stress. Previous studies have shown that grit was positively related to happiness^{12,13} and had a positive relationship with a growth mindset^{14,15}. Thus, the level of grit was reported to mediate the effects of negative stress on negative thinking¹⁶. These results suggest that a high grit level can play a positive role in the growth mindset by keeping the target in sight, reducing the urge to quit, even in difficult environments, and buffering the effect of exposure to severe employment stress so that it does not significantly reduce happiness. Previous studies have suggested that the relationship between employment stress and the growth mindset will differ depending on the level of grit and the influence of the mediation effect of a growth mindset on employment stress and that happiness may be predicted by one's level of grit.

Therefore, the purpose of this study was to examine the effect of employment stress and growth mindset on happiness in Korean college students and to provide a new model for the happiness enhancement of college students by verifying the moderated mediation effect of grit.

To achieve this goal, the following research questions were investigated. First, what is the relationship between

employment stress, happiness, growth mindset, and grit? Second, does grit moderate the relationship between employment stress and happiness via a growth mindset?

Research Method

Research Model: The main analytical method of this study was the moderated mediation analysis using Model 7 of PROCESS macro ver.3.2. The conceptualized research model is shown in Figure 1.

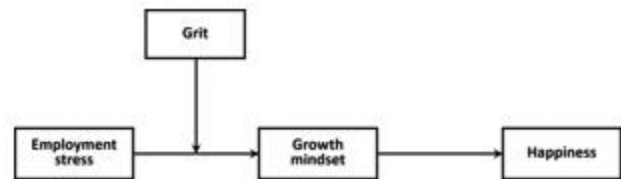


Figure 1: Conceptual Research Model

Survey Subject and Data Collection Method: 364 college students in D of Chungnam province and D metropolitan city were included in the study. There were 164 women (45.1%) and 200 men (54.9%) in the study. Most participants were under age 20 (175 persons, 48.1%), 107 (29.4%) were aged 21 to 22 years old, and 82 (22.5%) people were over 23 years old.

Research Tools

Employment Stress: In order to measure the employment stress of college students, we used the employment stress test developed by Hwang¹⁷ based on the index of Connell Medical the University (Connell Medical Index), revised by Kang¹⁸. The employment stress test consists of 22 subscales and was measured on a 5-point Likert scale. The higher the score, the higher the level of employment stress. Cronbach's α value for the employment stress test used in this study was 0.895.

Happiness: We used the Subjective Happiness Scale developed by Lyubomirsky and Lepper¹⁹. The scale consists of four items on a 7-point Likert scale. The higher the score, the higher the happiness. Cronbach's α for the Subjective Happiness Scale was 0.782.

Growth Mindset: The growth mindset scale developed by Dweck⁹ and used by Ayers²⁰ was used in this study. The scale consists of 20 items on a 5-point Likert scale. The higher the score, the higher the growth mindset. The reliability of the growth mindset scale used in this study determined by Cronbach's α was 0.833.

Grit: We used the grit (grit-O) scale developed by Duckworth & Quinn²¹. It consists of a total of 12 questions. Measurements are made on a 5-point Likert scale and the higher the score, the higher the grit. The reliability of the grit-O scale used in this study determined by Cronbach's α was 0.807.

Data Analyses: In this study, SPSS Win. 21.0 and SPSS PROCESS macro proposed by Hayes²² was used. SPSS Win. 21.0 was used for descriptive statistical analysis, reliability analysis, and mean comparison analysis. The mediation effect, moderation effect, and moderated mediation analyses were performed using SPSS PROCESS macro. The bootstrap method was applied to verify this.

Results and Discussion

Correlation and Descriptive Statistical Analyses:

Pearson's correlation analysis was used to identify correlations among the variables. The results are shown in Table 1. Employment stress had a negative and significant correlation with happiness, growth mindset, and grit. There was a statistically significant positive correlation between happiness, growth mindset, and grit.

These results are consistent with the finding that stress in adolescents had a significant negative correlation with growth mindset and happiness²³ and there was a positive relationship between growth mindset and grit^{24,14,15}. These results agree with another study which reported a statistically positive correlation between growth mindset and happiness^{25,23}.

Table 1: Results of correlation and descriptive statistics

	Employment stress	Happiness	Growth mindset	Grit	M	SD
Employment Stress	1				2.3009	.68265
Happiness	-.509**	1			4.7479	1.01868
Growth mindset	-.353**	.401**	1		3.5443	.46591
Grit	-.154**	.344**	.329**	1	3.1635	.52431

** $p < .01$

Moderated Mediation Verification: In order to verify whether grit moderated the mediating effect of growth mindset on the empathy, stress, and happiness of Korean college students, we analyzed the data using Model 7 of the PROCESS macro for SPSS proposed by Hayes²². For verification of the moderated mediation, the values for each variable were averaged, 5,000 repeats were made for bootstrapping, and a 95% confidence interval was set. The results of the analysis are shown in Figure 2 and Table 2.

First, in the mediating model, employment stress had a negative effect ($\beta = -0.2030$, $p < .001$) on growth mindset and grit had a positive effect on growth mindset ($\beta = 0.2244$, $p < .001$), both of which were statistically significant. The interaction between employment stress and grit was significant ($\beta = -0.1623$, $p < .001$) and the increase in R^2 by the interaction was also significant ($\Delta R^2 = 0.0254$, $p < .001$).

These results are similar to those of Hwang & Lee²³ who found that stress negatively affected growth mindset. The study also found that parenting stress had a negative effect on growth mindset²⁶.

The belief in self-change also depends on the level of enthusiasm and the persistence toward long-term goals. This is supported by the findings of Dweck⁹ that the higher the grit, the greater the growth mindset and the higher the growth mindset, the higher the grit. However, previous research has shown that most growth mindset had a positive effect on grit^{27,28}. In contrast, the study on the moderating effect of grit by Kim & Ko²⁹ is the only one which showed grit moderated the negative effect of hotel employees' employment anxiety caused by trying to satisfy customers' demands. However, grit and growth mindset are complementary concepts rather than concepts such as cause and result. The conditional effect of grit, a moderating variable, was significant at all grit levels, low (M-1SD), average (M) and high (M+1SD), indicating that the interaction of employment stress and grit affected growth mindset.

We used the Johnson-Neyman method, a floodlight method, to determine the significance of the conditional effects of employment stress and grit interaction depending on the grit values. Grit was responsible for moderating the relationship between employment stress

and growth mindset in areas where the grit value was greater than -0.6802.

Employment stress had a negative effect on happiness ($\beta = -0.6268, p < .001$), while a growth mindset had a positive and statistically significant effect on happiness ($\beta = 0.5532, p < .001$). The path of employment stress $\rightarrow$ growth mindset $\rightarrow$ happiness was significant for low (M-1SD), medium (M), and high grit values (M+1SD). Therefore, the moderated mediation effect of grit in the effect of employment stress on happiness via a growth mindset was verified.

The happiness of Korean college students was negatively influenced by employment stress but it was positively influenced by a growth mindset. This is the same result as a study which reported employment stress negatively affected the happiness of college students³⁰.

In addition, this is the same result as a study which reported that stress in adolescents negatively affected happiness, while a growth mindset had a positive effect on happiness²³. These results are in line with research findings that stress affected happiness negatively⁴⁻⁶.

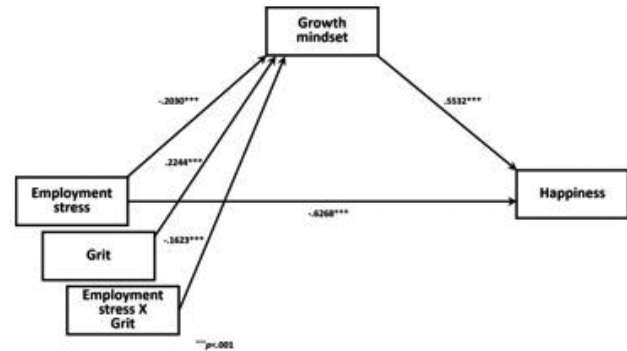


Figure 2: Statistical model of moderated mediation

Table 2: Results of moderated mediation effect

Mediating variable model (DV: Growth mindset)						
Variables	β	SE	t value	p	LLCI*	ULCI**
Constant	3.5353	.0217	162.7878	.0000	3.4926	3.5780
Employment stress $\rightarrow$ Growth mindset	-.2030	.0321	-6.3246	.0000	-.2661	-.1399
Grit $\rightarrow$ Growth mindset	.2244	.0423	5.3030	.0000	.1412	.3076
Employment stress $\times$ Grit $\rightarrow$ Growth mindset	-.1623	.0472	-3.4372	.0007	-.2552	-.0695
Test of highest order unconditional interaction:						
R ² -change	R ²	F	p			
Employment stress x Grit	.0254	11.8145	.0007			
Conditional effects of employment stress at values of grit:						
grit	Effect	se	t	p	LLCI*	ULCI**
-.5243	-.1179	.0420	-2.8085	.0052	-.2005	-.0353
.0000	-.2030	.0321	-6.3246	.0000	-.2661	-.1399
.5243	-.2881	.0390	-7.3790	.0000	-.3649	-.2113
Significance area of conditional effect of employment stress at values of grit:						
Grit	Effect	se	t	p	LLCI*	ULCI**
-1.1635	-.0141	.0657	-.2154	.8296	-.1433	.1150
-1.0176	-.0378	.0598	-.6329	.5272	-.1553	.0797
-.8718	-.0615	.0541	-1.1373	.2562	-.1678	.0448
-.7260	-.0852	.0487	-1.7492	.0811	-.1809	.0106
-.6802	-.0926	.0471	-1.9666	.0500	-.1852	.0000
-.5801	-.1088	.0437	-2.4887	.0133	-.1948	-.0228
-.4343	-.1325	.0394	-3.3664	.0008	-.2099	-.0551
-.2885	-.1562	.0358	-4.3633	.0000	-.2266	-.0858
-.1426	-.1799	.0333	-5.4032	.0000	-.2453	-.1144
.0032	-.2035	.0321	-6.3430	.0000	-.2666	-.1404

Conted...

.1490	-.2272	.0323	-7.0248	.0000	-.2908	-.1636
.2949	-.2509	.0340	-7.3743	.0000	-.3178	-.1840
.4407	-.2746	.0369	-7.4349	.0000	-.3472	-.2019
.5865	-.2982	.0408	-7.3093	.0000	-.3785	-.2180
.7324	-.3219	.0454	-7.0912	.0000	-.4112	-.2326
.8782	-.3456	.0505	-6.8414	.0000	-.4449	-.2462
1.0240	-.3693	.0560	-6.5924	.0000	-.4794	-.2591
1.1699	-.3929	.0618	-6.3592	.0000	-.5145	-.2714
1.3157	-.4166	.0678	-6.1469	.0000	-.5499	-.2833
1.4615	-.4403	.0739	-5.9563	.0000	-.5857	-.2949
1.6074	-.4640	.0802	-5.7863	.0000	-.6216	-.3063
1.7532	-.4876	.0865	-5.6347	.0000	-.6578	-.3174
Dependent variable model (DV: Happiness)						
Variables	β	SE	t value	p	LLCI*	ULCI**
Constant	2.7872	.3633	7.6710	.0000	2.0727	3.5017
Employment stress → Happiness	-.6268	.0694	-9.0260	.0000	-.7634	-.4902
Growth mindset →	.5532	.1018	5.4370	.0000	.3531	.7533
Conditional indirect effects of X on Y (Employment stress→Growth mindset→Happiness):						
Grit	Effect	Boot SE	Boot LLCI*	Boot ULCI**		
-.5243	-.0652	.0294	-.1314	-.0162		
.0000	-.1123	.0267	-.1680	-.0653		
.5243	-.1594	.0354	-.2279	-.0905		

*LLCI=The lower boundary of the indirect effect within the 95% confidence interval

**ULCI=The upper boundary of the indirect effect within the 95% confidence interval

For the moderated mediation analysis of grit, the Model 7 of PROCESS macro was used and the relationship of grit in employment stress and growth mindset was divided into low, medium, and high groups in Figure 3. As employment stress increased, growth mindset decreased according to grit's three levels ($M \pm SD, M$). Such a tendency was lower in the high grit group compared to the medium and lower grit groups.

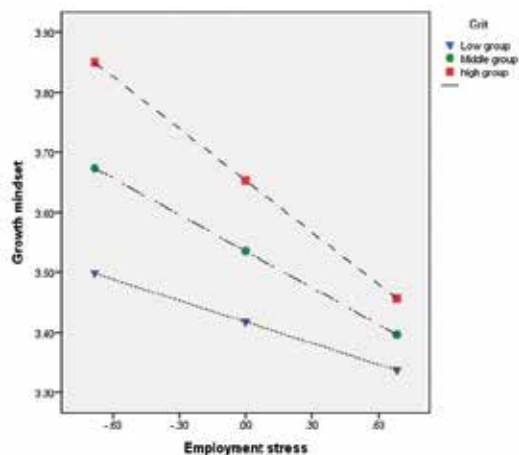


Figure 3: Moderating effect analysis of grit

Conclusion

Based on the results of the study, the following findings are reported: First, Pearson's correlation analysis showed that there was a statistically significant correlation between employment stress and happiness and growth mindset and grit and that employment stress was negatively correlated with happiness, growth mindset, and grit. Second, the moderated mediation effect analysis showed that grit moderated the path from employment stress to happiness via a growth mindset. In other words, grit played a role in controlling the mediating effect of a growth mindset in relation to employment stress and happiness. Therefore, the moderated mediation effect of grit was verified.

This study examined the theoretical validity of previous studies by analyzing grit's moderated mediation role in the effects on employment stress and growth mindset on happiness. This study was meaningful in that it attempted to integrate the results of previous studies by empirically analyzing the mediating

effect of a growth mindset and the moderating effect of grit. Nevertheless, suggestions for future research are as follows: First, scholars' interest in grit and growth mindset has increased but research on the moderating effect and moderated mediation effect of these variables is insufficient. In the future, it is necessary to identify the various roles of these variables, as well as the active research of grit and growth mindset. Second, this study revealed that the relationship between employment stress and the happiness of college students was mediated by a growth mindset and grit.

This is noteworthy in that this research verified effective variables which could enhance the happiness of college students, individuals who will soon enter the workforce. Therefore, the development and application of programs to improve the grit and growth mindset of college students are needed.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Comparison between Kinesio Taping and Compression Garments on physical muscle Strength and Stability

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ABSTRACT

This study measures strength and static/dynamic balance to investigate the impact of KTCG with kinesiology taping and the application of the KT technique on strength and stability. measured 34 peoples on following metrics to evaluate the stability and strength under the normal condition, with KT technique and with KTCG : Average torque of extensor and flexor under isometric and isokinetic, Reaching distance and AP, ML, overall sway and sway velocity. In addition to aforementioned measures. All measures were analyzed using one-way ANOVA. We found that the presence of applying on the KT technique and putting on the KTCG had no significant difference on muscle strength(Average torque of extensor and flexor under isometric and isokinetic) and part of stability(Reaching distance of anterior, Posteromedial, and Posterolateral, ML sway) with the p-value larger than .05($p > .05$). However, the metrics such as AP sway, Overall sway, and sway velocity had a significant p-value being smaller than .05($p < .05$). As a result, applying on the KT technique and putting on the KTCG is helpful to increase balance ability. And, gives positive effect to stability psychologically.

Keywords: Kinesio Taping, Compression garments, Muscle strength, Dynamic Stability, Static Stability

Introduction

Kinesio Taping(KT), which is used widely in orthopedics and sports medicine to prevent athletes' injuries, was developed in 1970s by a Doctor of Chiropractic, Kase Kenzo, who used elastic treatment tapes on the skin as a taping method¹. For this reason, The KT technique has been widely used as a method for preventing athlete's injury¹. And the use of Compression Garment(CG) is steadily gaining popularity among athletes who seek to increase motor ability and reduce fatigue as it reduces risks of injury during exercises and sports games². The ability determined to be important in short-distance sprint race is the generation of explosive power and rapid restoration, respectively, CG and KT evidently improve both of these elements³.

Strength is an important measure of individual's physical ability and an essential factor necessary for performing various daily and athletic activities⁴. Recent studies have shown that muscle abnormalities and muscle weakness, which play an important role in the musculoskeletal system, correlate with each other^{5, 6}. In addition, stability is the ability to maintain an upright posture and perform complex motor skills in sport⁷. Stability can be classified into static and dynamic stability. Static stability is defined as the ability to place the center of gravity(C.O.G) of the object in the rotation axis, and dynamic stability is defined as the ability to maintain the C.O.G in the body during the task⁸. At this time, postural control is maintained by the complex interrelationships between the body posture and the response of the musculoskeletal system, which controls movement. This system can be effective with the wearing of KTCG⁹. Maintaining stability can improve posture control ability¹⁰. As a result, activity performance is improved¹¹.

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Compression garment reduces energy consumption while exercising with low-medium intensity by triggering role of circulatory system¹². Canedo(1997) said that sensory system for body's senses and motor system for

movement have interaction in movement adjustment for each other. Ghai et al.(2016) conducted study to access unique receptivity of knee joint of dominant and non-dominant leg by putting on and not putting on compression garments underneath knee joint with covering participants' eyes to remove visual cues. And the result was that compression garments improve knee joint's self-awareness (unique receptivity) regardless of whether it's superior leg or not^{13, 14}. Also, in Michael et al.(2014)'s experiment, participants performed balancing test that had six conditions and needed for participants to stand with one foot for maximum 60 seconds. And the result shows that putting on compression garments gave more balanced time and less postural sway than putting on the shorts¹⁵.

Still, there is also the result shows that KT does not restrain or trigger any muscles tested^{8, 16}. When measuring strength in Quadriceps Femoris muscles, concentric and eccentric Hamstring muscles with using Cybex device while the muscles were contracted at 60°/s and 180°/s, Fu et al.(2008) said that there is no significant difference in strength before and after applying on KT technique¹⁷. Also, Fu et al.(2012) study shown that no effects appear in case of putting on compression garments during the activity¹⁸. As a result, KT technique has been widely and clinically used for the existing studies of KT intervention while the recent studies do not insist the intervention of using KT technique¹⁹. For this reason, as comparison between KT, KTCG has been seldom conducted still now, we believe that effect of putting on KT, KTCG for strength and stability. To verify this, it is this study's purpose to compare strength and stability among KT group, KTCG group and Normal group.

Method

Participants

Table 1: General characteristics of participants (N = 34)

Gender	Male (n = 17)	Female (n = 17)
Age (Year)	22.02 ± 2.54	21.44 ± 1.05
Height (cm)	173.48 ± 4.88	158.76 ± 4.27
Weight (kg)	77.64 ± 12.02	51.08 ± 7.56

This Study was performed by twenty healthy adults in S university in Asan city, Chungnam province. They were selected as those who agreed to participate

voluntarily by providing guidance on the purpose, necessity and method of study. After pretest, thirty four healthy participants with no prior history of ankle and knee pain participated in this investigation. Exclusion criteria was surgery within three months, history or hospital visit for recent ankle or knee pain, pain or discomfort during ankle, knee mobilization, history of inflammatory or degenerative joint disease, and connective tissue disease. The total of thirty four subjects were chosen using a sample size of output program(G*Power 3.1). Thirty four people of forty four were randomized by drawing lot and assigned this study. This study was approved by Institutional Review Board(SM-201804-018-2). General characteristics of the study participants are as follow Table 1.

Experimental procedures: The process of the study explained above is as follow [Figure 1]. The subjects were performed in a single group without a control group and with a KT technique and wearing KTCG in comparison with the control group [Figure 2]. To minimize participant' fatigue during the measurement, KT technique, wearing KTCG and control group were measured once a week for a total of 3 weeks. And, participants took a 30-second rest after one stretching to prevent negative symptoms such as muscle spasms and provided sufficient rest time between measurements.

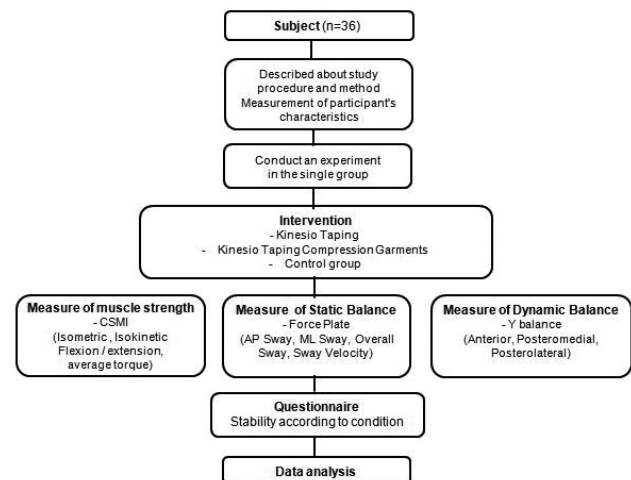


Figure 1: Experiment protocol flow chart

KT technique and Compression Garment: We used Kinesio Taping(Nitto Denko Corporation, Osaka, Japan) [Figure 2-A]. The KT was applied with 3 vertical "I" shape strips over the leg Vastus Lateralis muscle(VL), Vastus Medialis muscle(VM), and Rectus Femoris muscle(RF) from the base of the Patella. Also Tibia affixed to "I" shape strip. The "Y" shape strips applied with Hamstring

muscles, Gastrocnemius muscles. And The KT wrapped round on the basis of tibial tuberosity [Figure 3-B,C]. For the KTCG(E75 leg sleeve, Enerskin Corporation, Seoul, Korea) [Figure 2-B,C,D] designed to compress the anterior and posterior thighs, as well as lower legs. Small, medium and large or extra large KTCG was worn dependent on the leg volume to ensure a snug fit that would not impinge blood flow [Figure 3-D,E].



Figure 2: A: Kinesio Taping B: Figure indicating tape line of Compression Garments and its pressing direction C: KTCG (Anterior View) D: KTCG (Posterior View)



Figure 3: A: neither of those condition B: KT (Anterior View) C: KT (Posterior View) D: KTCG (Anterior View) E: KTCG (Posterior View)

CSMI (Muscle Strength): Prior to measurement, participants were explained the experimental purpose and procedure. To set the same environment between all participants, they worn same pants and the same researchers applied KT technique to reduce the error of the intervention. In order to achieve the most stable angular speed, the angular rate was specified at 60°/sec using the Isokinetic system Rehabilitation System(CSMI), and participants was placed on the measuring equipment with a fixed belt connected to the

chair. In a sitting position, measure the average torque of the Knee flexor muscles and the Knee extensor muscles three times each, perform the Knee flexion, extension within Full Range of Motion(ROM) to measure Average torque three times in a row during the isokinetic exercise.

Measuring stability of body (Dynamic Balance and Static Balance): To set the same environment between all participants, they worn same pants and the same researchers applied on KT technique to reduce the error of the intervention. Dynamic stability is measured reaching distance during Y-balance test. Participants assessed quantitative balance during performance of the YBT. The participants put the foot on the measuring tape which places the floor in the anterior, posteromedial, and posterolateral directions while standing on the other foot on a central. In the static balance, use the Force Plate to measure the static stability and stand on the Force Plate to hold the position that gathers their arms. While standing, participants placed their pubic symphysis where we mark the midline on the Force Plate. The data was calculated by the visual 3D motion analysis(HOSPI, S. Korea). Each participant was allowed two practice trials in each direction and then performed three test trials in each direction.

Data Analysis: In this study, descriptive statistics were used in order to analyze the mean and standard deviation(SD) of each variable. Statistical analysis of every measured value was calculated using SPSS/PC ver.20.0 for windows program(SPSS INC, Chicaco, IL). One-way ANOVA was used in order to figure out to compare the mean values according to the methods of intervention. In addition, Paired-Samples T test was used in post-hoc test in order to figure out the difference between each variable. All statistical significance levels were set at $p < .05$ for statistical analysis.

Result

Table 2: Comparison of muscle strength, dynamic balance and static balance according to intervention (N = 34)

	I ntervention			F
	KT ^b	KTCG ^b	Control Group	
Muscle Strength				
Isometric-extensor	63.62 ± 3.45 ^a	63.06 ± 3.52	63.03 ± 3.43	0.005
Isometric-flexor	89.65 ± 4.82	90.26 ± 4.84	90.24 ± 4.74	0.005
Isokinetic-extensor	148.30 ± 8.81	150.50 ± 50.53	147.53 ± 8.74	0.031
Isokinetic-flexor	63.62 ± 3.45	63.06 ± 3.52	63.03 ± 3.43	0.009

Conted...

Dynamic balance				
Anterior	82.52 ± 1.24	82.40 ± 1.22	82.67 ± 1.21	0.013
Posteromedial	66.80 ± 2.15	66.28 ± 1.88	65.72 ± 2.05	0.072
Posterolateral	71.11 ± 1.80	71.26 ± 1.77	70.88 ± 1.73	0.012
Static balance				
ML sway	78.37 ± 3.41	79.12 ± 3.27	81.34 ± 3.13	0.038
AP sway	109.14 ± 4.33	109.97 ± 4.00	112.41 ± 4.33 ^{†,††}	0.328
Overall sway	187.51 ± 7.31	189.08 ± 6.80	193.75 ± 6.80 ^{†,††}	0.177
Sway velocity	6.25 ± 0.24	6.30 ± 0.27	6.46 ± 0.27 ^{†,††}	0.175

a :All values are mean value ± SD

b :KT : Kinesio Taping group, KTCG : Kinesio Taping compression garments group

†: Comparison of KT and Control Group(p<.05)

††: Comparison of KTCG and Control Group(p<.05)

Compare difference among groups: By using isometric-extensor, isometric-flexor, isokinetic-extensor, isokinetic-flexor's average torque value in case of normal status, CSMI test with applying on KT technique and putting on KTCG and each direction's average reaching distance value and force plate, we measured ML sway, AP sway, overall sway, sway velocity with COP displacement in balance test, and compared significance by using one-way ANOVA. 3.2. Compare pre- and post-status in single group

Compare pre- and post-status in single group: By using isometric-extensor, isometric-flexor, isokinetic-extensor, isokinetic-flexor's average torque value in case of normal status, CSMI test with applying on KT technique and putting on KTCG and each direction's average reaching distance value and Force Plate, we measured ML sway, AP sway, overall sway, sway velocity with COP displacement in balance test, and compared significance by using Paired t-test. The statistical result shows no significant difference between average values for pre- and post-average torque of isometric-extensor, isometric-flexor, isokinetic-extensor, isokinetic-flexor in Normal-KT, Normal-KTCG, CG-KTCG(p>.05). The statistical result shows significant difference between pre- and post-values among AP sway, overall sway, sway velocity in Normal-KT, Normal-KTCG(p<.05).

Discussion

In this study, the difference among strength, dynamic stability, and static stability was measured to compare the effect for strength and stability between

applying on KT technique with putting on KTCG. There was no significant difference for strength and stability among three groups. Still, in static stability, significant difference was observed between Control group-KT and Control group-KTCG in AP sway, overall sway, sway velocity. It means that applying on KT technique with putting on KTCG increase stability in the standing position. Vercelli et al.(2012) applied KT technique to Quadriceps Femoris with three methods - Facilitation, Inhibition, Placebo and measured Quadriceps's muscle strength in isokinetic maximal test performed at 60 and 180 degrees per second. McMaster et al.(2017) said that putting on CG can stimulate skin mechanical receptor to trigger adjusting motor neuron however, it may also inhibit range of motion(ROM) during hip flexion²⁰. Cavanaugh et al.(2016)'s study, there was no significant difference in measuring strength for knee flexion and extension of control group, KT group and CG group¹⁶. Also, Fu et al.(2008)'s study, It showed that there was no significant difference in strength for instant and delayed effect in strength for Quadriceps muscles and Hamstring muscles of healthy, young athlete with KT technique. This reason is explained by the fact that tactile input created by KT is not enough to adjust healthy athlete's strength as it is reported that motor control is interacted with skin's tactile input by changing central nerve's stimulant²¹. Korman et al.(2015)'s study, test for concentric contraction at 60°/s or 180°/s isokinetic exercise between applying on KT technique and control group was conducted, and its result shows that there was no significant difference among maximum torque(Nm), total work(J) or average power(W) in applying it in

various conditions. This is explained by hypothesis that stimulus should be strong enough to affect muscles. Therefore, the results of this study, it is concluded that applying on KT technique and putting on CG has no effect to increase strength since there's no enough tactile stimulation and inhibit ROM²¹.

To compare dynamic balancing, Hettle et al.(2013) measured reaching distance the group of applying on KT technique with the group of control group in Modified Y-balance test(SEBT), and there was no significant difference among reaching distance²². Cavanaugh et al.(2016)'s study, there was no significant difference among Normal group, applying on KT technique group, putting on CG group in Y-balance test¹⁶. It might not be that Y balance test doesn't more challenging task. Michael et al.(2014) have no effect on CG about single – leg balance with eye open, but did report significant difference with eye close. The single leg drop jump landing balance task did seems to be more dynamic than single – leg balance with the sensitive of the Force plate force COP and impact forces^{14, 15}. For these reasons, we believe that applying KT and putting on KTCG has a better effective in stability for challenging tasks than Y balance.

In Cortesi et al.(2011)'s study, AP, ML sway was measured for both the group with applying on KT technique and group with control group, in static position, and significant difference was observed only in AP direction. This is because movement of joint is minimized as KT is applied to body. On the contrast, there was no significant difference in ML sway²³. Medial-Lateral balance control was mainly occurred in hip-joint and trunk rather than ankle. Specific muscles are related with adjusting ML sway. With conducting lots of studies, hip-joint flexor muscles and adductor muscles are activated when swaying ML two legs' loading status and no-loading status are adjusted support this opinion²⁴. The reason of no significant difference in ML sway is KT and KTCG doesn't influence on Hip joint because KT applied to knee flexor, extensor and patella, tibia. Also, CG is designed for leg sleeve. Based on these reasons, we consider in this study that applying on KT technique, putting on CG reduced affect to stability of joints.

Conclusion

The purpose of this study is to find out the effect for strength and stability on KT technique with putting on KTCG. Firstly, for the result of strength, there was

no significant difference among average torque values of isometric-extensor, isometric-flexor, isokinetic-extensor, isokinetic-flexor. Secondly, for the result of stability, there was no significant in dynamic sway while there was significant difference of static stability in AP sway, overall sway, sway velocity between Normal-KT and Normal-KTCG. As a result, applying on KT technique and putting on KTCG is helpful to decrease AP sway, overall sway, sway velocity of postural control, and applying KT technique and putting on KTCG gives positive effect to stability psychologically. Based on these, we can conclude that applying on KT and putting on KTCG is helpful for static balance training.

Ethical Clearance: Take from Sunmoon University committee Institutional Review Board (SM-201804-018-2).

Source of Funding: Self

Conflict of Interest: Nil

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Comparison of Proprioception, Lower Limb Stability, Blood Pressure and ROM after Proprioceptive Exercise by AR Exercise and Therapist Instruction

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ABSTRACT

The purpose of this study was to compare the changes and determine the effect of AR program and therapist instructions on exercise according to proprioception, stability, blood pressure and ROM. This study consisted of a total of 42 subjects; 22 healthy men and 20 healthy women with no orthopedic cardiovascular disease. The subjects performed proprioceptive exercise in various postures, and the Paired T-test was used to confirm the difference in change between the AR program group and the group trained under the therapist instruction. Independent T-test method was used to confirm the difference between the two groups. There were no ROM changes in both groups and the overall proprioception. The balance of the lower limb significantly increased but contrarily, the blood pressure significantly decreased. There were no significant differences between the two groups. The use of AR program and therapist's instructions has a positive effect on proprioception, balance and affects blood pressure. There were no significant differences between them. Therefore, it is thought that the AR program can be a good alternative as a therapeutic tool in clinical practice.

Keywords: *Augmented Reality, Proprioception, Lower extremity stability, Blood pressure, Range of motion*

Introduction

Most people with diverse diseases suffer from mild impairments that cause dysfunction in their primary function. Thus, people are unable to maintain activities of daily living, and thus the number of patients receiving Medicare is rapidly increasing¹. In a recent study, the Canadian health care system spent more than \$ 2.7 billion on treatment after disability and spent an average of 3 million hours to the hospital². The rehabilitation treatment time given to the patient is usually once or twice a day for 30 minutes. Most of the general rehabilitation(not computer based) is performed at the rehabilitation center in a hospital or a medical institution³. Due to the need for different equipments, large numbers of facilities and personnel are needed. However, therapists can only treat one patient at a time⁴.

In other words, a steady and intense exercise can help the patient to recover his motor function effectively^{5, 6}. AR stands for Augmented Reality, and refers to a technique of superimposing information on a visual space in real life. The AR does not change its position on the space even if it moves the body by displaying the object or the building which is displayed by overlapping 'other information'. It is described as a realistic building over a headset or a smart phone. The AR program is easy to use and convenient, and it has been used in many parts of our lives. In addition, AR programs are also used for medical evaluation because they are effective in evaluating ROM measurements⁷. In the medical evaluation, ROM is an important measurement method for joint motion(upper and lower limb) evaluation and physical therapy in patients⁸. Brown et al.(2008) also argues that AR or VR programs can be used in areas such as physiology, assessment, rehabilitation, and research involving subject's motor function and proprioception(ie, position sense and kinesthetic)⁹.

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The proprioceptive senses are located inside the muscles, tendons, and joints and play important roles in muscle tension, posture reflexes, joint stabilization, and

exercise control¹⁰. Proprioception is a term that integrates muscle sense and joint position sense, recognizing its position in muscle or joint space and contributing to functional joint stability¹¹. Proprioception are the most important part of body posture control¹², and functional instability in the movement of the joints may occur when the ability to control this senses deteriorates. Diener et al.(1984) suggested that inherent receptive sensations are related to stability¹³.

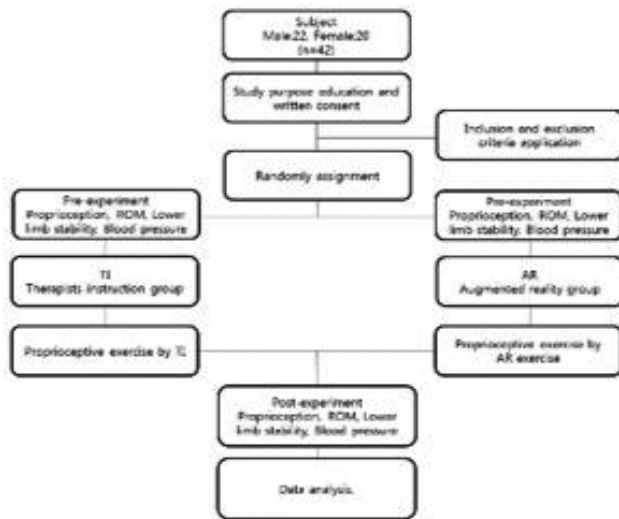


Figure 1: Experiment protocol flow chart

Additionally, Amic et al.(2014) propose that the proprioceptive exercise through AR was significantly more effective in lower limb stability than the proprioceptive exercise by therapist's instruction¹⁴. This suggests that the proprioception exercise related to the lower limb stability done by the AR may be more effective than an exercise by the therapist. Lower limb Stability is the ability to maintain a Center of Gravity(COG) within the Base of Support(BOS) and to maintain equilibrium in the body¹⁵. It is a complex process that responds appropriately to external movements during to maintain posture¹⁶. The Wii Fit Plus system with a lower limb stability plate and AR lower limb stability training techniques can be considered an effective and enjoyable tool for and adult body lower limb stability training¹⁷. Although there have been various studies on the effects of changes in proprioception, lower limb stability, and ROM using the AR program on the body, there are few studies that observe changes in blood pressure using the AR program. Therefore, we sought to determine whether there was a change in blood pressure during AR exercise based on the findings that blood pressure is generally decreases during exercise.

Method

Subject

Table 1: Subject characteristics (n = 42)

	TI (n = 21)	AR (n = 21)	2/y
Age(year)	22.04 ± 0.92	23.33 ± 1.35	N/S
Height(cm)	168.4 ± 7.8	167.4 ± 9.1	N/S
Weight(kg)	65.1 ± 13.2	63.3 ± 6.1	N/S
Gender	Male : 10 Female : 11	Male : 12 Female : 9	

Values indicate mean ± stand deviation, TI: Therapist instruction, AR: Augmented reality, N/S: Not Signification

The subjects were twenty-eight healthy men and women attending S University in Asan Chungnam, only those who were given sufficient explanations about the purpose of the study and the experimental methods participated in the study. The subjects who had no problems with lower limb stability due to fracture and trauma in the last 3 months, who have not received treatment or surgery in connection with the experiment, hypertension(systolic blood pressure 139 mmHg, diastolic blood pressure 89 mmHg or more), who have no cardiopulmonary system disease, who have no neurosurgical psychiatric disorder, no vestibular or visual problems were excluded from this study. The general characteristics of the participants are shown in [Table 1]. For this research, study involving human volunteers was obtained from the University of Sunmoon's Research Ethics Board in Asan, Chungnam(SM-201805-037-2) The overall research process is shown in [Figure 1].

Intervention Method: Subjects were divided through randomized control trials and non-equivalent intervention comparison designs. The groups were divided into two groups: those who underwent proprioceptive exercise by the therapist's instruction, and a group instructed by the AR. As a single blind study, the subjects underwent an experiment in which they did not know the contents of the intervention. Both groups performed warm up exercises and stretches to prevent any injuries. The cross-sectional study showed that exercise was performed under the direction of a therapist who was proficient in this area. The hip flexion-extension 0-90° was performed to the extent that the knee did not cross the end of the foot with the Swiss ball between the wall and the subject's back.

Knee flexion-extension 90-0° was performed with the subject sitting on a Swiss ball and extending one knee while the opposite foot remained on the ground. The group using the AR program performed the exercises

in the same way as the other group has done without the therapist. Each movement was performed on three sets of 15 times¹⁸, one minute of rest per set. [Figure 2] shown the specific acceptance movement.

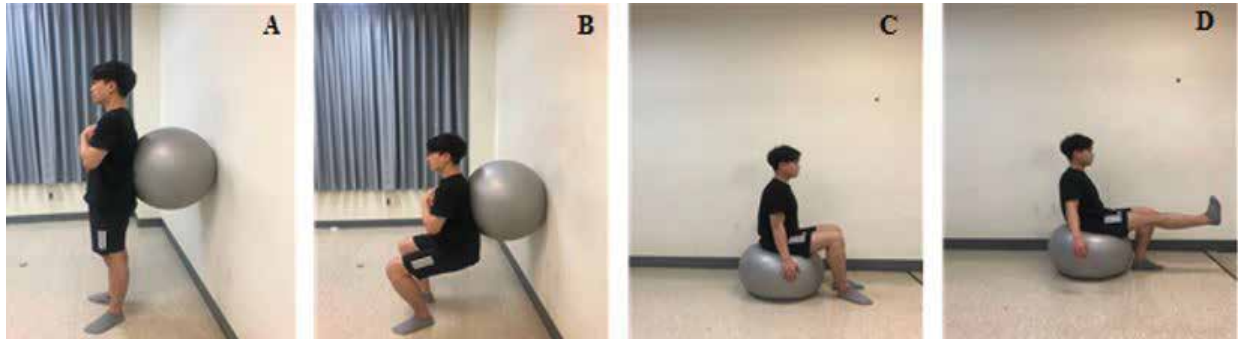


Figure 2. A: Starting posture, B: Exercise posture, C: Starting posture, D: Exercise posture

Measurement Methods and Tools

1. Proprioception Measure: We used motion analysis mode among the programs in AR equipment(UINCARE-82B DGAIT). When a subject maintains a static posture for 3 seconds in front of the AR device, the program recognizes each joint of the body, displays each joint on the screen, displays the angle of the joint on the side screen, then starts measurement [Figure 5]. Using the AR program, we were able to learn the angle of the knee flexion, hip extension 15°, 30°, and 60° 5 times, respectively. The subject then performed the sitting position of the knee joint to limit the compensatory action, hip joint was performed in a supine position.

2. Stability Measure and ROM Measure: All subjects measured the stability of the X-axis medio-rateral, Y-axis vertical, and Z-axis anterior-posterior before and after exercise using the Matlab program(MATLAB R2016a-9.0.0.341360). The Matlab program is shown in [Figure 2-A,B]. The subject is to hold the non-dominant foot in front of the program on the ground and hold the other foot up for 5 seconds with Knee flexion at 90°. Subject's arms were abducted at shoulder height, and the distance from the Matlab was measured once by setting three meter[Figure 2-C].

Result and Discussion

We compared the proprioception values of 15°, 30°, and 60° of hip flexion due to proprioceptive exercise.

In the TI group, there was a significant difference in the hip flexion 15° before and after exercise($p < 0.05$). In the AR group, there was a significant difference in the proprioception before and after exercise intervention ($p < 0.05$). In the TI group, there was a significant difference in the hip flexion 30° before and after exercise($p < 0.05$). In the AR group, there was a significant difference in the proprioception before and after exercise intervention($p < 0.05$). In TI group hip flexion 60° and the AR group, there was a no significant difference in the proprioception before and after exercise($p > 0.05$). In the AR group, there was a no significant difference in the proprioception before and after exercise($p > 0.05$). Our comparison of proprioception values during 15°, 30°, and 60° of knee flexion due to proprioceptive exercise, in the TI group, the difference of proprioception according to 15° knee extension was significant($p < 0.05$), and in the AR group, there was a significant difference in the difference before and after exercise intervention($p < 0.05$) [Table 2].

We compared the balance X, Y, and Z values before and after lower limb stability. In the TI group, the difference of the X-axis was significant($p < 0.05$), in the AR group, there was a significant difference before and after exercise intervention($p < 0.05$). The difference of the Y axis of the TI group before and after the exercise intervention($p > 0.05$) was not significant, AR group before and after the exercise intervention($p > 0.05$) was also not significant. In the TI group, the difference of the Z axis after the exercise intervention was significant($p < 0.05$), In the AR group, the difference between before and after exercise intervention was significant($p < 0.05$) [Table 3]. We compared the before - and after - blood pressures

according to the proprioceptive exercise. There was a significant difference between the SBP and DBP in the TI group ($p < 0.05$). In the AR group, the difference in blood pressure before and after exercise was significantly different between SBP and DBP ($p < 0.05$)

[Table 4]. There was no significant difference in ROM ($p > 0.05$) between the TI group before and after exercise intervention, and the difference in ROM before and after exercise intervention in the AR group was not significant ($p > 0.05$) [Table 5].

Table 2: Comparison of proprioception according to angles between TI and AR exercise. (n = 42)

		Angle		TI	AR	t
P	HF	15	Before	2.83 ± 0.46	2.84 ± 0.47	0.21
			After	2.60 ± 0.27	2.58 ± 0.30	
			t	2.46*	2.79*	
		30	Before	2.83 ± 1.07	3.21 ± 1.02	-0.73
			After	2.35 ± 0.95	2.54 ± 0.72	
			t	2.86*	5.39*	
		60	Before	3.87 ± 0.56	3.68 ± 0.53	0.85
			After	3.73 ± 0.73	3.54 ± 0.73	
			t	1.98	1.54	
	KE	15	Before	2.66 ± 0.42	2.68 ± 0.42	-1.18
			After	2.45 ± 0.30	2.57 ± 0.35	
			t	2.73*	2.20*	
		30	Before	3.64 ± 0.78	2.95 ± 0.81	2.12
			After	3.15 ± 0.86	2.61 ± 0.77	
			t	5.21*	6.59*	
		60	Before	4.08 ± 0.74	4.08 ± 0.71	-1.55
			After	3.66 ± 0.48	3.87 ± 0.38	
			t	3.76*	2.16*	

P : Proprioception HF : Hip flexion, KE : Knee extension, TI : Therapist instruction, AR : Augmented reality

Table 3: Comparison of lower limb stability according to axis between AR and TI proprioceptive (n = 42)

	Axis		TI	AR	t
Lower limb stability	X	Before	13.21 ± 4.49	12.09 ± 5.13	0.21
		After	11.21 ± 5.58	9.40 ± 5.73	
		t	2.22*	2.25*	
	Y	Before	4.57 ± 1.46	4.35 ± 2.38	-0.39
		After	4.31 ± 1.99	3.88 ± 1.88	
		t	0.73	1.08	
	Z	Before	17.11 ± 6.56	15.53 ± 6.56	0.25
		After	12.08 ± 5.00	11.20 ± 7.40	
		t	2.54*	2.12*	
	All	Before	25.06 ± 5.92	22.66 ± 8.37	-0.06
		After	19.54 ± 7.51	16.95 ± 9.79	
		t	2.82*	2.33*	

TI : Therapist instruction, AR : Augmented reality

Table 4: Comparison of the blood pressure between TI and AR according to proprioceptive exercise. (n = 42)

			TI	AR	t
BP	SBP	Before	123.42 ± 6.88	122.90 ± 7.33	0.20
		After	121.57 ± 4.89	121.23 ± 5.09	
		t	2.79*	2.37*	
	DBP	Before	77.81 ± 3.74	78.71 ± 4.03	0.22
		After	73.28 ± 2.47	74.38 ± 3.39	
		t	7.54*	6.88*	

ROM : Range of motion, HF : Hip flexion, KE : Knee extension, TI : Therapist instruction, AR : Augmented reality

Table 5: Comparison of the ROM between TI and AR according to proprioceptive exercise. (n = 42)

			TI	AR	t
ROM	HF	Before	106.76 ± 9.03	113.33 ± 7.39	-0.27
		After	107.09 ± 9.15	113.81 ± 7.23	
		t	-0.86	-1.31	
	KE	Before	108.47 ± 10.67	110.71 ± 9.32	0.21
		After	108.81 ± 11.19	111.19 ± 9.40	
		t	-0.89	-0.90	

ROM : Range of motion, HF : Hip flexion, KE : Knee extension, TI : Therapist instruction, AR : Augmented reality

Discussion

The results of Antonio et al.(2013) suggest that a proprioceptive training program is associated with a significant improvement in static posture and functional lower limb stability, and may also reduce the risks of falls. A 30-minute session(2 days a week) with a 12-week training program had a positive impact on external and post-stability, suggesting that using the Swiss Ball and BOSU as a proprioception training tool shows a significant improvement in the standing lower limb stability¹⁹. Although our study was a short-term experiment as compared to the previous ones, we also showed a significant improvement in the proprioception. This result seems to be due to the fact that the proprioceptive exercise using Swiss ball positively affected the stability as in the previous study. However, in the present study, there was no significant difference in hip flexion 60° in all of the TI group AR patients. In the study of Guex et al.(2012), he compared the isometric, concentric, and eccentric contraction of short-distance players. The effect of various hip flexion angles(0°, 30°, 60°, 90°) on the peak torque of the flexor muscles was evaluated and hamstrings developed a higher eccentric

torque with increased tension when flexed. During hip flexion, the hamstrings tension increases and develops a more eccentric torque. Experimental results show that Hamstrings torque values increase significantly from the hip flexion angle of 30° or more because the antagonist increases the tension when the agonist contracts. Because hamstrings are an antagonist structure of hip flexion, the tension increases²⁰. Based on these results, it was concluded that hip flexion was measured with knee extension in the supine position. Therefore, it is considered that there was no significant difference in the hip flexion 60° range during the proprioception

Diener et al.(1984) investigated the effect of a proprioceptive exercise on the lower limb stability of the elderly. After performing the proprioceptive exercise to stimulate the intrinsic receptor, the difference between the two sides in the coronal plane was decreased, and in the sagittal plane, the position of the shoulder joint and the knee joint were closer to the center of gravity than the outer side. In the AR group, there was statistically significant difference between the TI group and the AR group in both the coronal and sagittal planes when the differences in the lower limb stability before and after

exercise were compared. The proprioceptive receptive movement stimulates the dorsi-flexion of the ankle joint and the plantar flexion joint receptors, and when the golgi tendon organ and the muscle spindle of the muscle are stimulated by the movement of the joint, activation of the muscle¹³. This affects muscle performance. This study also suggested that the lower limb stability was influenced by the intrinsic recruitment and that there was a significant difference in each group¹⁴. In this study, there was no significant difference in the comparison between the two groups. In the same way as the result of the proprioception, when the normal subjects were exercising successfully, but there was no difference between the groups.

Monteiro et al.(2014) suggest that DBP is unchanged and SBP is elevated when aerobic exercise is performed for 10 minutes through AR²¹. However, the results of this study show a significant decrease in SBP and DBP. In addition, SBP is generally significantly lower than DBP, but DBP is significantly decreased in this study. Therefore, it seems that the blood pressure is decreased in both groups and there is no significant difference between the two groups.

This study suggests that there is no difference between the effects of therapist intervention by the AR program and the instruction of the therapist. Therefore, when the patient can perform the program independently or when the patient needs to be motivated, introducing the AR program into the rehabilitation procedure can be suggested.

Conclusion

In this study, we compared the training by the therapist's instruction and the training by the AR rehabilitation training program. As a result, there was no change in ROM in both groups, the overall proprioception and balance of the lower limb significantly increased, and blood pressure decreased significantly. There was also no significant difference between the two groups. As a result, training by the therapist was not more effective when compared to the AR rehabilitation training program. Through this, it is expected that the training through the AR program will be useful when training proprioception and balance of the legs and blood pressure.

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Conflict of Interest: Nil

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Moderating Effect of Disability Acceptance in the Influence of Discrimination Experience by Individuals Disabled Regarding the Sense of Happiness

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ABSTRACT

The purpose of this study is to identify the moderating effects of disability acceptance in the effects of discrimination experience of the disabled on the quality of life. In this case, the analysis method included using SPSS 21.0, frequency analysis, crossover analysis, and reliability analysis were performed. Additionally, the T-test, and ONEWAY ANOVA were applied. The adjustment effect of the noted disability acceptance was identified using the SPSS MACRO PROCESS 1. First, the level of adjustment of disability acceptance in the influence of discrimination experience of disabled on the sense of happiness, in the case of medium and high values, it was shown that 94% was significant. Second, it was found that discrimination experience, disability acceptance, and discrimination experience x disability acceptance all had a significant effect on the sense of happiness. In the effect of the discrimination experience of the disabled on the sense of happiness, the moderating effect of disability acceptance has been verified. In other words, even if there is a problem of happiness due to the discrimination experience of the disabled, when the degree of disability acceptance was high, it was found that sense of happiness was improved even more. As a suggestion for future research, first, although in this study, the moderating effects of disability acceptance in the relationship between discrimination experience and happiness was examined, the difference according to the age or gender of disabled people were not verified. Therefore, by using the age and gender of the disabled as control variables or parameters in future studies, the effect of acceptance of disability can be seen more clearly. Second, as limitations of the data, this study has analysed focusing only on the sense of happiness, but there is a need to expand the positive effect of disability acceptance by using variables such as stress, life satisfaction, suicidal thoughts, and self-esteem as dependent variables.

Keywords: *discrimination, happiness, disability acceptance, aged disabled, adult disabled*

Introduction

Broadly speaking, discrimination against the disabled population of individuals in any region is applying the standard such as limiting, excluding, separating, denying, etc. without taking the person's disability into account and without a justifiable reason, giving unfavorable results to disabled people and not

providing equal opportunities to the disabled without due cause for accommodating for the person's condition in life¹. It is therefore noted that 79.7% of disabled respondents have answered that there is a certain degree of discrimination against the disabled in Korea, where 9 out of 10 disabled people in Korea have reported that they feel discrimination in their daily life². Because of this, the disabled person becomes more alienated socially, and especially the elderly people with disabilities who experience elderly discrimination, and it is also the case where the naming of disability discrimination to individuals assume that these people are stigmatized as weak and dependent groups, and who will also experience inconvenience, incompetence, and prejudice due to the appearance of the deformed or defective

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physical parts of their bodies and reduced functional and physical impairments³. Disability acceptance refers to the extent to which people characterized by a disability adapts and it is deemed as the first step toward social adaptation and social integration while accepting their disabilities⁴, without degrading the value of the person's contribution to the community or to society in a general sense⁵. In other words, it means recognizing the disability as one of their characteristics and overcoming it without degrading the value of the person to be able to contribute something of value or positive to the society or community in those instances^{6,7}, which has claimed that disability acceptance can help the disabled to overcome the suffering of disabled, sadness, devaluation due to the condition of a disability and the situations that could cause negative reactions to others. And it has claimed that disability acceptance is the most powerful predictor of adaptation to a known disability, and the first start of disability identity is the acceptance of a disability⁶. These positive effects apply the same to the elderly with the experience of having disabilities. There are prior studies⁸⁻¹⁰ that the higher the disability acceptance, the higher the quality of subjective life of the elderly with a disability. In the study¹¹ of on the life satisfaction of the case of elderly women with disabilities, it reported that the higher the disability acceptance rate, the higher the life satisfaction of the elderly women with disabilities¹². In this case, as a result of analyzing the disability acceptance and life satisfaction of the visually impaired people aged 55 and over, the disability acceptance was shown to have a significant effect on life satisfaction. In addition, disability acceptance not only has a positive impact on the quality of life of people with disabilities, but also plays a role in moderating the quality of life of disabled people due to their experience of disability discrimination. According to related studies, the moderating effects of disability acceptance can be predicted in the relationship between discrimination and the person's quality of life¹³. This situation has been analyzed to reveal that the relationship between the disability acceptance and the life satisfaction of the disabled, and as a result, through acceptance of disability as a mediator, where it was found to have an influence on the life satisfaction of the disabled person⁵. It has been reported that the acceptance of disability affects the incidence of depression, and that the depression a person experiences has an influencing relationship that affects suicidal ideation. Even in the study¹⁴ of the acceptance of a disability had a negative influence (-) on the

incidence of experiencing depression. However, studies on disability discrimination, disability acceptance, and quality of life of persons with disabilities only focuses on fragmentary causal relationships, such as noting that the quality of life is high if the acceptance of disability is high, and if the quality of life is negative mainly due to disability discrimination and so on, then it does not clearly reveal what role the disability acceptance plays in the relationship between disability discrimination and quality of life, and what overall function that it serves. Just that only the study¹³ reveals the mediating effect of disability acceptance. Therefore, the purpose of this study is to identify the moderating effects of disability acceptance in the influence of discrimination experience of disabled people, on the sense of happiness by using the 2017 Disability Employment Panel data, which is a reliable nationwide data. First to note is to ask the question, does acceptance of a disability have a moderating effect in the influence of a discrimination experience of the disabled on the sense of happiness?

Method

Model of Research

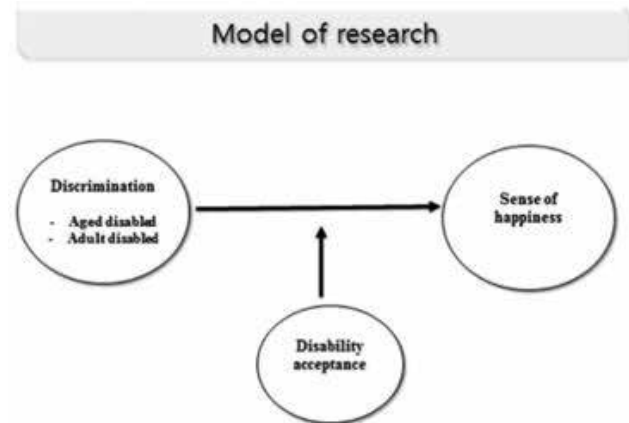


Figure 1: Model of Research

Study Subjects and Data Collection Procedures:

For the subjects of this study, it is noted that the 2017 Disability Employment Panel Data established by the Korea Employment Agency was used in this case. As of May 15, 2016, a disabled employment panel survey has targeted 4,577 people nationwide who are registered as a disabled person (aged 20 to 65 years) as prescribed every May to August in Article 2 of the Welfare for the Disabled Act, where the investigation was conducted using personal interviews (TAPI) using a tablet PC¹⁵, and this study also has used the data of these same 4,577 people.

According to the demographic characteristics of disabled people, there were more men (65.8%) than women, and the average age was 43.40 years, and it included 20.8% of elderly disabled with 55 years or older. For residence, the highest number (42.6%) of people lived in the metropolitan areas, and for the variable of education the highest number (43.3%) of participants were high school graduates, whereas singles accounted for 50.7% which was slightly more than married participants as shown in Table 1.

Table 1: Socio-Demographic Characteristics among the Disabled (N = 4,577)

Frequency %			
Gender	Men	3,010	65.8
	Women	1,567	34.2
Age	20 to 54 years	3,263	71.4
	55 to 65 years	954	20.8
Education	Primary school graduate	488	10.7
	High school graduate	1,984	43.3
	University	1,294	28.3
	Other	448	9.8
Marital Status	Has a spouse	1,892	41.3
	Singles	2,322	50.7

Measuring

Discrimination Experience: As an independent variable of this study, in the 2017 employment panel survey of the Korea Employment Agency for the Disabled, discrimination experience has one question in the survey. The degree of discrimination experience in everyday life has used 4-point Likert Scale (1=never experienced, 2=rarely experienced, 3=often experienced, 4=always experienced) for the analysis. **Sense of Happiness:** As a single question, there was a 10-point Likert Scale (1=very unhappy, 10=very happy) which was used. **Disability Acceptance:** As a control variable of this study, the disability acceptance in the employment panel survey structured in 2017 by the Korea Employment Service for the Disabled had 12 questions, with a 5-point Likert Scale (1=not at all, 2=somewhat not at all, 3=just so so, 4=yes, 5=certainly yes). The reliability of the scale was reviewed with a Cronbach's showing an alpha value of .947.

Analysis Method: Using SPSS 21.0, frequency analysis, crossover analysis, and reliability analysis

were performed. T-test, and ONEWAY ANOVA were applied. The adjustment effect of disability acceptance was identified using SPSS PROCESS macro 1.

Result and Discussion

Correlation between Variables: Utilizing the analysis of the correlation between variables used in this study, the multicollinearity between the relevant variables was identified. As shown in Table 2, the problem of multicollinearity was not found as correlation coefficient r values ranged from .280 to .580, and the correlation between all variables was considered to be significant.

In addition, according to the descriptive statistics of each variable, first, the level of happiness, which is a dependent variable of this study, was 7.65 points out of 10, which was higher than the median, and the disability acceptance was 3.109 out of 5 points, which was also higher than the median. Finally, the discrimination experience was noted at 1.81 points out of 4 points, which was lower than the median. Therefore, it can be seen that the disabled people of this study had a low discrimination experience, but a high disability acceptance and the sense of happiness (Table 2).

Moderating Effect of Disability Acceptance in the Influence of Discrimination Experience of Disabled on the Sense of Happiness:

It can be concluded that the moderating effect of disability acceptance in the influence of discrimination experience of disabled people has an effect on the sense of happiness. As a result of an analysis using SPSS PROCESS macro1 in order to identify the moderating effect of disability acceptance in the influence of discrimination experience on the sense of happiness, the results were significant as shown in Table 3~4 and Figure 1. It was found in this case that discrimination experience, disability acceptance, and discrimination experience x disability acceptance all had a significant effect on the sense of happiness (Table 3, Figure 1). The model that examined the significance of the model having an interaction item was significant, and the discrimination experience x disability acceptance has increased the explanatory power of the entire model by 3.3% (Table 4).

In addition, as a result of analyzing the significance area for moderating effect of disability acceptance, the moderating effects was seen to be significant when the disability acceptance value was less than -1.9165, and

in areas larger than -1.9165 or smaller than -.9685, the moderating effect was not significant. And it is noted that when it was greater than -.9685, the moderating effect of disability acceptance was significant as shown in Figure 2.

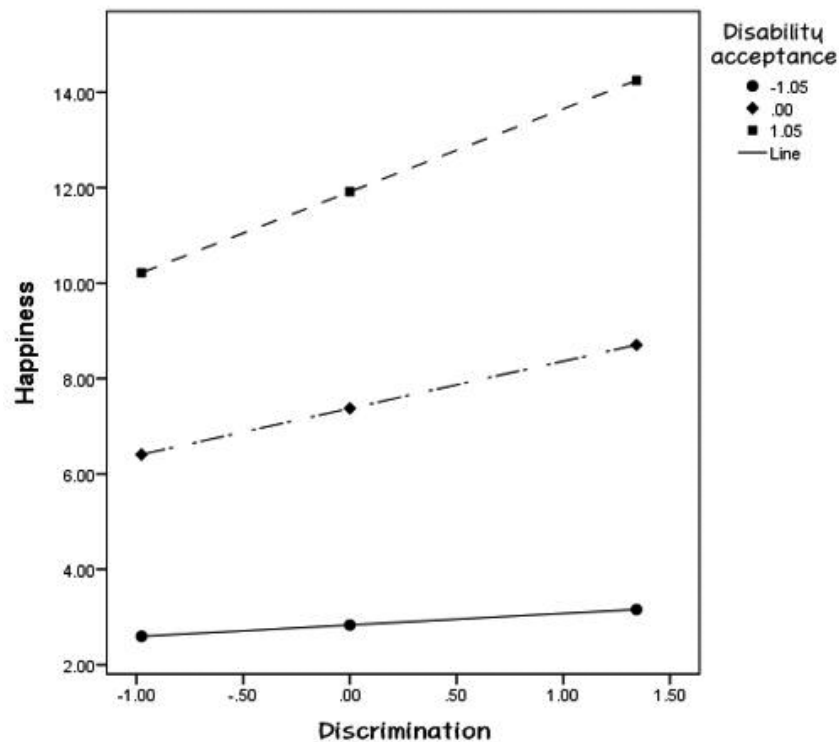
Table 2: Correlation among Variables and Descriptive Statistics

	Happiness	Disability acceptance	Discrimination
Happiness			
Disability acceptance	.580***		
Discrimination	.369***	.280***	
M(S.D)	7.65(11.977)	3.109(*.534)	1.81(.786)

*p<.05, ***p<.001

Table 3: Moderating Effect of Disability Acceptance in the Influence of Discrimination Experience of Disabled on the Sense of Happiness

	coeff	se	t	p	LLCI	ULCI
constant	7.3736	.1423	51.8252	.0000	7.0947	7.6525
discrimination(a)	.9901	.1274	7.7735	.0000	.7404	1.2399
disability acceptance(b)	4.3054	.1721	25.0117	.0000	3.9679	4.6429
a*b	.7090	.0458	15.4818	.0000	.6192	.7988

**Figure 2: Moderating Effect of Disability Acceptance****Table 4: The effect of the Discrimination Experience of the Disabled on the Euphoria(a)**

	R ² -change	F	df1	df2	p
discrimination x disability acceptance	.0333	239.6852	1.0000	4210.0000	.0000

Conclusion

The purpose of this study is to identify the moderating effects of disability acceptance in the effects of discrimination experience of the disabled on the quality of life. To achieve this, the data of 4,577 people from the 2nd Survey of Disabled Employment Panel was used and reviewed in this case.

As a result of the analysis, first, the level of adjustment of disability acceptance in the influence of discrimination experience of disabled on the sense of happiness, in the case of medium and high values, it was shown that 94% was significant. Second, in the effect of the discrimination experience of the disabled on the sense of happiness, the moderating effect of disability acceptance has been verified in the study. In other words, even if there is a problem of happiness due to the discrimination experience of the disabled, when the degree of disability acceptance was high, it was found that sense of happiness was improved even more. These results support the study¹³ on the moderating effect of disability acceptance and the results of previous studies^{5,13,14} on the noted positive effects of disability acceptance. Therefore, in education for the disabled, adaptation to disability and acceptance of disability can improve the quality of their lives, and by emphasizing that this can be positive for social adaptation and integration, even if disabled people are not discriminated in our society, but have had the experience of discrimination, it is necessary to develop the power to overcome the situation based on self-acceptance. In other words, even if discrimination increases, if the disability is accepted then the happiness will increase, and through proper understanding and acceptance of one's disability, the role and participation that one can do in society can be discovered, and these individuals should try to live as a member of society who can experience and can feel happiness.

Finally, as a suggestion for future research, first, although in this study, the moderating effects of disability acceptance in the relationship between discrimination experience and happiness was examined, the difference according to the age or gender of disabled people were not verified. Therefore, by using the age and gender of the disabled as control variables or parameters in future studies, the effect of acceptance of disability can be seen more clearly and should be reviewed in future research. Second, as limitations of the data, this study has analyzed focusing only on the sense of happiness, but

there is a need to expand the positive effect of disability acceptance by using variables such as the effects of stress, life satisfaction, suicidal thoughts, and self-esteem as dependent variables. Through various studies on the disability acceptance for the disabled, various problems that are experiencing exclusion and separation as a result of being disabled in the society, and should be predicted and prevented through the understanding of the difference and not as the therapeutic point of view. In addition, by creating an opportunity for self-determination for disabled persons who are not protected by human rights against discrimination experiences, a practical social system that can live together without discrimination should be created, and through substantial research in the community, it should be used as an important resource for policy recommendations activities and for new research going forward.

Ethical Clearance: Not required

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Conflict of Interest: Nil

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Employment Stress and the Happiness of Korean University Students: Multiple Mediating Effect of Growth Mindset, Grit and Hope

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ABSTRACT

Background/Objectives: The purpose of this study was to examine the multiple mediating effect of growth mindset, grit and hope on the effect of employment stress on happiness among 364 college students in Korea.

Method/Statistical Analysis: The data for the study were collected from 364 university students by using survey method. For the statistical analysis, frequency analysis, reliability analysis, correlation analysis and mediation analysis all were performed using SPSS Win.24.0 and PROCESS macro for SPSS version 3.2.

Findings: The results of the study are as follows. First, it is noted that the Pearson correlation analysis showed that happiness had a negative correlation with employment stress, and there was a significant positive correlation among growth mindset, grit and hope. Broadly speaking, employment stress showed a significant negative correlation with happiness, growth mindset, grit, and hope. Second, as a result of the PROCESS macro analysis, employment stress affects growth mindset, hope and happiness, and growth mindset has a positive effect on grit, hope and happiness. To this end, it is noted that grit has a positive effect on hope, happiness, and hope has a positive influence on happiness. Third, there was a multiple mediation effect of growth mindset, grit and hope in the identified relationship between employment stress and happiness.

Improvements/Applications: This result will be utilized as a new model in which growth mindset, grit and hope mediate the job-seeking stress of university students in the process of affecting happiness in the Korean society where the employment crisis is at serious proportions.

Keywords: *Employment stress, Growth mindset, Happiness, Hope, Mediating effect, Multiple mediating effect, Grit, PROCESS macro*

Introduction

Since the foreign exchange crisis has occurred, Korea has been suffering from a persistent recession and stagnation in the job market, and the unemployment rate of college students has grown to epic proportions. According to recent employment trends released by the National Statistical Office, the unemployment rate for young people is observed to be at the level of 7.9%¹. The employment rate of college graduates was also noted

as being down by 66.2%². In this way, college students experience anxiety due to the fact that they are not able to find or guarantee employment, even though they have received and completed a university education at a high educational level, and the stressors related to these students finding suitable employment after graduation is worsening. The university student experiences a period where the individual undergoes physical, mental and social changes due to transition from late adolescence to adulthood³. This developmental stage in the life of a student is a very important step in the preparation of a specific career path, which is the final stage of the school education to advance into adult society⁴. However, for college students, employment problems include both internal uncertainties such as uncertainty about the future and confusion of values in many cases. In some ways, it

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appears to be the most important concern as well as the greatest stress⁵, causing feelings of crisis, tension and anxiety due to the uncertainty of finding suitable future employment after graduation, and thus causing loss of balance both physically and psychologically in the lives of the students as they near adulthood.

The employment stress of college students is important to study and review, because it has a negative effect on happiness of the individual⁶. Happiness is the purpose and motive of life. Diener⁷ defined happiness as a subjective assessment of one's life, feeling satisfied with one's life, and experiencing fewer negative emotions. Generally speaking, the scholar's interest in the causal variables of happiness and enhancement measures has led to a positive psychology, and in recent years research has been expanding with a better understanding of a young adult's attitudes and behaviors manifesting of their growth mindset, grit and hope.

Bandura and Dweck⁸ classify their study into the categorization of entity and increment theory, depending on what beliefs students have about their abilities, as seen in various categories or situations. Dweck⁹ then named the entity theory as a fixed mindset, and went on to identify the increment theory as a growth mindset. In this context, the growth mindset is a belief that ability and intelligence can be improved through experience and effort, as noted on the part of an individual interested in making those changes⁹. For example, in the case of if a college student has the same level of employment stress, he or she may regard it as a challenging task, or accept it as a task to be avoided according to the mindset. This result and example is closely related to the theory of grit, and students with growth mindsets tend to be high in grit, thus devoting themselves to their goals and sustaining their endeavors¹⁰.

Since the introduction of the theory of an individual experiencing grit by Duckworth¹¹, research has been conducted in fields such as education, psychology, sociology and welfare. Grit can be referred to a stamina for long-term goals¹¹, a key concept that leads to the successful outcome of psychological development throughout life, and one of the key skills for an individual's healthy development task¹². On the other hand, hope is a positive motivation based on the successful interaction of goal-oriented energy, agency thinking and plan for achieving goals, pathways thinking¹³. Hope was understood as a vague belief, but scientific research was conducted by Snyder to further develop this theory¹⁴.

In previous studies, stress and happiness have been studied in various fields for a long period of time, but research on growth mindset, grit, hope has not been long researched. It has been reported that the daily stress of children and adolescents negatively affects the happiness of those individuals¹⁵, and the happiness is reduced as the person experiences more stress from the worries, conflict, and anxiety about work¹⁶⁻¹⁹. There was also a direct relationship between grit and growth mindset²⁰⁻²⁴, and stress was negatively associated with growth mindset²⁵, and hope had a statistically significant effect on an individual's psychological well-being²⁶. These previous studies suggest that employment stress, a stress experienced in preparation for employment, is a major factor that negatively affects happiness, and this relationship is likely to be closely related to growth mindset, grit, and hope.

However, research on mediating variables showed that grit mediated the relationship between growth mindset and academic achievement^{23,27}, that hope mediated the relationship between parenting stress and well-being²⁵ and that growth mindset mediated the relationship between stress and happiness in an individual²⁸. But studies using multiple mediators were rare and limited.

This study aimed to examine the multiple mediating effects of growth mindset, grit and hope in the effects of employment stress on happiness among university students in Korea, and to provide a new model for the happiness enhancement of college students.

Research Method

Research Model: The main analytical method of this study is the multiple mediating effect analysis of model 6 of PROCESS macro ver.3.2, and the conceptualized research model is shown in Figure 1.

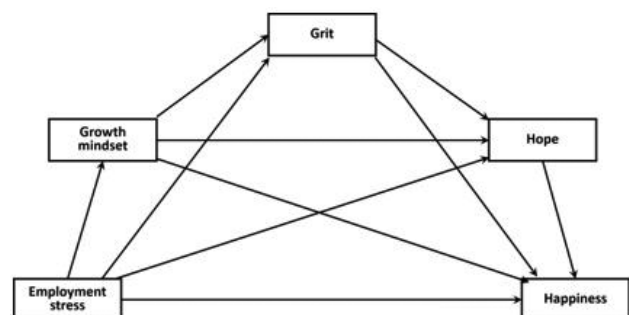


Figure 1: Conceptual Research Model

Survey Subject and Data Collection Method: The subjects of the survey, 364 college students were purposively selected from D city of Chungcheongnam-do and D metropolitan city. In this study, the results showed that 54.9% of male students and 45.1% of female students were surveyed.

Research Tools

Employment Stress: In order to measure the employment stress of college students, we used the Korean version testing as developed by Hwang²⁹ based on the Connell Medical Index and revised by Kang³⁰. The employment stress scale consists of 22 subscales and is a 5-point Likert scale. The higher the score, the higher the level of noted individual experienced employment stress. The reliability of employment stress in this study was .895 of Cronbach's α value.

Happiness: We used the Happiness Scale which was developed by Lyubomirsky and Lepper³¹ using the Subjective Happiness Scale. The measurement consists of 4 questions and is a 7-point Likert scale. The higher the score, the higher the happiness. Cronbach's α of Happiness is .782.

Growth Mindset: The growth mindset scale developed by Dweck³² and utilized by Ayers³³ was used in this study. The scale consists of 20 items and a 5-point Likert scale. The higher the score, the higher the growth mindset. The reliability of growth mindset in this study was Cronbach's α = .833.

Grit: We used the grit (grit-O) scale developed by Duckworth & Quinn³⁴. The study questionnaire survey consists of a total of 12 questions. The measurement is made on a 5-score Likert scale, and the higher the score, the higher the grit. The grit reliability in this study was Cronbach's α = .807.

Hope: To measure hope, we utilized a hope scale which was developed by Snyder et al.¹³ and was adapted to Korean Hope Scale by Choi et al.³⁵. The study questionnaire survey consists of a total of 8 questions. The measurement is made on a 4-points Likert scale. The higher the score, the higher the level of hope. The hope reliability in this study was Cronbach's α = .754.

Data Analyses: In this study, for the data analysis we used SPSS Win. 24.0 and SPSS PROCESS macro proposed by Hayes³⁶. In a similar vein, the SPSS Win. 24.0 was used for the descriptive statistics, reliability analysis and average comparison analysis. The multiple mediation effect analysis was performed using SPSS PROCESS macro.

Results and Discussion

Correlation and Descriptive Statistical Analyses: Correlation analysis of Pearson was used to identify correlations between variables. The results are presented in Table 1. Happiness was negatively correlated with employment stress, but was positively correlated with growth mindset, grit, and hope. This is consistent with the results that a grit and growth mindset have a positive correlation with each other²⁰⁻²².

Table 1: Results of correlation and descriptive statistics

	Employment stress	Happiness	Growth mindset	Grit	Hope	M	SD
Employment Stress	1					2.30	.68
Happiness	-.509**	1				4.75	1.02
Growth mindset	-.353**	.401**	1			3.54	.47
	-.154**	.344**	.329**	1		3.16	.52
Grit	-.382**	.591**	.414**	.414**	1	2.93	.40

** $p < .01$

Verification of Multiple Mediating Effects: The multiple mediating effects analysis results are shown in Figure 2 and Table 2.

Employment stress has been seen to have significant negative impacts on growth mindset ($-.241, p < .001$), hope ($-.151, p < .001$) and happiness ($-.463, p < .001$).

By the same token, growth mindset had a statistically significant effect on grit ($-.353, p < .001$), hope (.193, $p < .001$) and happiness (.211, $p < .05$). Additionally, grit had a statistically significant effect on hope (.231, $p < .001$) and happiness (.200, $p < .05$) and hope had a positive effect on happiness (.991, $p < .001$).

The total effect of the path between employment stress and happiness was $\beta = -.7600$ ($p < .001$), and the direct effect of the path between employment stress and happiness was $\beta = -.4633$ ($p < .001$). Therefore, the total effect was seen to have decreased. Accordingly, the relationship between employment stress and happiness was mediated by growth mindset, grit and hope.

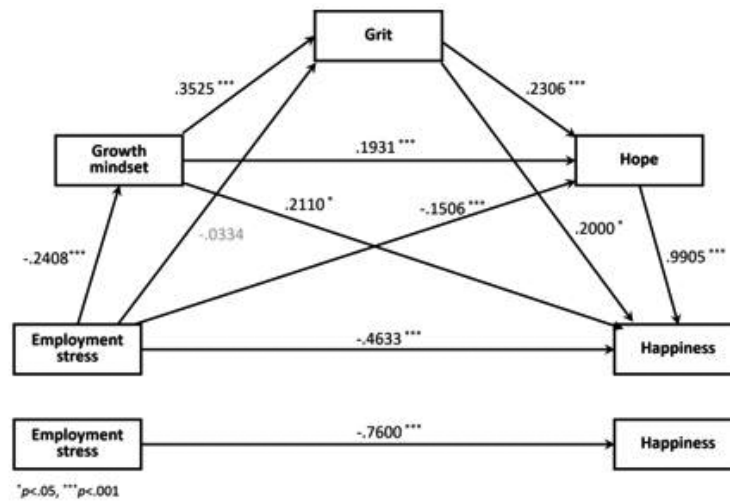


Figure 2: Effect size for each path

Table 2: Multiple mediating effects of growth mindset, grit, and hope in relation to employment stress and happiness

Mediating variable model 1 (DV: Growth mindset)								
Variables			β	SE	t value	p	LLCI*	ULCI**
Constant			4.0983	.0805	50.8797	.0000	3.9399	4.2567
Employment stress	→	Growth mindset	-.2408	.0336	-7.1736	.0000	-.3068	-.1748
Mediating variable model 2 (DV: Grit)								
Variables			β	SE	t value	p	LLCI*	ULCI**
Constant			1.9911	.2613	7.6186	.0000	1.4771	2.5050
Employment stress	→	Grit	-.0334	.0408	-.8187	.4135	-.1135	.0468
Growth mindset	→	Grit	.3525	.0597	5.9009	.0000	.2350	.4699
Mediating variable model 3 (DV: Hope)								
Variables			β	SE	t value	p	LLCI*	ULCI**
Constant			1.8664	.1892	9.8638	.0000	1.4943	2.2385
Employment stress	→	Hope	-.1506	.0274	-5.4926	.0000	-.2045	-.0967
Growth mindset	→	Hope	.1931	.0420	4.5935	.0000	.1104	.2757
Grit	→	Hope	.2306	.0354	6.5211	.0000	.1611	.3002
Dependent variable model (DV: Happiness)								
Variables			β	SE	t value	p	LLCI*	ULCI**
Constant			1.5276	.4802	3.1815	.0016	.5834	2.4719
Employment stress	→	Happiness	-.4633	.0643	-7.2091	.0000	-.5897	-.3369
Growth mindset	→	Happiness	.2110	.0974	2.1667	.0309	.0195	.4024
Grit	→	Happiness	.2000	.0842	2.3756	.0180	.0344	.3656
Hope	→	Happiness	.9905	.1187	8.3469	.0000	.7571	1.2239

*LLCI=The lower boundary of the indirect effect within the 95% confidence interval

**ULCI=The upper boundary of the indirect effect within the 95% confidence interval

Model 6 of PROCESS macro was used to verify the multiple mediating effects of growth mindset, grit, and hope. The results are shown in Table 3.

The total indirect effect size was significant at -0.2967. As a result of the mediating effect verification, first, the simple mediating effect of growth mindset was significant at -0. Second, the simple mediation effect of grit was not significant -0.0067. Third, the simple mediation effect of hope was significant at -0. The results showed that there were a simple mediation effect of growth mindset and hope, but no simple mediation effect of grit.

The double mediating effect of growth mindset and grit was significant at -0.0170 in relation to employment stress and happiness. The double mediating effect of growth mindset and hope in the relationship between employment stress and happiness was significant at -.0460.

The triple mediating effect of growth mindset, grit, and hope were significant at -0.0194 in the relationship between employment stress and happiness because there was no zero in the confidence interval of 95%. Therefore, the triple mediating effects were also subsequently verified.

Table 3: Verification of multiple mediating effects

Classification	Multiple mediating effect		
	Effect	BootSE	BC 95% CI
Employment stress → Growth mindset → Happiness	-.0508	.0247	-.1028 ~ -.0042
Employment stress → Grit → Happiness	-.0067	.0115	-.0329 ~ .0138
Employment stress → Hope → Happiness	-.1492	.0328	-.2192 ~ -.0892
Employment stress → Growth mindset → Grit → Happiness	-.0170	.0085	-.0363 ~ -.0031
Employment stress → Growth mindset → Hope → Happiness	-.0460	.0141	-.0773 ~ -.0216
Employment stress → Grit → Hope → Happiness	-.0076	.0122	-.0337 ~ .0146
Employment stress → Growth mindset → Grit → Hope → Happiness	-.0194	.0056	-.0320 ~ -.0099
A total indirect effect	-.2967	.0459	-.3925 ~ -.2123

Conclusion

The conclusion of the study is as follows. First, the happiness had a significant negative correlation with employment stress, and had a significant positive correlation with growth mindset, grit and hope.

Second, as a result of PROCESS macro analysis, employment stress negatively affects growth mindset, hope and happiness, but growth mindset has a positive effect on grit, hope and happiness. Third, as a result of bootstrapping, there was a multiple mediation effect of growth mindset, grit and hope in relation to employment stress and happiness.

Suggestions for further research are as follows.

First, this study examined the role of growth mindset, grit, and hope in the relationship between employment stress and happiness among college students. Follow-up studies should be followed to determine whether this model applies to other subjects. To this end, it is necessary to follow-up research using various stressors

and other variables, such as to utilize an expansion of study subjects, academic stress and job stress factors.

Second, growth mindset, grit, and hope were found to mediate in the relationship between employment stress and happiness. Therefore, it is urgent to develop and apply the growth mindset, grit, and hope enhancement program of college students.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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A Double Mediation of Stress and Growth Mindset between School Violence Victimization and Happiness of Adolescents

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ABSTRACT

Background/Objectives: The growth mindset is very important. So this study was done to verify mediating effects of stress and growth mindset between school violence victimization and happiness of adolescents.

Method/Statistical Analysis: Subjects were surveyed by purposive sampling method in 7 middle and high schools, and 956 questionnaires were used for analysis. SPSS Win 23.0 was used for descriptive statistics, reliability analysis and correlation analysis, and AMOS 23.0 was used for structural equation modelling analysis.

Findings: The main results are as follows. First, the correlation between school violence victimization and stress, and between growth mindset and happiness were significantly and positively correlated. But school violence victimization and stress were negatively correlated with growth mindset and happiness. Second, school violence experience, stress and growth mindset had a direct impact on happiness of adolescents. Third, stress and growth mindset revealed double mediating effects between school violence victimization and happiness of adolescents.

Improvements/Applications: Based on these results, we discussed ways to increase the happiness of youths who have suffered from school violence. This can be reflected in policies for students.

Keywords: School violence experience, Stress, Growth mindset, Happiness, Adolescent

Introduction

It has been noted that the incidence of school violence refers to “violence occurring in peer groups at school, when a person is repeatedly and continuously exposed to negative behavior by an individual or group”¹. It is a concept that encompasses both mental violence and sexual violence as is often directed towards students and their peers, and can include instances such as threats, insults, coercion, and bullying, as well as overt and harmful physical abuse from one student to another. In

a number of studies this violence has been found to be very close to the incidence of one student prone to attack another student both on and off of school grounds². On the psychological side, however, there is a distinction between an attack against a student and the incidence of violence as seen against a fellow student. As it is defined, an attack is an act that hurts another person, regardless of the degree of physical, physical injury, and verbal abuse. On the other hand, the incidence of violence is a state of extreme severity of such attacks. It is important to note that especially violence is different in that intentionality is emphasized in those cases³.

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According to a recent survey conducted in Korea, 8.2% of adolescents responded that they had experienced school violence victimization⁴. Specifically, it is noted that 10.0% of middle school students and 4.2% of high school students had confirmed living through a high school violence victimization experience. The trend of high school violence for the past 20 years in Korea has

been steadily declining, but it has been stagnant at around 10% since 2012, and Korea is still the top 10 among the world's top 30 countries⁵. Furthermore, the diversity and complexity of the experienced types of school violence by the students has become more serious in recent years. Therefore, considering these facts, school violence in Korea can no longer be ignored and active measures are needed to resolve this situation for the safety of the school-aged students.

Adolescents who experienced school violence victimization experienced a variety of psychological negative emotions, and for this reason socially it is difficult to establish relationships with their teachers and peers, resulting in the situation that these students may have difficulty adapting to school life. These same students also showed frequent school absences, avoidance of certain places, runaway, suicide, and aggressive behaviors for self-defense as a result of experiencing past violence in the school environment⁶. This can be explained from the viewpoint of social learning theory. The youth who experienced violence learn violence and perform destructive activities in school, and eventually can become students who are less able to learn school and social life rules, which serves to thereby making school adjustment more difficult⁷.

On the other hand, school violence victimization and stress were closely related. After school violence victimization, the emotional problems experienced by adolescents are shown to be: anger, loneliness, depression, and helplessness. These emotional problems, if they are serious, can be extended to other problematic behaviors such as interpersonal difficulties or drinking or can manifest into an Internet addiction⁸. Also, because of low self-esteem and depression, these same students have difficulties in speaking their opinions and are often found in a state of anxiety and atrophy⁹. The serious problem in these cases, is that when the students are violent, they become more isolated because their friends are afraid that they will be bullied together¹⁰. Therefore, long-term school violence can provide long-term follow-up to stressed students.

Recently, research on growth mindset has been actively carried out in relation to the experience of youth violence in school. Dweck divided the mindset theories and factors related to this issue into a growth mindset and fixed mindset¹¹. A person with a relatively strong fixed mindset tends to focus only on areas he is familiar

with, and avoids new challenges, because he fears the situation of failure itself. On the other hand, a person with a relatively strong growth mindset tends to think he learns from failure, tries harder, and enjoys the challenge itself without fearing failure¹². Based on the results of the study that school violence victimization has a statistically significant effect on stress and that stress negatively affects the internal motivation of growth, and for this reason it is considered that school violence victimization and growth mindset are negatively related. Happiness is the psychological function of an individual depending on their personal experience and the resulting psychological consequences. Therefore, the overall level of happiness or the factors that determine happiness may be different according to the identified culture and age of the students reviewed, and may vary depending on the difference of life experience and age during that period¹³. Particularly, Korean youths have very low happiness due to the stress of their continued development in adolescence and the excessive stress of parents on producing excellent marks through the course of academic affairs, family selfishness, unified and competitive school atmosphere, and school life which is specifically centered on preparing for the upcoming college entrance examinations¹⁴. In the study of Kim¹⁵, the daily stress and happiness of the adolescents showed a high correlation among stressors experienced by the students.

However, there has not yet been a direct study of the relationship between growth mindset and school violence victimization. Broadly speaking, some studies have found that the growth mindset affects behavioral outcomes by affecting emotional control and optimism¹⁶. Therefore, the growth mindset is presumed to be negatively correlated with the student's school violence victimization.

These results suggest that stress and growth mindset may mediate between school violence victimization and happiness in school aged students. Also, given the research that stress is negatively affecting growth mindset, stress and growth mindset are expected to have a dual mediating effect between school violence victimization and happiness as seen in these students. However, previous studies have only partially examined the experience of school violence victimization and the direct role of stress in the happiness of adolescents. Therefore, the purpose of this study was to investigate the role of growth mindset variables, which were not

addressed in the happiness research of adolescents, as a potential mediating variable in the behavior of adolescents at school.

In order to achieve these objectives, research questions were set. First, what is the correlation between the school violence victimization experience, stress, growth mindset, and happiness of adolescents? Second, do the stress and growth mindset between the school violence victimization experiences and happiness of adolescents work as a double mediated effect?

Method

Research Model: Based on the results of previous studies that a school violence victimization experience had a negative effect on growth mindset and happiness⁶, that growth mindset positively affected happiness^{11, 12}, and that stress had a negative effect on happiness¹⁵, the research model in this study was set in [Figure 1].

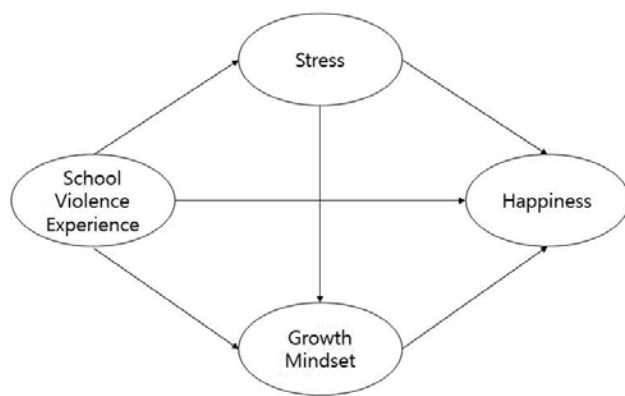


Figure 1: Research model

Research Subjects: The subjects of this study were middle and high school students who resided in D city, Chungcheongnam-do, and researchers visited the schools from September to October, 2017 for 2 months. A total of 975 questionnaires were collected and 956 copies were used for the final analysis, except for 19 questions that were unfairly answered.

According to their gender, there were 451 (47.2%) male students and 505 (52.8%) female students who were participants in this study. The school level distribution was 467 (51.3%) for middle school students and 444 (48.7%) for high school students, and thus there were relatively many middle school students. Their ages ranged from 13 to 19 years, with an average age of 14.79 years (SD = 1.89).

Research Tools

School Violence Victimization: The school violence victimization was measured using the identified 7 items of victimization experience modified and supplemented by Cho et al.¹⁷. This scale consists of questions related to language violence, money laundering, bullying, physical violence, coercion, sexual violence, cyber violence, and a total of 5 point Likert scale from “1=not at all” to “5=very agree.”

Stress: Stress was measured using the Korean version of the Brief Encounter Psychological Instrument (BEPSI-K)¹⁸. This scale consists of 5 items such as “I have felt uncertain or anxious about the future,” “I have forgotten very important things because I have too much work to do,” and a 5-point Likert scale from “1=not at all” to “5=very agree.” In this study, the reliability of the scale was the Cronbach’s α of .878.

Growth Mindset: The growth mindset was measured using the scale developed by Dweck¹⁹. This scale consists of a total of eight items, four items of belief in intelligence change and four items of belief in personality change. Each item is a Likert scale with a total of 5 points ranging from “1=not at all” to “5=very agree.” In this study, the Cronbach’s alpha of this scale was recorded at .755 in total, .755 in intelligence, and .668 in personality.

Happiness: Happiness was measured in the study using the shortened happiness scale developed by Seo and others²⁰ as well as modified and supplemented by Lee et al.²¹. This scale is composed of a total of 9 questions which are composed of 3 items measuring the satisfaction of individual (achievement, health, personality), relationship (family, friend, peer), and group (school, work, community), 3 positive items, and 3 negative items asking the feelings experienced during the past month. Each item is a 7 point Likert scale from “1=not at all” to “7=very strongly.” The computation formula for this scale is determined after summing the 3 satisfaction and 3 positive items, subtracting the 3 negative items and calculating the total score.

General Characteristics: We measured the subject’s sex, age, family type, and economic status of the subject’s family.

Data Analysis: In this case, SPSS Win 23.0 was used for descriptive statistics analysis, reliability analysis, and correlation analysis of major variables. Additionally, AMOS 23.0 was used for structural equation modeling analysis.

Results and Discussion

Correlation between the main variables and descriptive statistics: [Table 1] shows the results of correlation analysis among the main variables. The correlation between the measured and recorded happiness and growth mindset was statistically and

positively correlated. In this case, the school violence victimization experience and stress also were positively correlated with each other. It was shown that the growth mindset intelligence and growth mindset personality showed the highest correlation ($r = .562$, $p < .01$). The overall correlation coefficient ranged from $.562$ to $-.191$, indicating that there was no multicollinearity problem.

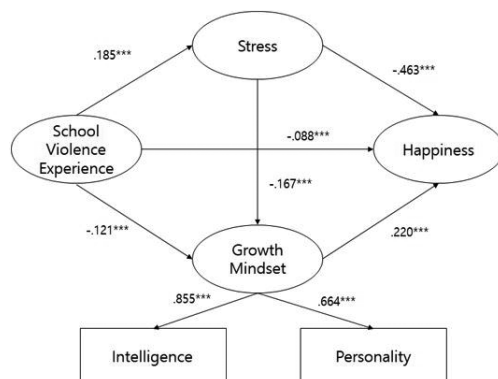
Table 1: Correlation between the main variables and descriptive statistics

		1.	2.	3.	4.	5.
	1. School Violence Experience	1				
	2. Stress	.174**	1			
Growth Mindset	3. Intelligence	-.113**	-.114**	1		
	4. Personality	-.077*	-.088**	.562**	1	
	5. Happiness	-.191**	-.479**	.259**	.200**	1
	M	1.17	2.80	3.56	3.38	19.31
	SD	.37	.99	.79	.75	10.09

* $p < .05$, ** $p < .01$

Hypothetical Model Path Verification Results: The overall fit of the study model was $\chi^2 = 41.783$, $df = 15$, $\chi^2/df = 2.786$, $TLI = .944$, $CFI = .970$, and $RMSEA = .069$. Therefore, the research model was accepted without modification. The verification results of the path coefficient are shown in [Figure 2] and [Table 2]. The results of verification for each path are as follows.

School violence victimization experience had a significant effect on happiness ($\beta = -.088$, $p < .001$), stress ($\beta = .185$, $p < .001$) and growth mindset ($\beta = -.121$, $p < .001$), respectively. In addition, it was confirmed in this study that the factor of stress had a significant effect on happiness ($\beta = -.463$, $p < .001$) and also had a significant effect on growth mindset ($\beta = -.167$, $p < .001$). Finally, growth mindset also had a statistically significant effect on happiness ($\beta = .220$, $p < .001$).



*** $p < .001$

Figure 2: Structural path model among variables

Table 2: Results of path analysis

Path	B	β	S.E	C.R
School Violence Experience $\rightarrow$ Happiness	-2.575	-.088	.702	-3.670***
School Violence Experience $\rightarrow$ Stress	.536	.185	.080	6.710***
School Violence Experience $\rightarrow$ Growth Mindset	-.233	-.121	.061	-3.802***
Stress $\rightarrow$ Happiness	-4.687	-.463	.244	-19.183***
Stress $\rightarrow$ Growth Mindset	-.111	-.167	.021	-5.223***
Growth Mindset $\rightarrow$ Happiness	3.359	.220	.500	6.712***

*** $p < .001$

Verification of Mediation Effect: [Table 3] shows the results of the bootstrapping in order to verify the significance of indirect effects. As a result, the mediating effect was verified because there is no 0 between the upper and lower limits of the bootstrap at the 95% confidence interval.

These results show that school violence victimization has definite negative effects on the happiness of school aged students through various paths. In other words, the school violence victimization experience directly affects the victim's happiness, but affects their internal

psychological stress, growth mindset, and ultimately lowers happiness. The results are consistent with various previous studies^{8, 9, 10}. When adolescents face difficulties in adapting to school life, they will show constant endeavors and endurance when their growth mindset level is high, and will potentially learn to actively cope with the progressive and challenging attitudes in

the future. Therefore, adolescents who have negative emotions due to school violence victimization and stress can judge that their recurring growth mindset will have a buffering effect. For this reason, it is suggested that a program of prevention education against school violence at school should be organically coordinated with the program to grow growth mindset.

Table 3: Bootstrap test of multiple mediating effects

Path	Estimate	p	95% Interval
School Violence Experience → Stress → Growth Mindset	-.031	.004	(-.046 ~ -.018)
Stress → Growth Mindset → Happiness	-.037	.003	(-.058 ~ -.021)
School Violence Experience → Stress → Growth Mindset → Happiness	-.119	.007	(-.145 ~ -.093)
School Violence Experience → Stress → Happiness			
School Violence Experience → Growth Mindset → Happiness			

Conclusion

The purpose of this study was to investigate the mediating effects of stress and growth mindset on school violence and happiness of school aged students. As a result, both stress and growth mindset were found to have indirect effects as well as direct effects on these students, which may influence their behaviors both in and outside of the school environment. Stress and growth mindset were also found to be dual mediated. Based on the results of these studies, we discussed ways to reduce the negative effects of school violence to offer a safer school environment for the enjoyment of the students enrolled at schools in the region.

Based on the limitations of this study, suggestions for follow-up research are as follows. First, this study was conducted only for young people in some parts of North Chungcheong Province, Korea. Therefore, there are clear limitations of the study due to its regional specificity. In the future, it would be valuable and useful for a nationwide sampling of similarly situated students, which will be necessary to review the results, and it is hoped that continued regional comparative studies will also be conducted. Second, this study deals with stress and growth mindset as mediators. However, there are some variables that are expected to mediate between the incidence of the school violence victimization experience and happiness. In the future, a combination of studies involving these variables and the mediators identified in this study should be conducted.

Despite these limitations, this study is meaningful in that it is the first study to identify the role of growth

mindset between school violence victimization experience and happiness, which are environmental variables at school for students who attend schools in Korea. Therefore, this study has enough suggestions for the development of a new policy that enhances the happiness of adolescents, and can determine new ways to prevent negative variables from affecting students while enrolled at school in Korea.

Ethical Clearance: Not required

Conflict of Interest: The authors declare no conflict of interest.

Source of Funding: Self

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Comparative Analysis of Skin Condition after Using Cleansing Oil and Cleansing Water for Removing Facial Makeup

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ABSTRACT

Background/Objectives: The purpose of facial makeup is to make skin look beautiful and appealing without giving any physiochemical stimulation to the skin. To do this, it is important to clear the skin by removing the cosmetics after applying makeup.

Method: After removing facial makeup using cleansing oil and cleansing water available in the Korean market, skin oil content, water content, and pH were measured with a skin analyzer and ingredients of cosmetic film were determined with a dermascope and scanning electron microscope.

Findings: Shortly after applying daily makeup, the cosmetic film was evenly applied to the face skin. As time passes, the cosmetic film formed a thick cosmetic film with the sebum and sweat components secreted from the skin as well as inorganic components of cosmetics. Scanning electron microscope observation showed that most cosmetic membranes consisted of spherical silica, nanometer sized iron oxide and titanium dioxide, and micrometer sized talc and ultramarine. Vellus hairs distributed on the skin were covered with cosmetic ingredients. Thus, cuticle layer was not observed. Face skin washed with cleansing water and cleansing oil was clean without observation of cosmetic ingredients.

Improvements/Applications: Cleansing oil is more effective than cleansing water in maintaining skin oil content and acidity while cleansing water is more effective than cleansing oil in moisturizing the skin

Keywords: *cleansing oil, cleansing water, dermascope, make up, skin condition, scanning electron microscope*

Introduction

In modern society, people consider that both internal images and external images are important. Makeup has been used as a means to present social image^[1]. Women may apply makeup to look beautiful and express their personality. Maintain the health of skin is a fundamental part to look beautiful. The skin has various metabolites released from the human body. Sebum is a light yellow, oily substance that is secreted by sebaceous glands to keep the skin and hair moisturized. When it is exposed

to air for a long time, it can be oxidized. Its oxidation is influenced by oxygen and microorganisms such as bacteria. The cleansing process to remove such waste on the surface of skin is called cleansing^[2].

Cleansing is a fundamental act to remove sweat, sebum, dead cells, and dust from the skin using cleansers such as soaps, forming cleansers, gels, and scrubs^[3,4]. To maintain a healthy skin, mild cleansing and moisturizing with protection from ultraviolet rays are required. Cleansing is also the first step in skin care. It is essential for maintaining healthy skin. Cleansing is very important because if impurities remain on the skin, hair pores of skin can get clogged which can affect metabolism and cause skin aging.

There is a growing interest in protecting and managing skin from various air pollutants such as fine dust since air pollution is now becoming a serious

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social problem globally. It is important to select and use a cleanser that is specific to one's skin type based on precise knowledge to properly protect the skin.

There are diverse types of cleansing cosmetics. They are classified based on the skin type. The quality of the product is also being upgraded and specialized. With development of manufacturing technology and cosmetic technology of cleansing cosmetics, the range of cleansing cosmetics is getting wider. Cleansing products are largely divided into cleansing lotion, cleansing oil, cleansing water, cleansing gel, and cleansing foam. Cleansing lotion contains a lot of surfactant, alcohol, and moisturizer. Thus, it is suitable for dry skin, aging skin, and sensitive skin. Cleansing oil contains very small amount of surfactant and ethanol. Thus, it is less irritating than cleansing lotion. It is suitable for aging skin, moisture-lacking skin, and dry skin. Cleansing water is a liquid detergent that is not tacky. It is formulated with a small amount of lotion, surfactant, and ethanol to make it suitable for sensitive skin and allergic skin. Cleansing gel is completely oil-free. It is suitable for sensitive skin, allergic skin, and acne skin. Cleansing foam contains surfactant with glycerine, sorbitol, and oily ingredients. It is less irritating than soap, suitable for sensitive skin and aging skin.

Previous studies have reported the importance of cleansing in skin care due to skin diseases such as atopic dermatitis, acne, and cleansing effects^[5,6]. However, studies about the effect of cosmetic ingredients in cleansing product that modern women use daily on physiological changes of the skin surface and the removal of air pollutants are insufficient.

In this study, changes of oil, moisture, and pH of facial skin cleansed with cleansing water or cleansing oil compared to those of facial skin before facial cleansing were determined. Cosmetic membrane before and after cleansing was observed with a scanning electron microscope over time.

Results of this study will provide research data on the selection of cleansing products that can completely remove cosmetic ingredients after applying makeup on the face

Method

Materials: As test materials, cleansing water (Bioderma sensibio H20, Korea) and cleansing oil (Mefactory super light cleansing oil, Korea) were used. This study was approved by the Bioethics Committee of the Public Institutions designated by the Ministry of Health and

Welfare of the Republic of Korea.(Approval number POI-201808-13-002).

Experimental Method

Skin Analysis: Ten women in their 20s were selected as subjects. Their skin conditions before and after applying makeup were analyzed with a dermascope (CC-205, Sometech Inc, Korea). After applying makeup, subjects cleansed the makeup with cleansing water on the right cheek, cleansed the makeup with cleansing oil on the left cheek, and then washed their faces with water. Right and left cheeks of subjects at 2 hours after cleansing were measured and analyzed for oil content, water content, and pH with noninvasive skin integration analyzer (MPA580, Courage + Khazaka electronic GmbH, Germany).

Oil Content Measurement: A sebumeter was used to measure facial skin moisture contents of subjects whose faces were cleansed with cleansing oil and cleansing water. A sebumeter cassette was placed on the skin area for measurement. It was pressed for 20 to 30 seconds with an appropriate pressure. The amount of oil per 1cm² was measured. Measurement was repeated three times and mean value was calculated.

Water Content Measurement: A corneometer was used to measure skin moisture content of the same subject. A probe attached to the corneometer was applied vertically to the surface of the skin. After lightly pressing the skin, it measured moisture content of the stratum corneum. The measurement was repeated three times. Mean value was then calculated.

pH Measurement: Skin pH meter was used to measure the pH of skin surface of the same subject. After repeating the measurement three times for each subject, the mean value was used.

Dermascope Observation: Skin condition of subject with makeup and that of the same subject after facial cleansing with cleansing water or cleansing oil were observed using a dermascope to check skin conditions

Scanning Electron Microscope Observation: To analyze cosmetic ingredients coated on the face after applying makeup, the skin of the cheek was scraped with a sharp double sided razor and used as experimental material. The collected sample of cosmetic component was adhered onto a stub with a copper tape and dried in a vacuum dryer (HMDS-6210 Hasuc, China) for 24 hours. Dried samples were platinum-coated to a thickness of 20 nm using an ion-deposition machine (IB-5 ion

coater, Eiko, Japan) and placed on a scanning electron microscope (S-4700, Hitachi, Japan) to be observed at high voltage of 15kV.

Result and Discussion

This study observed facial skins immediately, at 4 hours, and at 8 hours after applying makeup with a dermascope to check makeup conditions of female subjects. On the skin immediately after applying the make-up, the cosmetic membrane was evenly applied [Figure 1a].

The facial makeup of career women is mixed with sebum and sweat secreted from the skin over time. In this study, facial skin at 4 hours after applying makeup was found to be irregular because inorganic components of cosmetics were clumped to cover the curved fine wrinkle surface between keratinocytes [Figure 1b].

In facial skin at more than 8 hours after applying makeup, cosmetic ingredients, the sebum, and sweat secreted from the skin are gathered with each other to form a thick film [Figure 1c]. This skin stratum covering cosmetic ingredients coated on the skin was not exposed and attachment of foreign objects contaminated by the external environment during daytime activities was observed. In addition, sebaceous lumps secreted from the sebaceous gland were observed. Vellus hairs on the surface of skin were found to be transparent and white [Figure 1c]. Vellus hairs present in the facial skin are white fine hairs without medulla or melanin granules^[7].



Figure 1: Dermascope images of facial skin. a: immediately after daily makeup. b: 4 hours after applying daily makeup. c: 8 hours after daily makeup. white arrows: sebum, black arrows: vellus hairs. 20x.

The facial skin of female subject after applying makeup was gently scratched with a sharp razor and cosmetic ingredients collected therefrom were observed with a scanning electron microscope. These scraped cosmetic ingredients were clumped together to form lumps. Among cosmetic ingredients, spherical silica having various sizes were most frequently observed. Plate-shaped talc and ultramarine pigment were also observed [Figure 2a].

Talc is so smooth that it is scratched with nails. It provides excellent spread and lubrication. Thus, it

is used as a conditioning agent in cosmetics^[8]. Raw materials of talc are added to most cosmetics, especially powder, makeup base, BB cream, twin cake, foundation, and so on. Silica having spherical form is widely used as an additive to improve the spreadability and application of cosmetics on the skin^[9]. Nanomaterials such as titanium dioxide and iron oxide were observed with the scanning electron microscope at high magnification [Figure 2b]. These fine materials filled the space between large cosmetic ingredients such as silica and formed a homogeneous thickness of cosmetic membrane when makeup was applied. Iron oxide is a mineral pigment most commonly used in cosmetics. It is harmless to the human body with excellent stability.

In the present study, the thickness of vellus hairs collected together with cosmetic ingredients in the facial skin was measured to be 11 μm . Their surface was covered with fine pigment ingredients of cosmetics [Figure 3a]. In a previous study on morphological features of vellus hairs, Chang^[7] has reported that the length of vellus hair distributed in the facial skin is about 1 mm and the thickness is about 16 μm at the vicinity of the hair root. It became thinner toward the end. The thickness at its apiculus was measured to be 0.5 μm .

In this study, the materials surrounding these vellus hairs were inorganic pigments including titanium dioxide, iron oxide, and sweat, and sebum secreted from the skin mixed with each other [Figure 3b]. When observing with a scanning electron microscope, no cuticle layer was observed on the surface because vellus hairs were covered by fine cosmetic inorganic substances.

After facial skin was cleansed with cleansing oil or cleansing water to erase the cosmetic membrane, it was observed with a dermascope [Figure 4]. For the surface of skin cleansed with cleansing oil, cosmetic ingredients were removed that the surface of fine wrinkles between keratinocytes was shiny [Figure 4a]. For the skin cleansed with cleansing water, cosmetic ingredients were also removed. The stratum corneum on the surface of the skin was found and vellus hairs were clearly visible [Figure 4b].

In order to check change of skin moisture after cleansing, the right side of the face was cleansed with cleansing water while the left side was cleansed with cleansing oil to measure skin portions of both cheekbones [Figure 5a]. As a result of measuring the moisture content of the skin surface using an integrated analyzer, the average water content was 81.02% when the face was cleansed using cleansing water. It was 76.05% when the

face was cleansed with cleansing oil. Thus, both cheeks had sufficient water content. The measurement result revealed that skin surface moisture was higher when it was cleansed with cleansing water than that when it was cleansed with cleansing oil. The way to wipe off water is also important in order to protect the skin barrier and increase moisturizing after cleansing. Tapping the skin slightly with a towel to dry the skin can reduce the risk of skin damage due to friction and maintain skin moisture^[10].

Excessive sebum production and secretion can result in a shiny and greasy face. Oily skin causes skin disorders such as acne that can lead to aesthetic problems and ultimately decrease quality of life^[11]. Therefore, the use of cosmetics is recommended to reduce the shine of skin which is not an easy task.

Recently, many studies have been conducted to reduce sebum secretion by using a toner containing a natural substance such as green tea extract in oily skin^[12]. In addition, makeup remover containing vegetable seed oil has been developed to remove inorganic substances contained in the foundation and eyeliner^[13]. In this study, subjects who applied daily makeup were asked to use cleansing water on the right side of the face and cleansing oil on the left side to examine changes in skin oil after cleansing the skin. As a result of measuring oil contents in both cheekbone skin using an integrated analyzer, the average total amount of oil on the surface of the skin was 172 $\mu\text{g}/\text{cm}^2$ when cleansing water was used while it was 205.29 $\mu\text{g}/\text{cm}^2$ when cleansing oil was used [Figure 5b]. These measurement results indicated that cleansing oil gave more oil on the skin surface than cleansing water after cleansing.

It was recognized at the beginning of the 1st century that the skin surface was acidic. Since 1928, non-invasive measurement methods have been developed to measure the pH of skin surface in a variety of ways^[14]. To examine changes in pH of skin surface of subjects who applied daily makeup after cleansing, cleansing water was applied to the right side of the face while cleansing oil was applied to the left side of the face. As a result of measurement using an integrated analyzer, the average pH of the skin surface was 6.3 when it was cleansed with cleansing water while it was 6.1 when cleansing oil was used for cleansing [Figure 5c]. These measurement results indicated that cleansing oil was more effective in maintaining the acidity of skin surface than cleansing water after cleansing.

The skin is affected by ultraviolet light and temperature in the daytime when people are active. The skin pH maintains slightly lower acidity in the afternoon than that in the morning^[15]. This is due to the influence

of sebum secreted from the skin. In this study, the skin maintained a neutral status since the sebum was removed when face was cleansed with cleansing oil.

The skin maintains acidity (pH 4-6) while the internal environment of the human body maintains a neutral state at pH of 7-9^[16-18]. The pH difference between skin surface and the internal environment of the human body is caused by stratum corneum and epidermal/dermal barriers. Acidic skin surface plays an important role in preventing microbial invasion from the outside^[17].

The pH of skin is slightly acidic. It changes when soap or cleansing products are used. Also, when the skin is washed with water only, the pH of the skin may increase. It may take several hours to recover to a slightly acidic state after washing the skin^[18]. Even after removing the cosmetic membrane of the skin with cleansing oil and cleansing water, the use of these slightly acidic cleansing products is required for the pH of the skin to reach a physiological level of weak acidity.

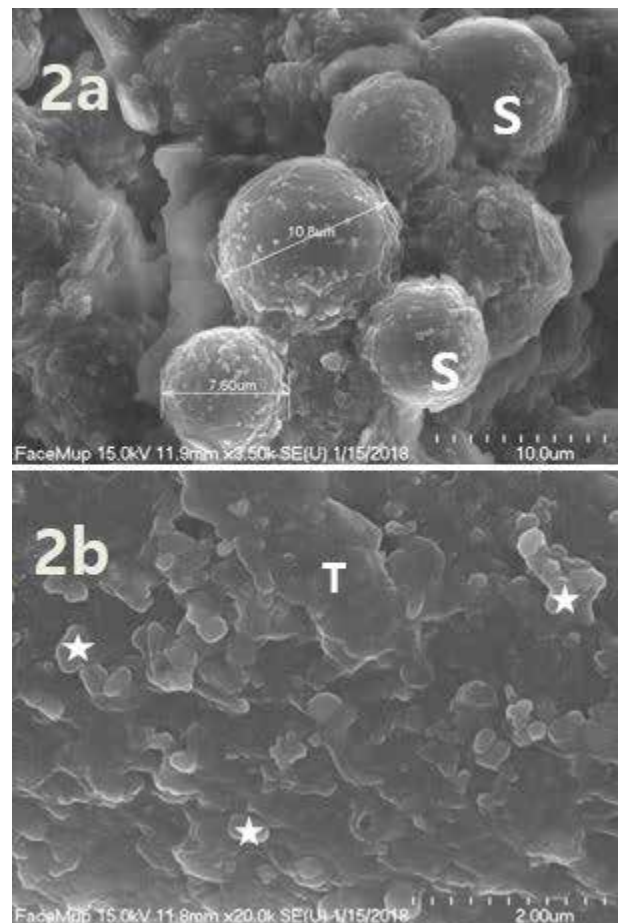


Figure 2: Scanning electron micrograph of cosmetic ingredients scraped from facial skin. a: Note that the spherical silicas(S) with various size. b: Images of cosmetic ingredients showing titanium dioxide(asterisks) and talc(T)

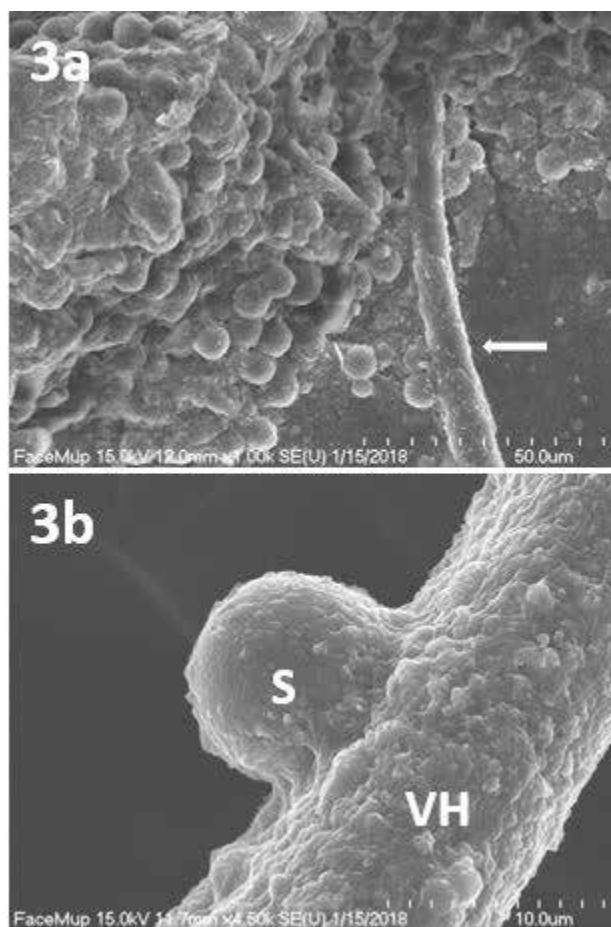


Figure 3: Scanning electron micrograph of cosmetic ingredients scraped from facial skin. a: The vellus hair (arrow) collected from the facial skin. b: The surface of vellus hair (VH) is coated with titanium dioxide and iron oxide. S: silica



Figure 4: Dermoscope image of facial skin after cleansing the cosmetic membrane with cleansing oil (a) and cleansing water (b). 20x



Figure 5: Changes of face skin moisture(a), sebum(b), pH(c) indexes measured after cleansing the right cheek with cleansing water and the left cheek with cleansing oil

Conclusion

In this study, facial skin of female subjects after applying makeup and the facial skin of female subjects after cleansing with cleansing oil or cleansing water were checked with a dermascope and cosmetic ingredients in the cosmetic membrane were observed with a scanning electron microscope. Changes of oil, moisture, and pH were then checked and analyzed. Immediately after applying makeup, the cosmetic membrane was evenly applied to the facial skin while the stratum corneum was not found. During routine daily activities, sebum, sweat, and cosmetic inorganic ingredients secreted from the skin over time were mixed with each other to form a thick cosmetic film.

As a result of observing cosmetic ingredients collected from the facial skin of female subject covered by makeup with a scanning electron microscope, spherical silica with various sizes was observed the most frequently. Nanometer-sized iron oxide and titanium dioxide and micrometer-sized talc and plate ultramarine pigment were also observed.

The cleansing oil was more effective in maintaining skin oil content and acidity than cleansing water while the cleansing water was more effective in moisturizing skin than cleansing oil. In conclusion, the skin cleansed with cleansing water or cleansing oil was clean without showing any cosmetic ingredient.

Ethical Clearance: Not required

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Conflict of Interest: Nil

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Morphological Damage Procedures of Hair Surface Treated with Repetitive Oxidation Coloring Agent

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ABSTRACT

Background/Objectives: People apply permanent hair dyes in various colors to change their hairstyle or appearance. Frequent dyeing damages the hair cortex and cuticle layer.

Method: In this study, a permanent coloring agent was applied to normal hair five times consecutively and the damage on the hair surface was observed with a scanning electron microscope (SEM).

Findings: In this study, the hair surface was continuously damaged as the number of permanent dyeing procedures increased. As the number of permanent dyes applied increased, the surface of the repeatedly dyed hair cracked and was lost in the cells of the cuticle. As the number of dyeing procedures to the same hair increased, the surface area of the scales making up the hair became wider and some broken cells remained attached to the surface of the hair scales.

Improvements/Applications: Damage to hair due to dyeing was confirmed by scanning electron microscopy. This study indicated that frequent dyeing should be avoided in order to prevent excessive hair damage.

Keywords: hair, hair dye, permanent colouring agent, SEM, scale, cuticle layer

Introduction

In modern society, many people vary their hairstyle to express their individuality and make themselves more attractive. Hairstyling is achieved in various ways, depending on an individual's age, personality, and social activities. Hairstyling practiced at beauty shops is divided into styling by physical procedures and methods using physicochemical reactions. Hairstyling by physical methods includes haircuts using a variety of tools, such as scissors, curlers, hairdryers, and combs. Hair styling by physicochemical reactions includes hair dyeing, bleaching, and making permanent waves^[1,2]. In recent years in Korea, with the liberalization of high school students' attire, there has been an acceptance of

the application of physicochemical reactions to the hair, such as hair dyeing and bleaching, and people as young as adolescents are interested in using these techniques to express their personality and change their appearance. In order to express an individual's appearance, not only in Korea but also throughout the world, hairstyling techniques applied to the scalp and hair can be done from adolescence to old age.

Dyeing, which changes the hair shade and color, is classified into temporary dyes, semi-permanent dyes, and permanent dyes, depending on the physical reaction between hair protein and the dye and the presence or absence of chemical reactions. Temporary dyes and semi-permanent dyes physically dye hair by the application of material to the hair and there is no chemical reaction with the hair proteins. These products have the color of the dye they are imparting^[3]. Temporary dye agents have chromophore groups which absorb light at particular wavelengths and form a hue. Most of them are azo-group-containing macromolecules which attach to the surface of the cuticle layer and exhibit a specific color^[4]. Semi-permanent dyes can be washed several times. The

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dyed hair gradually fades in color, rather than being washed away with one washing. Direct coloring is a physical reaction in which the dye material is deposited between the exposed cuticular cells on the surface of the hair. Semi-permanent dyes are used to enhance the hue of hair and to change it into gray hair but these dyes do not contain decolorant components and, therefore, cannot exhibit bright hues^[5].

Permanent dyes cause an oxidation dye reaction in which the dye precursor, which is the primary intermediate, enters the cortex inside the hair and reacts with the coupler resorcinol to form a large dye molecule. One dye precursor used in permanent dyes is *para*-phenylenediamine, which does not itself form a chromophore group. In cuticular cells and the cortex of hair, *para*-phenylenediamine is oxidized to form the quinone diimine and a chromophore group is formed in the dye molecule as reactions with resorcinol occur. These molecules continuously undergo oxidation and condensation reactions, eventually forming large dye molecules inside the hair cortex and permanently dyeing the hair.

Through this process, physical damage to the cuticle layer and cortex of the dyed hair occurs due to the alkaline and oxidant components present in the hair dye. As the hair dye procedures are repeated, the degree of damage to the entire hair fiber becomes severe, particularly damage to the cuticle layer on the surface of the hair^[6,7]. The physicochemical action artificially applied to the hair exposes the cuticular cells of the cuticle layer and the scales forming the surface of the hair separate, break, and crack but this damage cannot be observed with the naked eye. When the naked eye looks at damaged tresses, the hair simply appears as rough, dry, or crumbly.

Therefore, this study investigated the degree of damage to hair, the roughness of the hair surface and the morphological changes to the cuticle layer by repeated hair dyeing with permanent hair dye using a scanning electron microscope.

Materials and Method

Materials

Collection of Experimental Material: The normal hair of a woman in her 20s was cut to a length of 10 cm from

the scalp about 1 cm away from the scalp and was bundled into a hair tress with a forceps and fixed with silicone.

Permanent Dye Treatment: Agent 1 permanent hair dye (W company, 3/0, Japan) and agent 2 oxidant were mixed in a ratio of 1:1.5, evenly applied to the hair tress, and left at room temperature for 40 minutes. Then, the hair was washed with lukewarm water using shampoo, dried naturally, and a sample of the dyed hair was collected. To determine the degree of damage to the surface of the dyed hair with an increasing number of permanent dyes, the first, second, third, fourth, and fifth permanent dyes were applied at intervals of seven days in the same manner as above. Then, each sample was collected and used as experimental material.

Method

Observation of the External Shape Change of Hair Treated with Permanent Coloring Agents: After each hair sample was treated by the application of one to five permanent dyes, they were cut to lengths of about 1.5 cm according to the sample processing method of Chang^[8]. Pre-fixation was performed using paraformaldehyde–glutaraldehyde, (4°C, 0.4M phosphate buffer, pH 7.4) as a pre-fixing agent and post-fixation was performed using 1% osmium tetroxide (OsO₄, 4°C, 0.4M phosphate buffer, pH 7.4). After drying and dehydration with ethanol and isopropyl alcohol, the hair was naturally dried and the hair samples were placed on a stub treated with copper tape. The stub with the hair sample was platinum coated to a thickness of 20 nm by an ion deposition machine (IB-5, Eiko, Japan) and was irradiated with a scanning electron micrograph (S-4700, Hitachi, Japan) at 15 kV for observation.

Result

The surface of the hair was clearly observed in the scanning electron micrographs of normal hair used in this study. The scales, which are the exposed areas of the cuticular cells forming the cuticle layer on the surface of the hair, were observed in oval shapes and some of the scales were observed to be broken apart at the tip [Fig. 1a]. High-resolution scanning electron micrographs showed no gaps between the superimposed cuticular cells and they were closely attached to the lower cuticular cells. The surface of the scales was smooth [Fig. 1b].

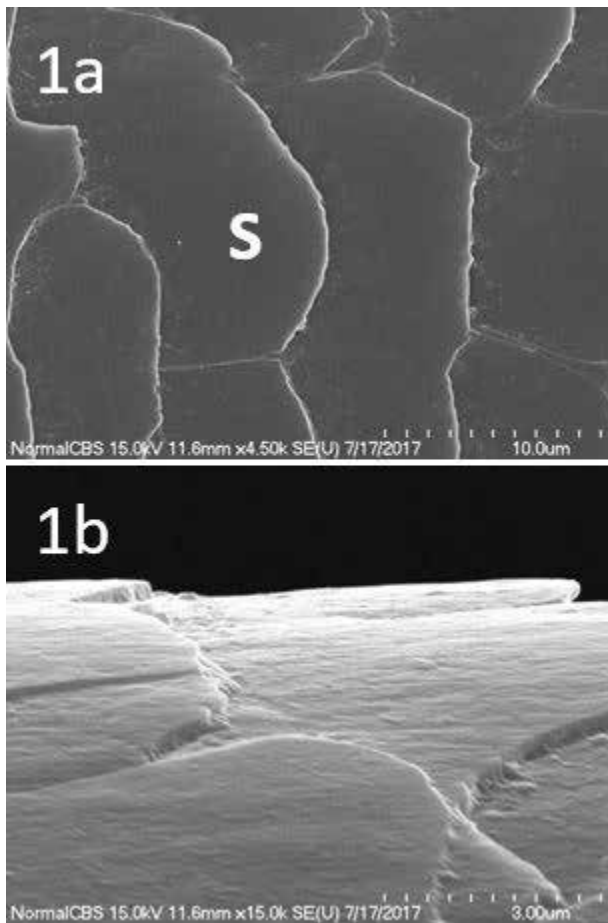


Figure 1: Scanning electron micrographs of normal hair. a: The hair surface showing round scales (S). b: High-magnification scanning electron micrograph of normal hair

In scanning electron micrographs after the first application of permanent hair dye, the hair surface was observed to be rougher than that of normal hair. The distal region of the scales was pointed and irregular. The surface of the hair scales was partially depressed and damaged by the physical action of the dyeing process and damage to the edges of the scales formed very irregular shapes [Fig. 2a].

The high-magnified images showed a fine gap of about $0.1\mu\text{m}$ between the superimposed cuticular cells of the surface. The area of the cell edge section about $5.7\mu\text{m}$ thick that was broken off appeared clear [Fig. 2b]. On the surface of the scales exposed under the part where the cuticular cells on the surface of the hair broke apart, there was a cell remnant of the endocuticle which was not separated from the surface [Fig. 2b].

The hair washed after the second permanent dye, the surface area of the scales exposed to the hair surface was

very irregular. After the primary dyeing, the separated or broken cuticular cell remnants were partially washed away [Fig. 3a].

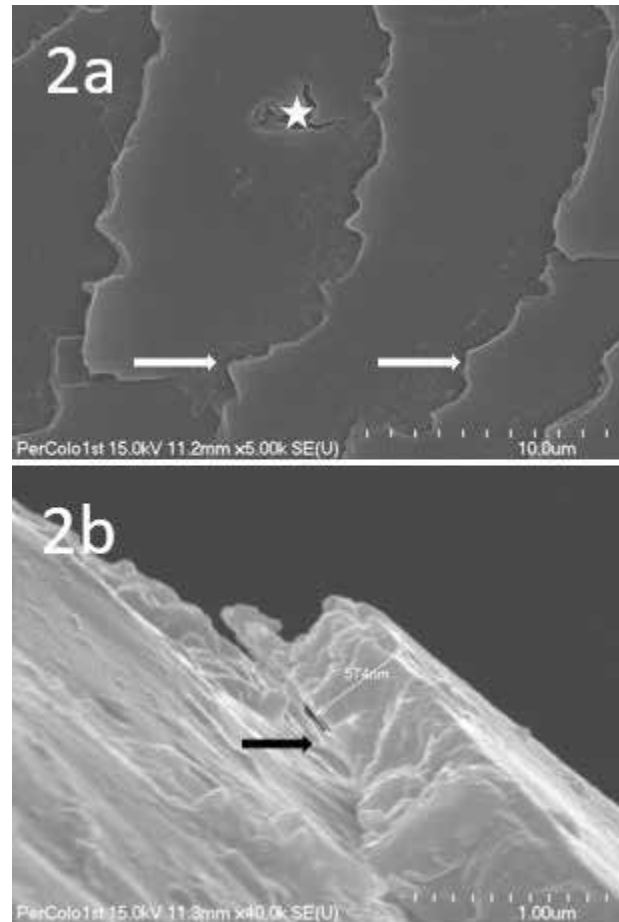


Figure 2: Scanning electron micrograph of the hair surface after the first permanent-hair dyeing. A: Irregular terminal edge of the scales due to shattering(a). b: Cracks (black arrow) developed among the cuticular cells. White arrow: edge of scale. Asterisk: depressed crack.

After the second application of permanent dye, the hair surface was rough, the surface of the cuticular cells was covered with a remnant of the endocuticle, and the edges were very irregular with sharp points [Fig. 3a]. In addition, separated cuticular cells were attached to the surface of the hair and some cell remnants which were not separated at the edge of the cell bent toward the free surface of the hair [Fig. 3]. Separation of the cuticular cells on a scanning electron micrograph at high-magnification showed that the cuticular cells were not completely separated but that the endocuticle of the cuticular cells was broken off [Fig. 3b].

The third permanent-dyed hair showed more scales separated from the surface than the second permanent-

dyed hair and a large gap between the separated scales. The surface area of the exposed scales was widened. The scales on the surface of the creviced hair were continuously separated from the overlapping scales [Fig. 4a].

Specifically, the high-magnification scanning electron micrograph confirmed that the surface of the hair was relatively smooth and that slight wrinkles had formed. In addition, the separated cells were completely detached and the surface of the underlying cuticular cells was clearly observed (Fig. 4b).

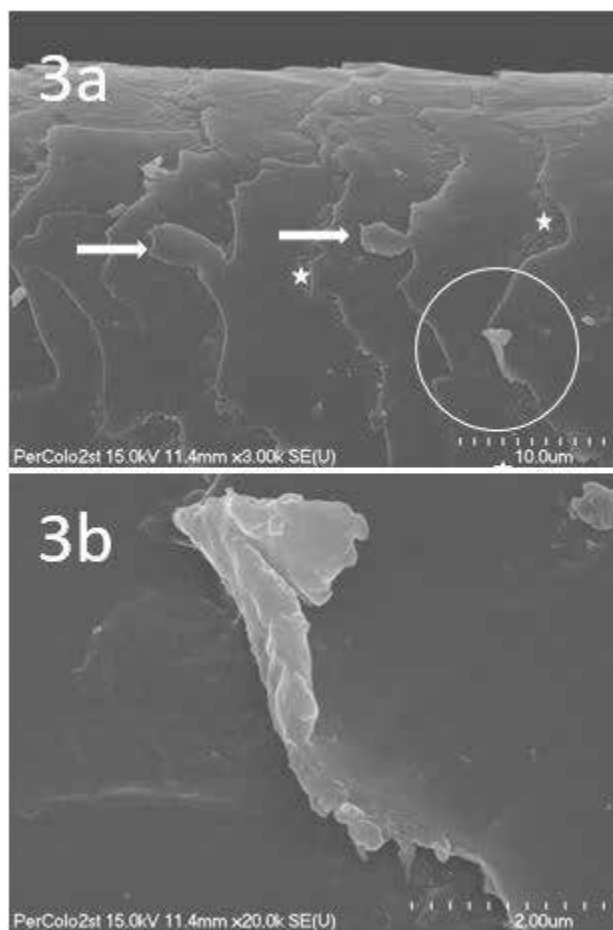


Figure 3: Scanning electron micrograph of a hair after the second permanent-hair dyeing. a: Scales on the hair surface are shattered (arrow) and the endocuticles (asterisks) are attached to the cellular membrane. Circle: separated curved. B: Separation of the endocuticle and exocuticle can be observed in the cuticular cells.

The fourth application of permanent hair dye showed a relatively smoother surface than the third permanent-dyed hair but the overlapping cuticular cells of the cuticle layer were observed to be torn off in some areas. On high-magnification scanning electron

micrographs, the cell remnants remained attached to the surface of the tears and the scale surface was cracked [Fig. 5]. At the depressed sites where the cuticular cells were severely torn, cuticular cell damage was found and the cuticular cells adjacent to the cortex were cracked [Fig. 5].

The fifth permanent-dyed hair showed fewer cell remnants attached to the surface than the fourth permanent-dyed hair, where relatively few cell remnants attached to the surface or separated cell remnants were observed [Fig. 6]. The surface of the fifth permanent-dyed hair was found to have a relatively smooth appearance, although some cell remnants were present. On the high-magnification scanning electron micrographs, the cuticular cells were physically and chemically deformed into cave shapes and some cell remnants were present but the hair surface was smooth [Fig. 6].

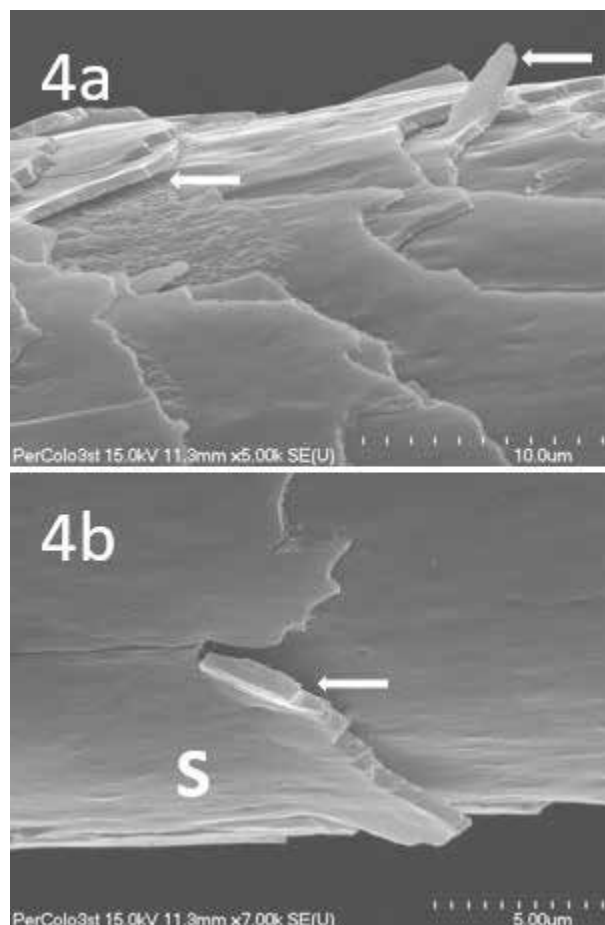


Figure 4: Scanning electron micrograph of a hair after the third permanent-hair dyeing. a: Continuous separations (arrow) of the cuticular cells can be seen. b: Magnification scanning electron micrograph of the hair surface showing separated crack (arrow). S: scale.

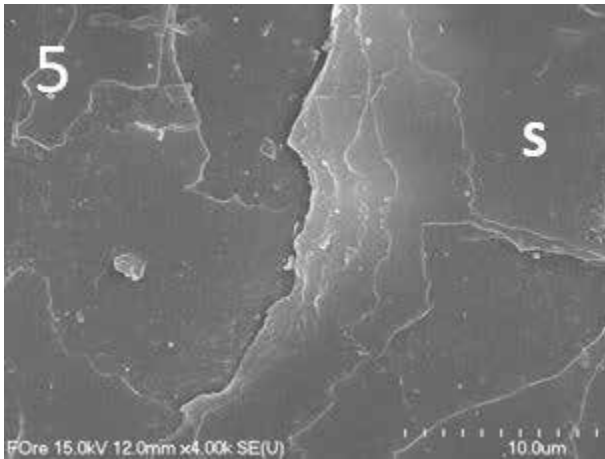


Figure 5: Magnified scanning electron micrograph of the hair surface after the fourth permanent-hair dyeing. The damaged hair surface shows depressed cracks. S: scale.

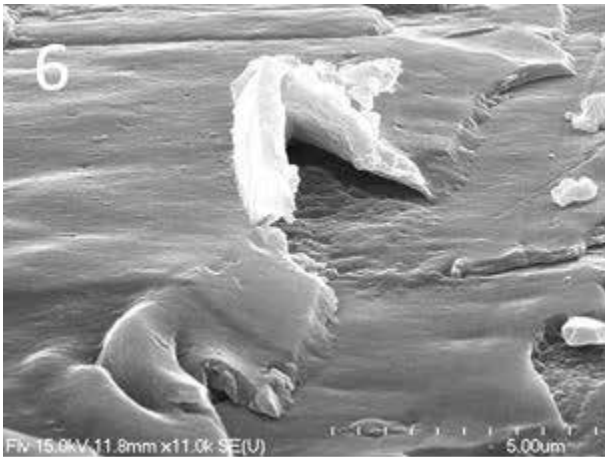


Figure 6: High-magnification scanning electron micrograph of the hair surface after the fifth permanent-hair dyeing. Swelling of the cuticular cell on the hair surface is seen.

Discussion

Scalp hair grows from the hair follicle and is physically and chemically damaged from the point of exposure to the skin surface. Damage to the hair growing on the scalp is primarily caused by weathering phenomena and secondary physicochemical actions, such as hair dyeing, discoloration, permanents and drying for hair styling. Scalp hair is damaged during frequent hair curling and combing, sun exposure, and wind-induced friction during the anagen phase of hair growth. In addition, the high salinity of sea water, the chlorine compounds used in pools, and polluted air inflict hair damage called weathering^[9-13]. In this study, normal hair was observed to have a relatively clean surface and no severe weathering phenomenon was observed.

Modern people change their natural hair color, sometimes repeatedly over many years. Dyeing to bring about a permanent change in hair color uses permanent dyes or oxidation dyes. Oxidation dyes create dye by a chemical reaction between the dye materials in the hair cortex and can produce a color brighter than the natural hair color^[14].

In this study, brown hair color was pigmented with a permanent coloring agent and the surface of the hair was observed with a scanning electron micrograph. The end of the scales on the surface of the hair appeared broken and irregular. In a scanning electron micrograph study of the outer shape of permanent-dyed hair, Lee & Chang^[8], reported that the scales of the permanent-dyed hair surface were partially separated and that these cuticular cell pieces had lower electron density. In this study, we confirmed that the outermost cuticular cells of the primary permanent-dyed hair cuticle layer were damaged and separated, in agreement with Lee & Chang^[8].

In this study, scanning electron micrographs after the application of a second permanent dye revealed that the surface area of the hair was more irregular than that dyed once with permanent dye. In addition, the separated cuticular cells did not completely fall off and the endocuticle remnants were attached to the surface of the cuticle cell membrane located below them.

The third permanent-dyed hair had more scales separated on the surface than the second permanent-dyed hair and there were many fine gaps between the underlying cuticular cells. As these gaps spread, the cuticle layer of the hair was separated continuously. Lee & Chang^[15] observed the cuticle layer of permanent-dyed hair by transmission electron microscopy and found that the cuticular cells of the surface were cleaved and separated from the lower adjacent cuticular cells. They reported that high electron density analysis showed encased 7-8nm thick fine particles between the surface and the gap in the cuticular cells. These fine particles reacted with a coupler in the dye to form large molecules before they penetrated into the cortex as the dye intermediate was oxidized. Small molecular size particles on the surface of permanent-dyed hair were not observed in the scanning electron micrographs of this study.

In this study, the fourth permanent-dyed hair was more smooth than the third permanent-dyed hair but the scales were already removed and the surface of the

exposed cuticular cells was torn off. On high-power scanning electron micrographs, the continuously-torn surface of the cuticular cells was depressed. This result was due to repeated permanent physicochemical damage to the hair surface by the continuous permanent dye procedures to the hair. The alkalinity of hair dye products swells the keratin protein of the hair cuticle layer and diffuses the dye precursors into the cortex between the swollen cuticular cells^[16].

The fifth permanent-dyed hair showed relatively fewer cell remnants separated from the surface-attached cell remnants left from the fourth dyeing. The surface of the hair was relatively smooth compared to the third and fourth dyed hair. As a result, the fifth permanent-dyed hair had relatively few cell remnants separated from the surface-attached cell remnants than the fourth permanent-dyed hair and the surface area of the scales was continuously widened. Therefore, most of the cuticular cells and cell remnants were separated and the hair surface was found to be relatively smooth.

Results of this study confirmed that the hair was continuously damaged as the number of permanent dye treatments increased. The dyeing process damaged the hair cuticle layer, causing the cut surface of the cuticular cells on the surface to collapse and fall off and the surface area of the scales became wider. With dyeing, hair was cracked but could be washed and appeared clean to the naked eye. However, when the dyeing process was continuously repeated, the cuticle layer of the hair was excessively damaged, exposing the cortex, eventually necessitating cutting the damaged hair.

Conclusion

A permanent coloring agent was tested five times on normal hair and damage on the hair surface and microstructural changes of the cuticle layer were observed with a scanning electron microscope.

The surface of the normal hair used in this study was clearly observed but the surface of the first permanent-dyed hair was rougher than normal hair. The ends of the scales of the second permanent-dyed hair surface were broken and very irregular. The third permanent-dyed hair showed more scales separated on the surface than the second permanent-dyed hair. The hair of the fourth permanent-dyed hair was smoother than that of the third permanent-dyed hair, but the overlapped cuticular cells

were observed to be partially cut off in some areas. The fifth permanent-dyed hair was found to have relatively few cell remnants separated from the cell remnants attached to the surface. The surface of the hair was smooth and the surface area of the scales was widened.

In conclusion, as the number of permanent dyes applied to the hair increased, damage to the surface of the hair increased. The hair surface was physically and chemically damaged by the combs and hair dye used during the dyeing processes. The dyed hair repeatedly cracked and was torn in the cuticle layer surrounding the cortex and the surface area of the scales which make up the hair became wider. When the broken cellular remnants were cleanly washed, however, the hair appeared cleaner to the naked eye.

Ethical Clearance: Not required

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Conflict of Interest: Nil

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A Study on Heavy Metal Materials in Cosmetic Makeup Concealers

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ABSTRACT

Background/Objective: This paper aimed to select low-priced and high priced concealer products sold in Korea to analyze the inorganic materials in these cosmetic products and to investigate whether any heavy metal materials harmful to humans are present in them.

Method: The inorganic materials and heavy metal materials in the concealer cosmetics products were observed with a scanning electron microscope and the component elements were analyzed using energy dispersion spectroscopy.

Findings: Both the low- and high-priced concealer products used for this study mainly contained silica, titanium dioxide, and iron oxide. The study found that the high-priced concealer products did not contain heavy metal materials harmful to humans but the low-priced concealer products contained the radioactive material technetium. When cosmetics containing this radioactive material are applied over a long period of time adverse health and cosmetic effects may develop.

Improvements/Applications: Not only stones and soil in nature but also metals in water may be mixed into the base materials used to manufacture cosmetics. High-purity base materials must be used to produce high-quality cosmetics and a thorough quality control process must be applied to the manufacturing process to prevent foreign materials from contaminating cosmetics products.

Keywords: concealer, cosmetics, make-up, scanning electron microscope, technetium.

Introduction

The use of colored makeup products by both males and females in Korea is continually increasing. In particular, young people are becoming more and more interested in colored makeup and routinely use makeup cosmetics^[1].

Makeup products are applied to the face every day in the course of daily living. The metal materials in cosmetic products may be absorbed into the human body through the oral cavity, the mucous membranes of eyes, and the thin skin of the face. The metals absorbed

into the human body may cause cancers and trigger toxic and chronic diseases in various parts of the body^[2-7]. The elements of colored makeup products may contain various harmful compounds such as color dyes, heavy metals^[3,8], preservatives, paraben, formaldehyde, and saturated hydrocarbons^[9].

Eight metals, including antimony (Sb), arsenic (As), cadmium (Cd), chromium (Cr), cobalt (Co), mercury (Hg), nickel (Ni) and lead (Pb), are forbidden for use in cosmetic products because when these materials permeate the skin or are absorbed through the respiratory system, they may cause toxicity^[2].

Heavy metal elements, such as lead (less than 50µg/g), nickel (less than 30µg/g), arsenic (less than 10µg/g), mercury (less than 1µg/g), antimony (less than 10 µg/g), and cadmium (less than 5µg/g), etc., are forbidden to be intentionally added to the base materials used in the manufacturing process of colored makeup products. All color additives used in cosmetic products

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in Korea must be approved by the Ministry of Food and Drug Safety^[10]. Particularly, metals such as nickel, cobalt, chromium, etc., are allergic antigens which can permeate through the skin of children who suffer from atopic dermatitis. Adults may develop contact dermatitis by nickel concentrations as low as 0.5ppm^[8,11].

Cosmetic products must be safe because they are used repeatedly and are directly applied to human skin. Nevertheless, there is growing concern regarding the safety of some products. Unfortunately, cosmetic products have been sold in the Korean market to which harmful heavy metals, such as antimony, were added intentionally or unintentionally.

In March 2018, Korea's Ministry of Food and Drug Safety found antimony was added over the acceptable level to the concealer products of eight cosmetics companies, including a well-known one, and took measures to suspend their sale and recall the products.

Antimony is a heavy metal and is permitted to be used in the end-product only under the acceptable level of 10µg/g according to the Korean Food and Drug Administration (KFDA) cosmetics safe standards. This heavy metal must not be added intentionally during the cosmetic manufacturing process. In cases where the material is added from the shipping materials used in the process of manufacture or storage, objective data must identify the material. When the complete removal is impossible in the process of cosmetics manufacture due to technologic limitations, the manufacturer must observe the detection limits designated in the KFDA^[10].

The concealer in colored cosmetic products is used to mask small blemishes on facial skin which cannot be masked by foundation, BB cream, etc. And it masks pigmented parts, such as acne, freckles, age spots, and dark circles, etc., in order to present the appearance of clean and bright skin. Thus, it is a functional colored cosmetic product^[12].

Concealer products are available in various forms, such as brushes, pencils, creams, liquids, and sticks, etc. Cream concealers can be applied to dark circles below the eyes by spreading it with a brush. And, the brush and stick type concealers can be applied to mask freckles or age spots.

In addition, concealers are produced in various shades and colors for different uses. Concealer that is

one tone level brighter than an individual's skin tone is recommended to mask dark areas, such as dark circles, etc. But, concealer one tone darker is better at masking dark parts, such as acne, etc., to make the bumps appear less prominent. Thus, concealer cosmetic products, which have various functions and usages, are popular among young people, too. Korean people use colored cosmetic products less than Americans and Europeans, except for lip gloss, lip balm, lipstick, eyeliner and eyebrow products^[13]. But, as the cosmetics industry develops in Korea, the use of colored cosmetic products by all age groups is increasing.

The experimental materials used in this study were the concealers which caused social problems recently in Korea due to the heavy metal materials contained in these products. The inorganic minerals and heavy metal materials added to these products were analyzed with a scanning electron microscope. Then, energy dispersive X-ray spectroscopy was utilized in order to investigate whether harmful heavy metal materials could be detected in these concealer products.

Materials and Method

Materials Preparation: Among the concealer cosmetic products sold in Korea, the researchers in this study purchased low- and high-priced stick-type concealers which almost every woman uses, including young people, and used them as the test materials. In order to analyze the heavy metal materials added to the concealers, 1g of every test material was put into a Falcon tube (50ml) and was washed three times for an hour with acetone (30ml, Merck, Germany). Next, it was washed with absolute ethanol (30ml, Merck, Germany) three times for an hour to remove the organic materials before it was precipitated.

Test Method

Scanning Electron Microscopy: In order to identify the ultrastructural characteristics of the inorganic materials added to the concealer products, each test material was deposited on a stub treated with carbon and copper tape and was allowed to air dry. Then, it was coated with platinum to a thickness of 20nm with the aid of the ion coater (IB-5 ion coater, Eiko, Japan). The coated test materials were analyzed at an accelerated voltage of 15kV with the aid of energy dispersive X-ray spectroscopy (INCA, Oxford

Ins, Great Britain). It was observed at the 15kV with the aid of the scanning electron microscope (S-4700, Hitachi, Japan).

Analyzing the Component Elements: In order to analyze the component elements of the materials which were added to the concealer products, the test materials were made in the same way as the sample for the scanning electron microscope were made. Next, the test materials were deposited on the stub where the carbon tape was attached. Then, they were coated with platinum to a thickness of 20nm with the aid of the ion coater (IB-5 ion coater, Eiko, Japan). Finally, the coated samples were analyzed at the accelerated voltage of 15kV with the aid of the energy dispersive X-ray spectroscopy (INCA, Oxford Ins, Great Britain).

Results and Discussion

First, the low-priced stick-type concealers were observed with a low-power scanning electron microscope. Globular-shaped silica was observed by low-power scanning electron microscopy. The various sizes of silica were evenly distributed from 4 μ m in diameter to 15 μ m in diameter. Flat-type material, 20 μ m in diameter was observed around the silica [Figure 1a]. Polygonal flat-type kaolin material, has a homogenous and smooth surface and its boundary is very soft. Tetragonal or octagonal kaolin is uniquely smooth and has a homogenous surface and excellent absorptivity so that it is used as a base material for medical and cosmetic products^[14,15].

Silica is an environmentally-friendly inorganic pigment which is used, not only in cosmetic products but also in paper manufacture, the textile industry, chemistry, paints, and biological preparations, etc.^[16-19]. The silica which was added to the low-priced concealers had a smooth surface and a lot of titanium dioxide particles attached to its surfaces [Figure 1b].

Talc added to the low-priced concealers was observed as a thin flat-type or as a mass composed of layers of thin plates. The thin plates were about 20 μ m in diameter [Figure 2a]. Talc has a wide surface area so that it can be applied and adhere to the skin effectively. There is neither an electric charge on the surface of talc nor any cations between the thin flats. Talc is held together by weak van der Waals forces which exists between the layers piled one over another^[20]. Because of this, the talc particles are dispersed easily, giving talc a soft, smooth touch.

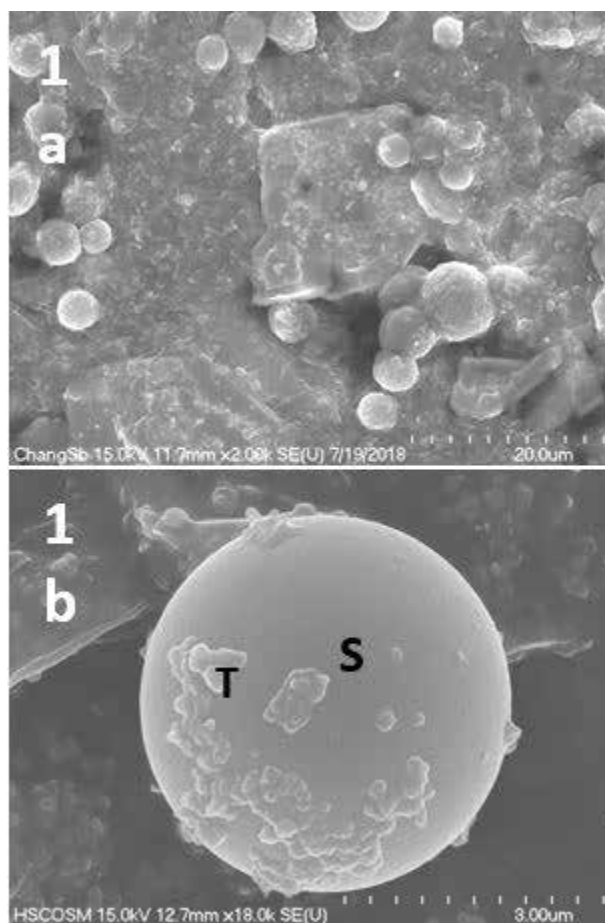


Figure 1: Scanning electron micrographs of the elements in low- priced concealer cosmetic products. a: Various sizes of silica (S) and flat-typed kaolin are observed. b: The surface of the silica appears smooth, and titanium dioxides (T) attached to the surface of the silica.

According to the image taken by the high magnification scanning electron microscope, the particles of titanium dioxide were not distributed evenly, built up a chunk, and were in cubic form with smooth surfaces. Its size measured 0.2-0.3 μ m in diameter [Figure 2b].

In this study, the component elements of low-priced concealers were analyzed with energy dispersive X-ray spectroscopy. The results demonstrated that titanium (Ti), technetium (Tc), silica (Si), iron (Fe), chloride (Cl), and aluminum (Al) were detected [Figure 3]. The component elements identified were Ti (40.4%), Si (28.51%), Tc (12.03%), Fe (6.68%), Cl (3.46%) [Figure 3].

Technetium is a radioactive material whose color is silver gray and changes slowly in wet air. Technetium, whose atomic number is 43, doesn't have a stable isotope and is generally considered to be an extinguished element in the Earth. Technetium, artificially manufactured by humans has been produced

for the last several decades^[21,22]. Technetium may exist in polluted underground water and sediments of surface water in locations near nuclear facilities^[23].

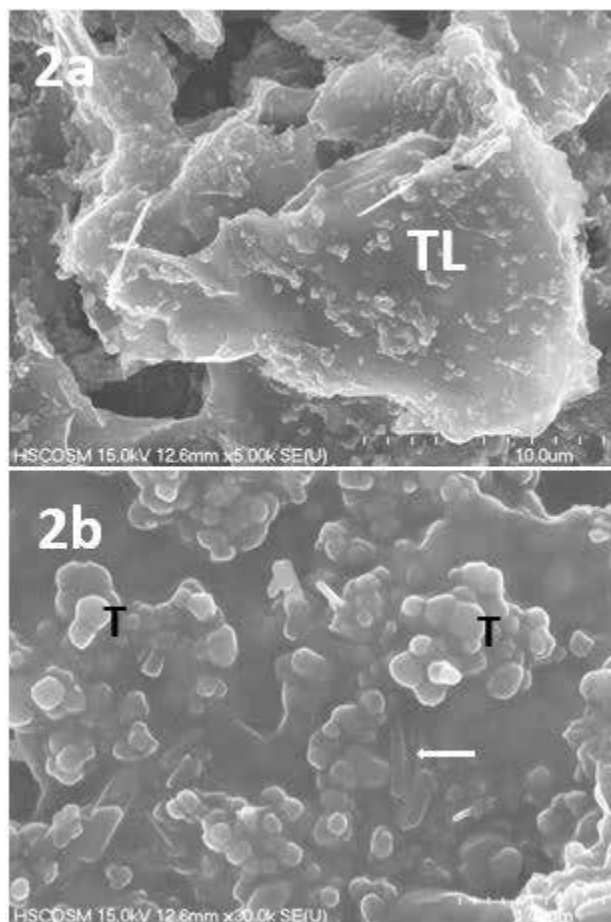


Figure 2: a: Talc (TL) in the low-priced concealers.

This image was taken by the scanning electron microscope. b: The particles of titanium dioxide (T) combined into chunks. Rod shaped iron oxide (arrow) is observed between the titanium dioxide particles.

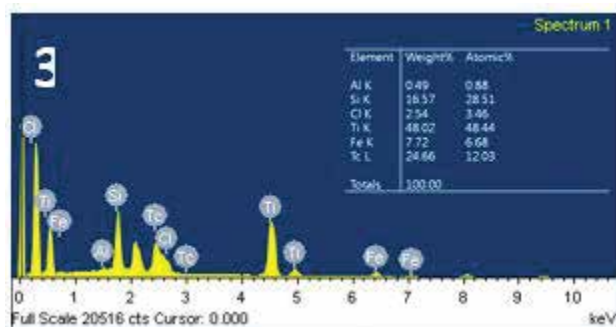


Figure 3. Analysis of low-priced cosmetics products by the energy dispersive X-ray spectroscopy showing detection of elements, such as titanium (Ti), technetium (Tc), silica (Si), iron (Fe), chloride (Cl), and aluminum (Al). Inset: Content by percentage of component elements in low-priced concealer products.

Stones and soil which exist in the natural environment, and metals which exist in water may be mixed into the base material in the process of manufacturing cosmetic products^[2]. The technetium detected in the concealers used in the study was likely added in the process of mixing the base materials or was mixed in the base materials themselves. This material is forbidden to being added during cosmetic production.

The metal materials discovered most in the personal care cosmetics include antimony, arsenic, cadmium, cobalt, chromium, mercury, nickel and lead^[24]. A lot of metals included in cosmetics from the base materials may cause many abnormal side effects, such as cancers, allergic contact dermatitis, mutations, respiratory problems, as well as development and reproductive problems^[24,25].

The high-priced stick-type concealer products were observed with the scanning electron microscope. The globular silica was evenly distributed on the surface of the test materials. Silica is a porous structure, so a lot of titanium dioxides particles were attached to the surface [Figure 4a]. Silica is used comprehensively as an additive in order to help improve the spreading and application of cosmetic products to the skin. The particulate material of silica, which has a multi-perforated nano-structure, can block UV rays and absorb sweat and sebum^[26].

The silica added to the high-priced concealers in this study was globular in shape with a multi-perforated structure and its size ranged from 3 μ m to 18 μ m in diameter.

Nano-particles of titanium dioxide were observed mostly around the silica in the high-priced test materials [Figure 4b]. The picture taken by the high-magnification scanning electron microscope showed that the cubiform titanium dioxide had a regular size and oxidized steel was observed around it. Titanium dioxide blocks UV rays, along with zinc oxide, and its size is less than 100nm. These inorganic materials of nanometer-sized units cannot permeate the skin under normal conditions. Since it stimulates skin less, it is comprehensively used as particulate material in cosmetic products^[5].

As a result of the analysis of the component elements of the high-priced stick-type concealers by energy dispersive X-ray spectroscopy elements, such as titanium, silica, and iron, were detected [Figure 5].

The content of the component elements of the high-priced concealers was Ti (77.31%), Fe (20.33%), and Si (2.36%) [Figure 5].

Besides titanium dioxide, iron oxide, and silica, no other inorganic materials were detected in the high-priced concealer cosmetics. When cosmetic products containing even the minimum amount of heavy metals are used over a long period of time, they accumulate in the human body and may cause various problems in biological systems of the human body, potentially resulting in serious health problems^[25,27]. Therefore, a thorough quality control process must be carried out in order to prevent the addition of various foreign materials to the base material of cosmetic products and to prevent contamination during the manufacturing process.

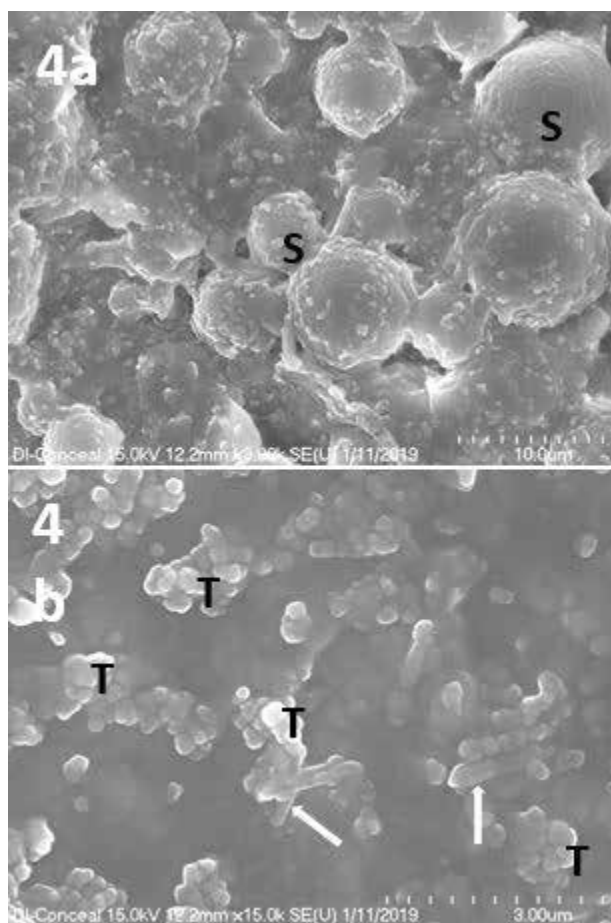


Figure 4: Component elements of low-priced concealer cosmetics taken by the low-magnification scanning electron microscope. a: Various sizes of silica (S) were observed with many titanium dioxide particles attached to its surface. b: Titanium dioxide (T) and rod shaped iron oxide (arrows) in the high-priced concealers were observed by the high-magnification scanning electron microscope.

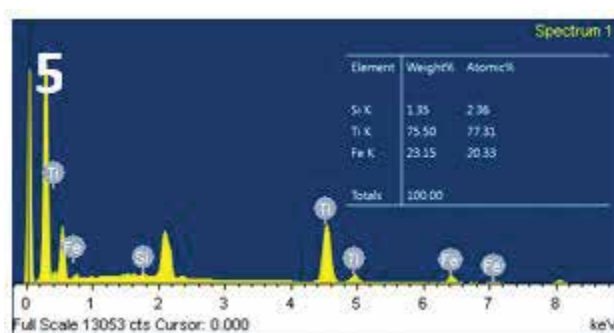


Figure 5: Energy dispersive X-ray spectroscopy of the high-priced cosmetic products detected titanium (Ti), silica (Si), and iron (Fe). Inset: The percentage content of the component elements of the high-priced concealer products.

Conclusion

This study observed the morphologic characteristics of materials added to both low-priced and high-priced concealer products using the scanning electron microscope and carried out comparative analyses of the component elements with energy dispersion spectroscopy.

The scanning electron microscopy results demonstrated that silica, titanium dioxide, rod shaped iron oxide, talc, and kaolin structures were detected in the low-priced concealer products. And scanning electron microscopy of the high-priced concealer products detected silica, titanium dioxide, and iron oxide. The energy dispersion spectroscopy analysis detected titanium, technetium, silica, iron, chloride, and aluminum in the low-priced concealer products, and titanium, silica, and iron in the high-priced concealer products.

As a result of this study, although metal materials harmful to the human body were not detected, technetium, which is characteristically a radioactive material, was detected in the low-priced concealer products. When cosmetic products containing this kind of radioactive material are used over a long period of time, they may threaten human health and cosmetic appearance. Given the fact that these kinds of cosmetic products were sold under the brand name of the well-known company in Korea, caution must be exercised in order to produce safe cosmetic products, starting from the stage of base material selection so that better cosmetic products can be distributed in the market.

Ethical Clearance: Not required

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Conflict of Interest: Nil

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New Strategies for the Application of the Latest Information System on the Strengthening Pelvic Muscle for Treatment of Uterine Prolapse

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ABSTRACT

The research is to carry out new strategies for the application of advanced information system on the strengthening pelvic muscle for treatment of uterine prolapse. The data consisted of 142 women who visited the gynecology of a university hospital. After the survey, it was carried out by a one-on-one interview from February 5 through April 13, 2018. The pelvic reinforcement was measured by t-test. The continuation of immunity and muscle strength were compared to 7, 14, 21, 28, 35, and 42 days and prior to the application of the latest system. The results obtained are as follows. 1) The data has been shown that 52.4% of people who exercise regularly is significantly less than 46.0% of the comparative people($X^2=3.91$, $p<.05$). 2) 47.9% of people who drank frequently were significantly higher than 28.2% of the comparative people($X^2= 4.26$, $p<.05$). 3) The pelvic examination was significantly higher after the application than before the application of the latest system. 4) The kegel exercise had increased significantly since the application of the system than before the application of it($t=-3.84$, $p<.01$). 5) Bending and stretching both legs were significantly higher after applying the system than before applying it($t=-1.65$, $p<.01$). 6) Seven days later, the immunity of pelvic organ was improved rapidly in the investigation people than comparative people. 7) It has been shown that strengthening pelvic muscle has increased in the case population after application of it than before the information system was applied. But it has decreased somewhat since the 21 days in the test people than comparative people. The data has been shown to be effective in treating pelvic organ prolapse. It is expected to contribute to the effect if the system applied to other organ prolapse.

Keywords: *Pelvis, Muscle, Treatment, Uterine, Prolapse*

Introduction

The uterine prolapse is the prolapse of part or all of the uterus through vagina. It moves downward or upward from its normal position. According to prior research, pelvic organ prolapse is a disease in which the pelvic organ protrude from the lower part due to muscle weakness in the lower part of the pelvis¹. According to previous paper, uterine prolapse is caused by poor support of the vagina, the adhesive part of the ligament that supports the uterus². According to previous study, the weakening of the pelvic support structure may lead

to the prolapse of the rectum, small intestine and bladder to the vaginal cavity¹⁻³.

The degree of prolapse and the association with pelvic symptoms are small⁴. Patients with pelvic organs are accompanied by symptoms related to urinary problems, the complain of incontinence, urinary obstruction. They cannot urinate due to narrowing or clogging of the urinary tract. Patients can complain of frequent urination more than eight times a day. The most common symptoms are the feeling and pressure of something extruded out of the vagina. If patients stand in the afternoon for a long time, they tend to get worse over time.

Three out of 10 women in their 40s or older who have had a baby have had pelvic organ prolapse^{4,5}. The uterine prolapse is a high incidence in the majority of older people. It is because in the past, the vaginal outlet was loosened due to renal failure or trauma of

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the peritoneum and perineum during delivery. In this condition, long-term operation of factors that increase abdominal pressure promotes uterine exudation. When the cervix is 2cm lower than the virgin membrane, it's called uterine prolapse. It is classified as Class 0-4. The higher the grade, the worse the symptoms of prolapse. Zero degrees is a case of no uterine exudation One degree of ectopic hysterectomy is as low as the vagina. The uterus is 2 degrees and the cervix is down to the mouth of the vagina. 3 degrees of uterine exudation is about the cervix coming out of the vagina. Four degrees of ectopic hysterectomy is where the whole uterine body is lowered out of the vagina. It happens well when you do a lot of work or have a chronic cough. Also, heavy objects are often carried or heavily constipated. The cause is weakened tissue, such as muscles and ligaments, which support pelvic organs. Patients feel uncomfortable when they walk. Also patients often have to urinate and constipation. The quality of their life decreases due to pelvic organ prolapse⁵⁻⁷. Continued prolapse can lead to non-recovery or complications such as ulcers, bleeding, and rectal rupture. Expectancy management can be used for people who have tolerable symptoms or do not want surgery.

According to previous study, surgical treatment depends on the severity of the symptoms, the spread of the prolapse, and the doctor's proficiency^{8,9}. The rate of recurrence or re-surgery after surgery is about 36 percent. The uterine prolapse is a difficult problem to solve due to aging¹⁰. It causes damage to the uterus as well as related organs such as rectum and bladder. Surgery to resect the entire uterus, such as a hysterectomy, causes confusion in women's self-esteem and identity. Correct information is needed before and after surgery through proper research⁹⁻¹¹. It is inconvenient to walk and live because of the exodus of the uterus, which lowers the quality of life. In addition to aging, pelvic and urethra muscles are prone to weakening due to increased female hormones or childbirth during pregnancy. Osteoporosis should strengthen damaged or weakened pelvic muscles. All diseases develop when the body's immune system decreases^{11,12}. Prolapse of the uterus is a disease in which the organs protrude downward due to muscle weakness in the pelvic region with uterus, vagina, bladder and rectum. Therefore, encephalopathy requires muscle and immunity to be strengthened. To do this, we need to strengthen pelvic muscles by applying the information system. For the treatment of uterine prolapse, a new strategy should be implemented through the application

of information system. Therefore, the paper is to analyze new strategies for the application of the latest information system on the strengthening pelvic muscle for treatment of uterine prolapse.

Survey Research

New Strategies of the Latest Technology: The paper reveals new strategies for the application of advanced technology on the strengthening pelvic muscle. Evaluation components of the advanced system for the treatment of uterine prolapse are as follows. 1) effectiveness : results of the system's attempts 2) reliability : evaluating the reliability of a system 3) Information : information for the treatment of uterine prolapse 4) Link : connectivity to other medical institutions 5) Velocity : speed during patient application of the system 6) Charge : cost used by information system 7) Others : problems, improvements in Figure 1. The treatment strategies for pelvic organ prolapse is presented as below in Figure 2.

Materials: The data consisted of 142 women who visited the gynecology of a university hospital in K area. Strategies for treating of pelvic organ prolapse indicate in Figure 1. After the survey, the data were carried out by a one-on-one interview from February 5 to April 13, 2018. This research was drawn from two parts.

Statistical Analysis: The characteristics of subjects were measured by using Chi-square test. The pelvic reinforcement was measured by t-test. In addition, the continuation of immunity and muscle strength were compared to 7, 14, 21, 28, 35, and 42 days and prior to the application of advanced system.

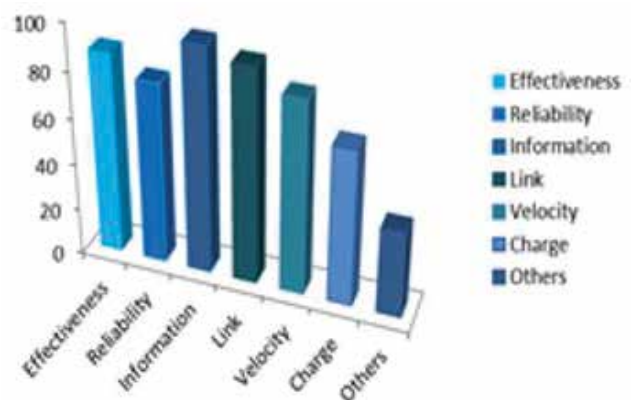


Figure 1: Evaluation Components of Advanced System for the Treatment of Uterine Prolapse

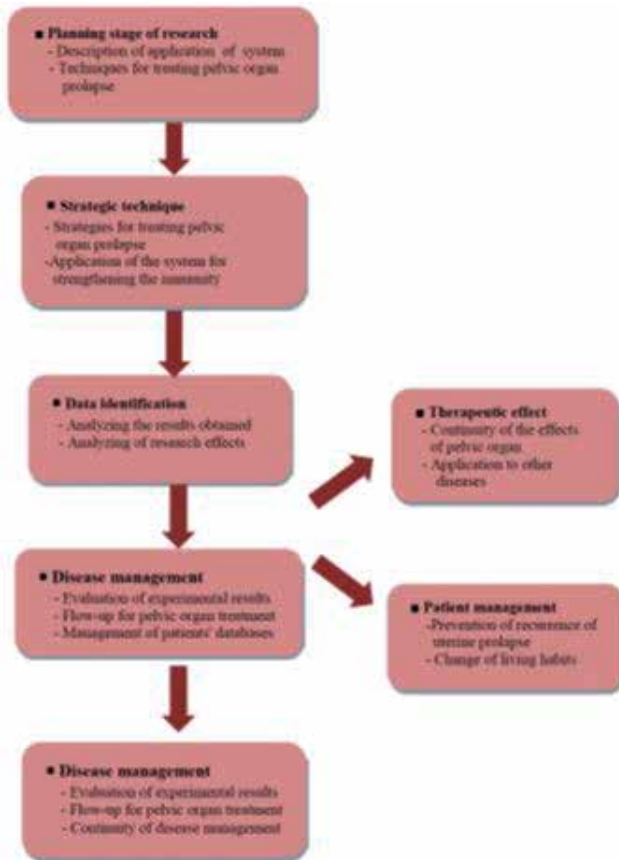


Figure 2: Information Characteristics of the Respondents

Results and Discussion

Information Characteristics of Subjects: Below indicates the information characteristics of subjects. The data has been shown that 52.4% of patients who exercise regularly is significantly less than 46.0% of the comparative people ($X^2=3.91$, $p<.05$). 47.9% of people who drank frequently were significantly higher than 28.2% of the comparative people ($X^2 = 4.26$, $p<.05$). Over 25kg/m² cases of obesity were higher than the controls in Table 1.

Table 1: Information Characteristics of Subjects

Variables	Experiment group N(%)	Control group N(%)	X^2
Regular exercise			
No	18(52.4)	26(46.0)	3.91*
Yes	53(47.6)	45(54.0)	

Conted...

Age/years			
<29	11(15.5)	14(19.7)	10.73
30-39	23(32.4)	12(16.9)	
40-49	29(40.8)	20(28.2)	
≥50	8(11.3)	25(35.2)	
Drinking			
Frequently	34(47.9)	20(28.2)	4.26*
Non-drinking	37(52.1)	51(71.8)	
Smoking			
Frequently	22(31.0)	17(23.9)	1.58*
Non-smoking	49(69.0)	54(76.1)	
Marriage status			
Single	23(32.4)	15(21.1)	6.93
Married	48(67.6)	56(78.9)	
BMI (kg/m ²)			
<18.5	17(23.9)	19(26.8)	13.47
18.5-24.9	15(21.1)	17(23.9)	
≥25	39(54.9)	35(49.3)	
Total	71(100.0)	71(100.0)	12

* $P<.05$

Measures to Strengthen Pelvic Organs: Below is the indication of the measures to strengthen pelvic organ. The pelvic examination was significantly higher than the application of the advanced system in Table 2. The kegel exercise had increased significantly since the application of the latest system than before the application of it ($t=-3.84$, $p<.01$). Bending and stretching both legs were significantly higher after applying the information system than before applying it ($t=-1.65$, $p<.01$). The finding was similar with the previous studies on the ovary cancer¹⁰⁻¹². I suggest that people with pelvic organ prolapse should be utilized in the latest system to prevent the recurrence of pelvic organ prolapse.

Table 2: Measures to Strengthen Pelvic Organs

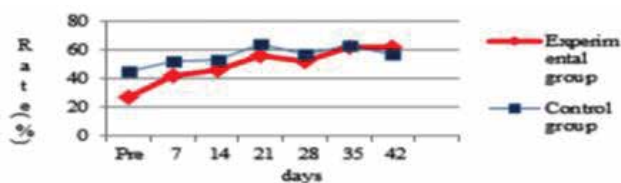
Variables	Before Mean ± S.D	After Mean ± S.D	t
Daily intake of vegetables and fruits	23.19 ± 3.56	38.67 ± 4.92	-5.26
Mental and physical stability	26.84 ± 0.39	31.85 ± 0.71	-2.45

Conted...

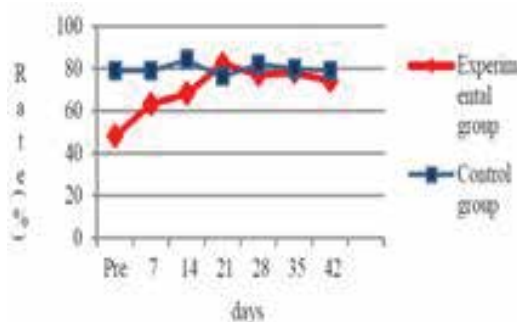
Regular aerobic exercise	19.62 ± 1.48	35.92 ± 3.15	-1.37**
Pelvic organ examination	12.57 ± 5.26	30.47 ± 4.24	-4.61**
Hand and foot pressure	16.36 ± 3.82	37.25 ± 3.21	-1.52
Kegel exercise	10.84 ± 1.59	32.73 ± 1.64	-3.84**
Appropriate weight control	24.69 ± 4.73	29.45 ± 3.76	-5.17*
Bending and stretching legs	14.57 ± 2.81	36.45 ± 2.93	-1.65**

* p<.05 ** p<.01

Persistence of immunity and muscle strength in the pelvis: Below is the indication of the persistence of immunity and muscle strength in the pelvis. Seven days later, the immunity of pelvic organ was improved rapidly in the test population than comparative people. It has been shown that strengthening pelvic muscle has increased in the case people after application of it than before the latest system was applied. But it has decreased somewhat since the 21 days in the test people than comparative people in Figure 3.



(a) Sustainability of the Immunity As Time Goes by



(b) Muscle Strength in Pelvis As Time Goes by

Figure 3: The Persistence of Immunity and Muscle Strength in the Pelvis

Conclusion

The research is to carry out new strategies for the application of advanced system on the strengthening pelvic muscle for treatment of uterine prolapse.

The results obtained are as follows. Firstly, the data has been shown that 52.4% of people who exercise regularly is significantly less than 46.0% of the comparative people ($X^2=3.91$, $p<.05$). Secondly, the pelvic examination was significantly higher after the application than before the application of the latest system. Thirdly, the kegel exercise had increased significantly since the application of the latest system than before the application of it ($t=-3.84$, $p<.01$). Fourthly, bending and stretching both legs were significantly higher after applying the system than before applying it ($t=-1.65$, $p<.01$). Fifthly, seven days later, the immunity of pelvic organ was improved rapidly in the investigation people than comparative people.

Therefore, the data has been shown to be effective in treating pelvic organ prolapse. It is expected to contribute to the effect if the system applied to other organ prolapse.

Ethical Clearance: Not required

Source of Funding: Nil

Conflict of Interest: Nil

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Investigation for How Koreans Construct the Concept of Dying Well

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ABSTRACT

The subject of dying well has attracted much attention, but to date there have been few papers that have examined what this actually means and what components must be present to qualify as dying well. The present study investigates how Koreans envision dying well, how this is affected by demographic factors, and how their ideas correlate with factors related to quality of life. A total of 1,000 survey participants were recruited nationwide by means of a stratified random sampling method for each region, gender, and age group. Based on previous studies conducted on the perception of dying well or a “good death,” we came up with six main themes of that we further classified into 20 subthemes. We constructed a dying well assessment tool using a total of 57 items and used these to conduct a survey through Gallup Korea. The items covered matters such as death preparation, religious and spiritual factors, physical symptoms, medical treatment, social relationships, and death environment. The quality-of-life (QOL) index and the perception of dying well were highly correlated regardless of the theme, with a high QOL generally correlated with a high score for dying well. For Koreans, the general perception of dying well is most strongly associated with death preparation, such as the making provisions for the costs associated with dying and making funeral arrangements. The next-most important component is the acceptance of death and psychological dignity such as spirituality. From a demographic point of view, individual health and stress conditions had some significant correlations with subthemes of dying well. Other factors did not show significant correlation. Surprisingly, it was found that age did not change Koreans’ perceptions of what it means to die well. Discussions about death and dying well are increasingly relevant in aging populations, but it does not appear in various forms at the individual level in reality. Future studies will need to develop measurement tools around more sensitive issues of death or investigate the developmental aspects of thinking through longitudinal research.

Keywords: *Dying Well, Good Death, Quality of Life, Palliative Care, Aging, Hindrance Factor*

Introduction

Korea’s life expectancy is sixteenth in the world and still improving ^[1]. Like many countries, however, it is also facing a rapidly aging society and a decreasing birth rate ^[2]. These factors, taken together socioeconomic problems such as pension concerns, medical expenses,

and reduced productivity have left a significant portion of the Korean population facing a serious decrease in their quality of life (QOL) ^[2]. This has led to increasing questions concerns about the next phase: quality of death. We all hope to die well, but what does that mean? The study aimed to shed light on that question.

Traditionally, the young cared for the old and sick. Parents and grandparents lived and died in the homes of their relatives. This happens with far less frequency today, not just in Korea but worldwide. The number of Koreans living alone has been rising steadily for decades, and this includes the elderly—especially elderly women; in 1960, the number of elderly widows living alone was about half what it was in 2010 ^[3].

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Recently, discussions of dying well have been attracting attention, and considerable research several social movements are under way in efforts to improve the quality of life and the quality of death of the elderly population. Despite this, while there have been many studies what constitutes QOL when it comes to policy; social and psychological support; and economic and environment status, there have been few comparable studies for dying well.

To develop a new welfare policy for the elderly and to improve the efficiency of existing policies that are customized to address the problems in today's society, it is essential to investigate the perception structure of dying well and the obstacles to dying well. Evidently, from an academic point of view, dying well is a complex concept that includes the philosophical understanding of death, the mindset for a happy life, concrete action plans and attitudes, the psychological state or reaction to death, physical preparation, social relationships, some medical knowledge, and awareness. Therefore, it is important to investigate and systematically identify this complex cognitive framework in Koreans.

The literature on dying well can be divided into two main areas: (1) developmental aspects or general perceptions of dying well or a good death; and (2) the concept of dying well or a good death in those who are faced with it, in medical experts, or among family members who have witnessed it—for example, patients with cancer ^[4], patients in nursing homes or long-term care facilities ^[5], patients receiving palliative or hospice care ^[6], families of patients ^[7], and nurses in hospices ^[7]. As discussed earlier, few of these studies reveal insights into the public's perception of dying well, and none of these focus on it specifically.

Typical measurement tools used to investigate dying well are the Quality of Dying and Death Questionnaire (QODD) or a modified version ^[9,10]; the Good Death Scale and the Good Death Inventory (GDI) ^[11]; and the Quality of Dying in Long-term Care (QOD-LTC) ^[12]. These measurement tools are actually designed to investigate those who have experienced death directly rather than to investigate the perceptions of the general public.

Although some differences may exist, summarizing the perception structure of dying well based on the relevant literature yields seven major components that people consider: physical, psychological, social,

spiritual and existential experience; the nature of health care; life closure and death preparation; and the circumstances of death. Physical symptoms and control over some components of dying from a physical point of view is associated with fear of physical pain and a desire for personal control over our own pain. Control of physical symptoms is expected to play an important role in dying well, and fear of death in general likely plays a major role in whether a death is viewed as “good” or not. Other elements likely associated with dying well are not having to rely on mechanical devices (or having to), living the last moments free of pain or suffering (or not), feeling comfortable, content, and confident that you are not leaving your family economically distressed by your death (or not) ^[12].

Death preparedness consists of reducing psychological and economic burdens; finalizing funeral preparations; and making relationship, work, and personal arrangements. In a study conducted with the elderly population, death anxiety averaged 3.04 points, with 64% showing little or no death preparation; not surprisingly, death anxiety increases with the failure to prepare for death ^[13].

Death environment consists of preferred place of death and the presence of others. Previous studies have shown that dying in a preferred place is associated with dying well; typically, the preferred places named are either those best equipped to handle death, such as hospices or nursing home facilities, or at home. The preference varies depending on the educational background and the number of family members ^[14].

In terms of social relationships, family is the most direct and important area of individuals' social and cultural environment that affects disease prevalence among the elderly. Family plays an intermediate role in linking the elderly and society, acting as the major factor in dying well by providing direct support in researching problems, solutions, and resources. Friends and neighbors are also important, but the support they provide is far less in terms of duration or strength ^[14]. Most of the social support comes from family members as the end of life approaches ^[4].

The hospital treatment environment consists of questions about adequate care, specialized care and reflection of personal wishes with respect to prolonged care versus euthanasia and death with dignity versus a

natural death. Studies have found that the factors that interfere with the best decision-making in actual hospital settings are the characteristics of family relations in Korea in which family members act on behalf of the patients based on familism; communication problems among medical staff and the patients' families; and the public's passive attitude toward clinicians' burdens in making decisions [16].

Increasingly, the place of death has moved from home to hospital. Naturally, this means increased access to means to prolong life artificially, such as artificial respiration, cardiothoracic devices, cardiopulmonary resuscitation, kidney dialysis, artificial nutrition, etc., meaning that the number cases of mere extension of life where the patient would have died in the past have increased [16].

Finally, religiosity and spirituality come from psychological affirmation, psychological acceptance, meaning and purpose of life, dignity, self-respect, and transcendence. In terms of spirituality, the general view is that dying well is a process of facing death in a state of awakening the soul through religious prayer or meditation. To overcome death anxiety with a transcendental belief in death, a psychological component, and to face death with a sense of happiness, psychological spirituality can intervene, and many studies have suggested that a relationship between spirituality and death anxiety is important. However, a more systematic approach has not been made [17].

Based on the existing literature, this study designed a measurement tool of dying well to measure the economic, social, medical, psychological, and environmental factors of dying well to investigate what dying well means to Koreans. In addition, we investigated how dying well correlates with people's QOL and tried to extract qualitative parts of life to enhance dying well.

Materials and Method

Research Subjects: Subjects were randomly sampled from each group using a stratified random sampling method. The distribution and collection of questionnaires was conducted by Gallup Korea throughout February 2018. To obtain written consent of the subjects, the consent form was prepared and obtained from the subjects prior to conducting the survey, and the permission information included the purpose of the

study, a description of the participation, and the consent for disclosure of personal information used in the study.

Perception of dying well was considered to be influenced by individual life cycle characteristics and environment, so we set gender, age group, and region (17 cities) as stratification variables. Based on statistics issued by the Ministry of Public Administration and Security (as of the end of November 2017) on resident populations, we used proportional allocation. After the final IRB approval, we conducted a one-on-one survey on a total of 1,000 people through Gallup Korea (Table 1).

Measurement Tools (Materials): Dying well measurement tool. To investigate the perception of dying well in Koreans, we extracted six factors based on the existing literature, and then further divided them into 20 subthemes (Table 3). The final questionnaire consisted of 57 items based on these detailed factors.

Quality of life measurement tool. In the present study, we used the WHOQOL-BREF tool, created by WHO and adapted into Korean by Man et al. (2002), to measure QOL. The four subfactors were physical health, psychological health, social relationship, and environment.

Analysis method. Analysis was done using statistical Program R. Frequency analysis was conducted for gender and age, among other items in the questionnaire; and descriptive statistics analysis was performed on factors that constitute dying well for Koreans. We analyzed correlation between socio-statistical variables and the components of dying well and between the perception of dying well and QOL.

Table 1: Distribution of Survey Participants

Frequency of Demographic Variables (N)		N	(%)
Gender	Male	502	(50.2)
	Female	498	(49.8)
Age	Ages 19–29	190	(19.0)
	Ages 30–39	187	(18.7)
	Ages 40–49	217	(21.7)
	Ages 50–59	212	(21.2)
	Ages 60–69	160	(16.0)
	Ages 70–74	34	(3.4)
Total		1,000	(100.0)

Results and Discussion

Correlation between Dying well and Demographic Characteristic Factors: First, we looked at the correlation between socio-statistical variables and the components of dying well. As shown in Table 2, the correlation between the perception of dying well and socio-demographic factors was small. In particular,

there was no correlation between Koreans' change in age and their change in perception of dying well. The level of education correlated with the religious and spiritual aspects of death, and stress levels correlated with medical care and health status, death environment, and social relationships. Lastly, those who thought that they were interested in dying well thought that death conditions and medical care were important (Table 2).

Table 2: Correlation between Dying well and Demographic Characteristic Factors

	Age	Education	Sleep	Stress	Health	Interest of Dying well
Symptoms & Personal Control	.061	.020	-.019	.024	.028	.044
Preparation for Death	.035	.009	.006	.045	.021	.051
Death environment	.047	-.003	-.004	.045	.078*	.139**
Family & Social relationship	-.030	-.037	.052	.055	.102**	.038
Medical care	.023	.041	-.019	.078*	.053	.089**
Religiosity & spirituality	-.005	.070*	.013	.030	.047	.023

* Correlation is significant at the 0.05 level(t-tailed)

** Correlation is significant at the 0.01 level(t-tailed)

Mean of Main Themes of Dying well: Figure 1 and Table 3 show the factors that constitute the dying well as perceived by Koreans. The most important factor is death preparation, followed by psychological dignity, physical symptom and personal pain control, hospital treatment, family social relationship, and death environment [F(5, 4825) = 102.86, $p < 0.001$] (Figure 1). Among subthemes, psychological acceptance had the highest score for dying well in Koreans, followed by psychological and economic burden (Table 3).

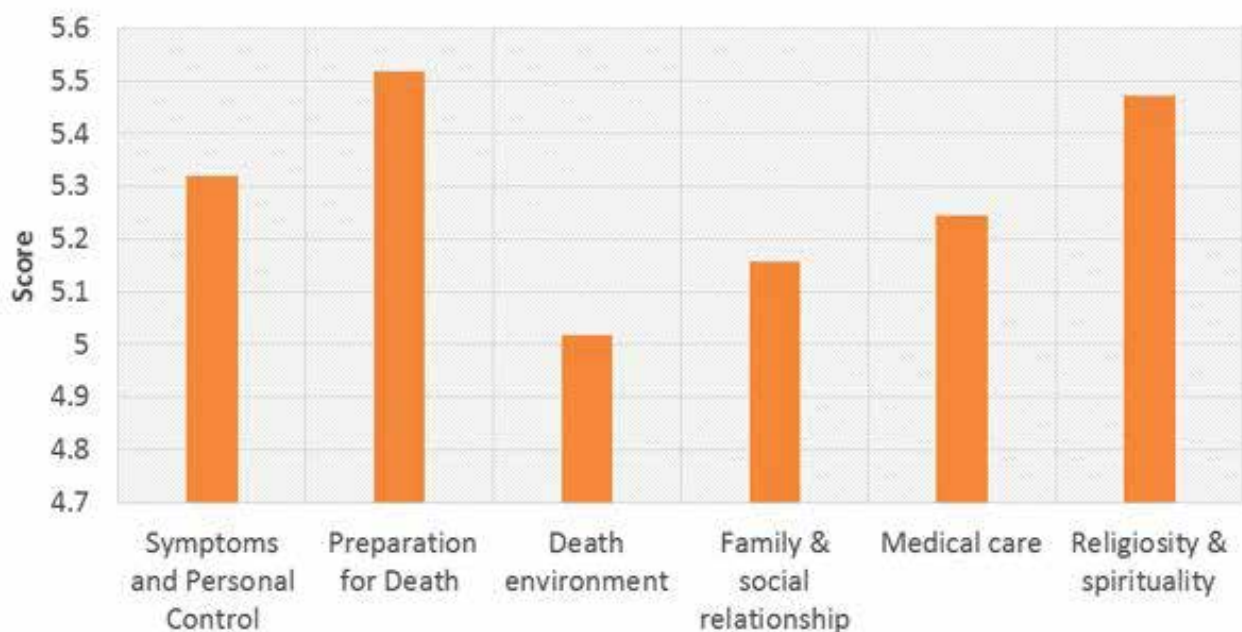


Figure 1: Mean of main themes of well-dying

Table 3: Means of the Subthemes of Dying well

Core Themes	Subthemes	Mean	Stv.
1. Symptoms and personal pain control	1. Pain-free status	5.30	1.01
	2. Control of body	5.34	0.93
2. Preparation for death	3. Healthcare costs covered	5.61	0.77
	4. Funeral arrangements in order	5.31	0.92
	5. Arrangements of personal concerns	5.56	0.74
	6. Goodbyes said	5.59	0.82
3. Death environment	7. Place of death arranged	5.38	0.86
	8. Special place of death	4.66	1.14
	9. Having others present at time of death	5.10	0.98
4. Family & social relationship	10. Arrangement of family relationship	5.38	0.77
	11. Arrangement of social relationships	4.99	0.91
5. Medical care	12. Adequate medical care	4.97	0.93
	13. Preferences for dying process	5.21	0.78
	14. Euthanasia death with dignity	5.56	0.89
	15. Natural death	5.58	0.83
6. Religiosity & spirituality	16. Emotional support	5.53	0.83
	17. Acceptance of death	5.64	0.73
	18. Meaning and purpose in life	5.45	0.79
	19 Maintained dignity and self-respect	5.43	0.81
	20. Transcendence	5.22	0.85

Quality of Life: Among the four subthemes of life quality for Koreans as shown in Table 4, physical condition showed the highest score followed by psychological, environmental, and social condition [$F(3, 2997) = 156.23$].

Correlation between Dying well and Quality of Life: Table 5 shows the correlation between the perception on dying well and QOL. Factors that constitute dying well were correlated with the subthemes of QOL. Those who rated their QOL high generally scored high on most dying well items. Environmental factors were rated somewhat higher in explaining the perception of dying well than other factors in terms of QOL ($r^2 = .06$).

Table 4: Mean of Quality of Life

Quality of Life Subthemes	Physical quality	Psychological quality	Environmental quality	Social quality
Score	5.14	4.80	4.77	4.76

Table 5: Correlation between Dying well and Quality of Life

[illegible]

Conclusion

For Koreans, the general perception of dying well is most strongly associated with death preparation, such as the making provisions for the costs associated with dying and making funeral arrangements. The next-most important components are the acceptance of death and psychological dignity such as spirituality. From a demographic point of view, individual health and stress levels had some impact on dying well. Other factors did not show significant correlation. Surprisingly, it was found that age did not change respondents' perceptions of dying well. Although the general assumption is that the older we get, the more likely we are to be interested in death and dying well, this turns out not to be so. Our survey results revealed very little difference between the generations of Koreans in their perceptions of dying well. This means that dying well in Korean people is thought in abstractive and normative level but not in real life.

As discussed earlier, there is not much research on the general public's perception about dying well in Korea. Although more research is needed, the results of this study suggest that Koreans in general do not connect much the end of life with current life and social conditions. What is interesting is that educational experience about dying well leads to a broader sense the complexities of dying well and allows people to understand that dying well is not just an individual matter, providing more evidence that it is important to raise the level of education and awareness of dying well.

Ethical Clearance: The study was approved by the Institutional Review Board (IRB No. KYU-2018-003-03) of Konyang University.

Source of Funding: This work was supported by the Ministry of Education of the Republic of the Korea and National Research Foundation of Korea (NRF-2017S1A5B6066807)

Conflict of Interest: Nil

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Analysis of MRI Image to Develop the Aid During the Radiological Test of Femoro Acetabular Impingement

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ABSTRACT

Background/Objectives: It is to sustain the test accuracy and improve diagnostic capability of self-developed aid in Dunn view to confirm modification of pistol grip in neck of femur that causes anterior femoro acetabular impingement.

Method/Statistical Analysis: The test was performed before and after the usage of the self-developed aid in the patients referred to the test of Dunn view (45 and 90-degree flexion) who were scheduled with hip arthroscopy. α -angle and femoral head-neck offset were measured by oblique transverse images in MRI test and statistical significance was analyzed with paired T-test.

Findings: In the MRI images and Dunn 45° and 90° images before and after ancillary device use, as a result of measuring and analyzing α -angle, it was not statistically significant at 45° ($P>0.05$), but it was found there was statistical significance in 90° ($P<0.05$). In the MRI images and Dunn 45° and 90° images before and after ancillary device use, as a result of measuring and analyzing femoral head-neck offset, it was found there was statistical significance in both 45° and 90° ($P<0.05$).

Improvements/Applications: Upon the comparison results of unidirectional image and MRI test before and after the use of the aid in this study, statistically significant outcomes were found in 45 and 90 degree of Dunn view after the use of the aid. Therefore, it is considered that they could be used as the foundation data in the image studies with Dunn view.

Keywords: *Dunn view, femoro acetabular impingement, α -angle, femoral Head-Neck offset, MRI image*

Introduction

Recently, as leisure activities through various sports have become diverse and activities have increased, the number of young and active patients who are admitted to the hospital due to excessive and unrelieved movements due to hip pain is increasing^[1].

The cause of pain in the femur and hip joints, which is the largest skeleton in the human body, is the femoral acetabulum impingement, which is considered to be the cause of hip arthritis, which is caused by a fracture of the non-lingual cartilage, which is a triangular fiber cartilage tissue between the limbus acetabuli and joint capsule^[2,3]. The anatomical mechanism of the hip is known to be caused by repeated contact of the acetabulum and femur with the proximal femur of the sphere and the osseous deformation of the femur, leading to femoroacetabular impingement^[4,5]. The anatomical

abnormalities that cause impingement between proximal femur and acetabulum include femoral head pistol grip deformation, asphericity, coxa valga, coxa vara, acetabular retroversion, and intrapelvic protrusion of the acetabulum^[6-9]. For the diagnosis of femoral acetabular impingement syndrome, general imaging studies using X-ray, computed tomography, and MR arthrography (MRA) using magnetic resonance imaging are used.

Thus, the purpose of this study was to develop an ancillary device and to investigate its applicability in general imaging studies using X-ray in the diagnosis of femoral acetabulum related hip joint diseases that are recently being studied. In addition, the developed ancillary device is used to maintain the accuracy of imaging and to reduce the radiation dose by retesting in diagnosis and follow-up of femoral acetabulum diseases. Also, there is purpose and necessity of research to contribute to the improvement of the quality of the test method by

improving the satisfaction of the test posture felt by the patient and to provide basic data in related fields.

Materials and Method

To achieve the purpose of this study, the subjects were 51 patients (29 male mean age 41.3 years, 21 female mean age 41.2 years) who were admitted and underwent femoral acetabulum test. For the study method, the study analyzed retrospectively the patients who underwent simultaneous hip joint MRI test among the patients who were followed up more than 2 times in the hip joint X-ray examination. The ancillary device and patient posture developed for image evaluation are as follows (figure1).

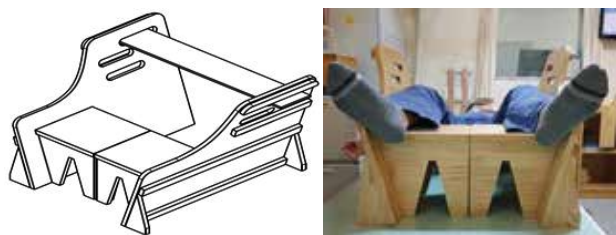


Figure 1: Self developed aid

Test Method: The images for the analysis were inspected for general radiography using X-ray, and the MRI scans were evaluated and analyzed by obtaining inclined axis upper surface (oblique transverse) that can diagnose the most sensitive femur neck form examined by Proton Density fat saturation method among Indirect MRI images performed 10 minutes after contrast agent injection.^[1]

Image Evaluation: Alpha angle and femoral head-to-neck offset were used as the best measure of the degree of circularity of the femoral head and analysis was done divided into before and after use of ancillary device. The alpha angle of the femoral acetabulum (45°, 90°) and MRI inclined axis upper surface images of the radiograph obtained by the examination were measured, and the femoral head-to-neck offset was measured on the normal image femoral acetabulum (45°, 90°) and MRI inclined axis upper surface images (figure 2), (figure 3).



Figure 2: Femoral α -angle measurement



Figure 3: Femoral offset measurement

Statistical Method: Based on MRI images before and after using ancillary device, statistical analysis was performed using the SPSS (SPSS for windows Release 22.0;SPSS, Chicago, IL) program and statistical significance level ($P < 0.05$) was determined statistically significant.

Results and Discussion

α -angle Result

Dunn 45°: In the results of α -angle measurement according to gender, in Dunn 45°, for men, it was 52.84 ± 6.69 before device use with difference of 3.08 with MRI image, and 53.02 ± 6.43 after device use with difference of 4.28 with MRI image. For women, it was 56.34 ± 5.43 before device use with difference of 5.71 with MRI image, and 56.88 ± 5.78 after device use with difference of 4.63 with MRI image. Overall, it was 52.76 ± 6.84 before device use with difference of 3.17 with MRI image, and 52.84 ± 6.72 after device use with difference of 4.41 with MRI image, and it was found that there was no statistical significance ($P > 0.05$), (Table 1).

Table 1: The result of statistical analysis of Dunn 45°, MRI (Mean $\pm$ SD)

Division	Gender	Mean $\pm$ SD	MRI – Dunn (Mean)	P-Value
Before device use	Male	52.84 ± 6.69	3.08	$P > 0.05$
	Female	56.34 ± 5.43	5.71	
	Overall	52.76 ± 6.84	3.17	
After device use	Male	53.02 ± 6.43	4.28	
	Female	56.88 ± 5.78	4.63	
	Overall	52.84 ± 6.72	4.41	

Dunn 90°: In the results of α -angle measurement according to gender, in Dunn 90°, for men, it was 53.74 ± 8.23 before device use with difference of 5.56 with MRI

image, and 52.86 ± 8.46 after device use with difference of 3.32 with MRI image. For women, it was 53.92 ± 7.52 before device use with difference of 5.34 with MRI image, and 52.85 ± 8.63 after device use with difference of 3.48 with MRI image. Overall, it was 53.20 ± 8.36 before device use with difference of 5.71 with MRI image, and 52.07 ± 8.24 after device use with difference of 3.15 with MRI image, and it was found that there was statistical significance ($P < 0.05$), (Table 2).

Table 2: The result of statistical analysis of Dunn 90°, MRI (Mean $\pm$ SD)

Division	Gender	Mean $\pm$ SD	MRI – Dunn (Mean)	P-Value
Before device use	Male	53.74 ± 8.23	5.56	$P > 0.05$
	Female	53.92 ± 7.52	5.34	
	Overall	53.20 ± 8.36	5.71	
After device use	Male	52.86 ± 8.46	3.32	
	Female	52.85 ± 8.63	3.48	
	Overall	52.07 ± 8.24	3.15	

Femoral head-neck offset Result

Dunn 45°: In the results of femoral offset measurement according to gender, in Dunn 45°, for men, it was 7.33 ± 1.48 before device use with difference of 1.13 with MRI image, and 6.44 ± 1.44 after device use with difference of 0.91 with MRI image. For women, it was 7.07 ± 1.12 before device use with difference of 1.26 with MRI image, and 6.81 ± 1.24 after device use with difference of 0.98 with MRI image. Overall, it was 7.14 ± 1.42 before device use with difference of 1.44 with MRI image, and 6.67 ± 1.48 after device use with difference of 0.94 with MRI image, and it was found that there was statistical significance ($P < 0.05$), (Table 3).

Table 3: The result of statistical analysis of Dunn 45°, MRI (Mean $\pm$ SD,mm)

Division	Gender	Mean $\pm$ SD	MRI – Dunn (Mean)	P-Value
Before device use	Male	7.33 ± 1.48	1.13	$P > 0.05$
	Female	7.07 ± 1.12	1.26	
	Overall	7.14 ± 1.42	1.14	
After device use	Male	6.44 ± 1.44	0.91	
	Female	6.81 ± 1.24	0.98	
	Overall	6.67 ± 1.48	0.94	

Dunn 90°: In the results of femoral offset measurement according to gender, in Dunn 90°, for men, it was 7.68 ± 1.56 before device use with difference of 1.37 with MRI image, and 6.02 ± 1.29 after device use with difference of 0.79 with MRI image. For women, it was 7.18 ± 2.13 before device use with difference of 1.56 with MRI image, and 6.29 ± 1.21 after device use with difference of 0.84 with MRI image. Overall, it was 7.84 ± 1.42 before device use with difference of 1.66 with MRI image, and 6.38 ± 1.32 after device use with difference of 0.83 with MRI image, and it was found that there was statistical significance ($P < 0.05$) (Table 4).

Table 4: The result of statistical analysis of Dunn 90°, MRI (Mean $\pm$ SD,mm)

Division	Gender	Mean $\pm$ SD	MRI – Dunn (Mean)	P-Value
Before device use	Male	7.68 ± 1.56	1.37	$P > 0.05$
	Female	7.18 ± 2.13	1.56	
	Overall	7.84 ± 1.42	1.66	
After device use	Male	6.02 ± 1.29	0.79	
	Female	6.29 ± 1.12	0.84	
	Overall	6.38 ± 1.32	0.83	

Despite the many diagnostic methods, in femoroacetabular impingement, general imaging with X-ray is still the primary and basic method. For this, Meyer et al reported that Dunn 45° flexion view was the most sensitive of the 6 radiographic tests (Hip AP, Dunn 45°, 90° flexion, cross-table/15° internal rotation, cross-table/15° neutral rotation, cross-table/15° external rotation) used to evaluate the femur head and asphericity of the neck (Hip AP, Dunn 45°, 90° flexion, cross-table/15° internal rotation, cross-table/15° neutral rotation, cross-table/15° external rotation) [10], and Kim et al reported that Dunn 90° flexion view was most useful when compared with MRI of Hip AP, Dunn (45°, 90°), Frog leg view, and Trans Lateral view, through comparative analysis [11]. In this study, MRI images were compared according to the use of ancillary devices, where it was found to be useful in Dunn 90°, and the ancillary device was used to supplement the inconvenience of unstable posture in patients where it was not possible to fix the tibia during the examination.

Conclusion

This study was performed to evaluate the image of Dunn view test using a self-developed device in 51 hip

joint patients (29 male, 21 female) with femoroacetabular impingement and the results are as follows.

First, in measuring and analyzing the α -angle in MRI image, it was not statistically significant at 45° ($P>0.05$), and there was statistical significance at 90° ($P<0.05$)

Second, in measuring and analyzing the femoral head-neck offset in MRI image, it was statistically significant at both 45° and 90° ($P<0.05$).

In the results of the study, using a self-made ancillary device in Dunn view examination, it showed in the diagnosis of femoroacetabular impingement of the Cam type, that it is possible to improve diagnostic ability in general radiography and to provide accurate and consistent diagnostic value images in the follow-up examination which can be helpful to make an accurate diagnosis in the patient observation process and at the same time to improve the satisfaction of the test posture felt by the patient.

Therefore, it is expected that the results of this study will be utilized to provide basic data for accurate and efficient patient posture in Dunn view examination.

Ethical Clearance: Not required

Source of Funding: This study was supported by the 2018 University Research Support Project of Hanseo University

Conflict of Interest: Nil

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The Convergence Study on Korean Consumers' Perception of Cosmeceuticals in the Aging Society

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ABSTRACT

Background/Objectives: This study is aimed to investigate consumers' interests in cosmeceuticals and to examine usage and satisfaction in the aging society. Therefore, it provides effective marketing data to industries.

Method/Statistical Analysis: For this study, self-questionnaires were done for Korean consumers who are in age over 20. A total of 366 copies were collected for the final analysis, and the data were analyzed by SPSS ver. 21.0 statistical program, then data were verified at the significance level of $p < .05$.

Findings: The behavior of managing appearance healthier and younger than the actual age led to the growing in cosmeceuticals market. There are some previous studies done, but there is a lack of researches focusing on role of cosmeceuticals in the aging society. Korean consumers' knowledge about skin was relatively high with an average score of 79.0%. However, the result of analyzing perception of cosmeceuticals proved that the definition of cosmeceuticals was not widely known, and there was lack of promoting cosmeceuticals to general consumers: 23.2% used cosmeceuticals without being aware of them. The strength of cosmeceuticals was high reliability due to its professionalism, and the drawback was its high cost. So, for the development of cosmeceutical market, it is necessary to introduce a marketing method which can reduce its cost. Many Korean consumers used cosmeceuticals with moisturizing effect, and the overall satisfaction level was 3.59 out of 5.00. Especially, the satisfaction level was high with the use of cosmeceuticals of anti-wrinkle or moisturizing effects.

Improvements/Applications: This study will provide the effective marketing resource to beauty industries and propose a positive direction to expand cosmeceutical market in the aging society.

Keywords: cosmeceuticals, aging society, anti-aging, perception, usage, satisfaction

Introduction

In the aging society, more than 7% of the whole population is aged 65 or over, and in aged society, more than 14% is aged 65 or over¹⁾. Korea had already entered into aged society in 2017, and there is an increase in numbers of countries shifting into aging society in worldwide. According to United Nations, the global population trends showed that the elderly population

over the age of 60 was 952 million in 2017, and this number is twice bigger compared to that of 1980 which was 382 million. At this growth rate, it is expected to become 2.1 billion in 2050, which is more than double to the number in 2017²⁾. The lifespan of mankind has been steadily increasing, and the era of 'Homo hundred' with the universalization of 100-year-old longevity has come to the fore³⁾. The average lifespan of Korean which was only 61.16 years in 1970 has been steeply rising up to 80.02 by 2016⁴⁾, and in many countries such as Japan, France, Italy, the U.S. and etc. population of 85 years and over has increased rapidly⁵⁾.

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Also, 'Active Senior' who are elderly people seeking for challenges are the active consumers in the society. The life expectancy of the world's population is getting longer

and as a result, the demand of using functional cosmetics to fight against aging is becoming even significant. This is because improving aging skin is included as the qualification to 'good health'; hence the use of effective and safe cosmetics is becoming important⁶⁾.

Accordingly, the Korean government has set up a plan to develop the improving method of anti-aging industry in the plan of fostering aged-friendly industry in 2009. Also, the Korean government defined the anti-aging business to cosmetics, foods, pharmaceuticals, health services and etc. which prevent or treat aging and geriatric diseases⁷⁾. In this context, the growth of cosmeceuticals which are highly functional cosmetics which combines the concept of therapeutic treatment to general cosmetics is remarkable. General cosmetics are recognized as beauty products while cosmeceuticals are recognized as convergence products which embrace not only the function of beauty products but also that of pharmaceuticals by protecting skin⁸⁾.

Korean cosmetics market is the world's 10th largest and it occupies 2.9% of the global cosmetics market⁹⁾. However, there still are no legal definition and regulations of cosmeceuticals. Also in the United States, which used the concept of cosmeceutical for the first time in the early 1990s, the FDA did not legally define cosmeceuticals, and there is no meaning under the law as well. Instead, industries in the US use the term meaning cosmetics which has medicinal or drug like benefits focusing on its function. In Korean beauty industry, cosmeceuticals are vaguely recognized as products which were developed by either dermatologists or pharmaceutical companies, so the concept is different.

There are previous studies related to cosmeceuticals such as 'Comparative analysis of consumer behavior by gender' by Junaid et al.¹⁰⁾, 'Cosmeceutical market development'¹¹⁾, 'Perception and satisfaction of cosmeceuticals'¹²⁾, and 'Effect of product choice to marketing communication'¹³⁾. These previous studies are done in worldwide to study about various topics related to cosmeceuticals. However, there is a constant inadequacy in researches around the world due to the different concept of cosmeceuticals defined in each study to progress in-depth.

Therefore, in this study, it was aimed to investigate the consumers' interests in skin and cosmeceuticals and to examine usage and satisfaction of the convergence product, cosmeceuticals in this aging society so that to provide effective marketing resources to beauty industries.

Materials and Method

Materials: The general characteristics and subjective skin types of surveyors were investigated and their perception of cosmeceuticals was evaluated. Also, the consumers' usage and satisfaction of cosmeceuticals were analyzed. Further research about the correlation of perception and usage of cosmeceuticals was examined and, the satisfaction depending on main efficacy was analyzed.

Data Collecting Method: For this study, self-questionnaires were done for Korean consumers who are in age over 20. The surveys were conducted to 400 consumers from 2nd to 18th of May, 2018. A total of 366 copies were used for the final analysis.

Survey Tool: The survey was composed of 11 questionnaires about general characteristics, 14 questionnaires about knowledge of skin, 6 questionnaires about perception, 4 questionnaires about usage, and 4 questionnaires about satisfaction of cosmeceuticals based on previous studies^{14),15),16)}. The Likert 5 point interval scale was used for this study.

Statistical Analysis: For this study, the collected data were analyzed by SPSS ver. 21.0 statistical program. Also, data were verified at the significance level of $p < .05$. In order to investigate general characteristics of subjects, frequency analysis was conducted. The knowledge about skin of subjects were evaluated and to figure out differences between the knowledge and general characteristics or skin types, independent sample t-test and one way ANOVA were operated. The cognition of cosmeceuticals was examined and cross-sectional analysis was practiced to compare the results between the general characteristics of subjects and the subjective skin type. To determine the difference in the usage of cosmeceuticals depends on the consumers' awareness of cosmeceuticals, independent sample t-test and one way ANOVA were conducted. A descriptive statistical analysis was utilized to examine the satisfaction of using cosmeceuticals. Also, one way ANOVA was practiced for analyzation of satisfaction on each of the cosmeceuticals' main effect.

Results and Discussion

General Characteristics and skin considerations of Surveyors: General characteristics of surveyors were analyzed depending on the following factors: gender,

age, marriage status, educational level, occupation, and monthly income. The number of female surveyors was 314(85.8%). The participants' age in 20s was the highest in number. 257(70.2%) were unmarried. 189(51.6%) of surveyors attended or graduated undergraduate school. 155(42.3%) were students. 152(41.5%) had the monthly income under 1000 USD. In the meantime, 64(17.5%) of surveyors had a skin trouble of dryness, 61(16.7%) had that of wrinkles and elasticity, 57(15.6%) had that of spots, 55(15.0%) had that of big pores, 49(13.4%) had that of acnes, 37(10.1%) had that of excessive sebum, 31(8.5%) had that against sensitivity, and 12(3.3%) had no skin trouble.

According to "Trends to Watch in Anti-aging" done by Datamonitor in 2013, for consumers in the US, Canada, Mexico, Europe, Korea, Japan, and Australia, the skin consideration which the most number of people had was skin dryness, and that occupied 70% of the participated surveyors, and the second largest number of people which was 61% had wrinkles and appearance of fine wrinkles as their skin consideration¹⁷⁾. Hence, the result by Datamonitor showed the same result to this study.

Skin Knowledge: The overall average rate of getting correct answers for Korean consumers was 79.0%.

To evaluate skin knowledge, it was calculated as 1 point when the answer was correct and 0 when the answer was wrong. The higher the score was, it was assumed that the knowledge of consumer was high. The overall score for Korean consumers was 9.53 out of 12. Moreover, the knowledge about skin for the participants in 20s had higher score compared to the other ages, and those who were unmarried had relatively higher score compared to those who were married.

Awareness of Cosmeceuticals of Korean Consumers

Awareness of Cosmeceuticals: As a result of analyzing the recognition of cosmeceuticals, 92 people (25.1%) knew or heard about cosmeceuticals while 274 (74.9%) did not know well, so it was proved that the term, cosmeceuticals, is unfamiliar to Korean consumers.

Cognitive Path of Cosmeceuticals: As in Figure 1, 36(39.1%) of people learned the information about cosmeceuticals via the internet(SNS). Regarding the general characteristics of surveyors, especially those in aged 20s, 40s, and over 50 had more experience of receiving the information about cosmeceuticals through

the internet(SNS), and more than 30% of consumers in 30s also experienced the information of cosmeceuticals via the internet(SNS). Hence, it was shown that the main pathway of learning about cosmeceuticals was through the internet(SNS). According to KISA's Internet Statistics Report in 2017, entitled "Research of Internet Use", the rate of internet access of Korean households had approached to the saturation period, so until 2017, the rate of retention ratio had risen to 94.1%. Also, the Internet usage rate of elderly people aged 65 and over has increased over three times compared to 5 years ago, hence the gap between ages became smaller¹⁸⁾.

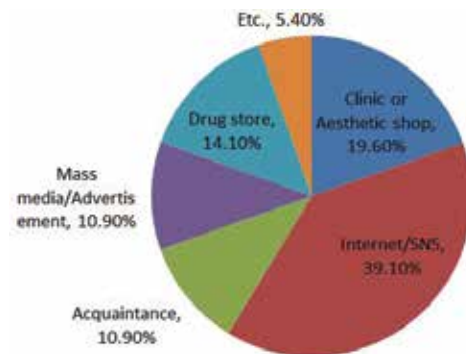


Figure 1: Cognitive path of Cosmeceuticals

Strengths and Drawbacks of Cosmeceuticals: Figure 2 showed the primary strength of cosmeceuticals was 'its high credit due to its professionalism', 137 (37.4%). Korean consumers preferred using cosmeceuticals because it seems to be professional and scientific since it is referred by dermatologists¹²⁾.

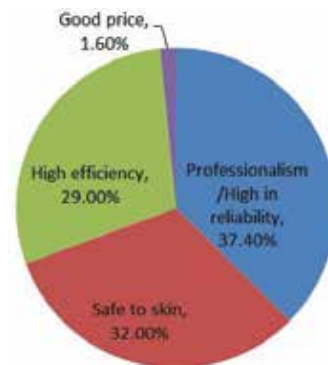


Figure 2: Strength of Cosmeceuticals

In the meantime, the results of analyzing the drawback of cosmeceuticals are as follow: the highest percentage of Korean consumers which is 228(62.3%) answered that the cost of cosmeceutical is high(Figure 3). According to Junaid et al., in the Indian market, as similar to the Korean market, the price of cosmeceuticals had a great influence on the consumers' purchasing

behavior¹⁹). In order for the active consumption of cosmeceuticals in the aging society, it is necessary to find a method to lower the price.

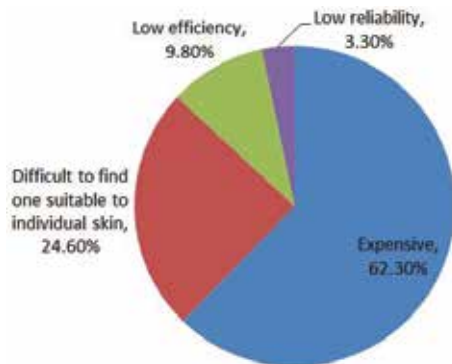


Figure 3: Drawback of Cosmeceuticals

Usage of Cosmeceuticals for Korean Consumers: 154(23.2%) had no experience of using it, 127(34.7%) had experience of using it, and 85(23.2%) had experience of using it although they did not recognize what they were using was called 'cosmeceuticals'. There was the significant difference between genders for this questionnaire; Korean male consumers generally did not have an experience of using cosmeceuticals whereas Korean female consumers either had no experience of using it or had a past or current experience of using it ($p < .001$). In Park and Kwon's study, 49.85% of Korean consumers had an experience of using cosmeceuticals and among this, 78.02% of female consumers and 21.98% of male consumers had the experience of using it, hence showed the similar result to this study¹²). However, according to Junaid et al., there also were significant differences in the purchase of cosmeceuticals between male and female consumers in India; 47.36% of men and 45.28% of women responded that cosmeceuticals are important to them, so generally, more men than women had a positive view toward using cosmeceuticals, hence showed quite different result to this study¹⁰).

Korean Consumers' Preference and Satisfaction of Cosmeceuticals

Main Effect of Cosmeceuticals for Users: To 212 Korean consumers who had an experience of using cosmeceuticals, a questionnaire was done to figure out differences in analysis results between factors of general characteristics and subjective skin types.

According to the analysis done for the main efficacy of cosmeceuticals, the highest rate of Korean consumers which was 83(39.2%) were using cosmeceuticals with

moisturizing effect, and 56(26.4%) was using it for anti-acne effect, and 28(13.2%) was using it for treating skin sensitivity.

Depending on ages, Korean consumers' preferred main efficacy of cosmeceuticals was different. Those in 20s generally used cosmeceuticals with anti-acne effect while those in 30s preferred using it with moisturizing effect. Many of surveyors in over 40 used cosmeceuticals with highly related to anti-aging effect, such as moisturizing and anti-wrinkle.

Moreover, as shown in Figure 4, many married consumers used cosmeceuticals with moisturizing or anti-wrinkle effect, whereas unmarried consumers usually used it with moisturizing or anti-acne effect ($p < .001$). Depending on subjective skin types as in Figure 5, oily skin type preferred using cosmeceuticals with anti-acne effect, while other skin types such as dry skin, normal skin, complex skin, and sensitive skin used products with moisturizing effect ($p < .001$).

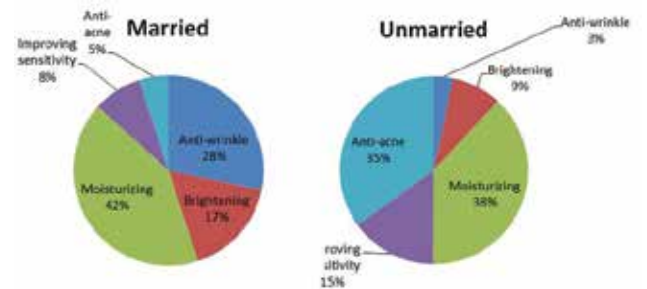


Figure 4: Main effect of cosmeceuticals in use depending of marriage status

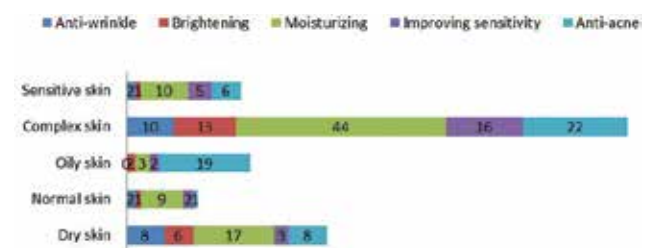


Figure 5: Main effect of cosmeceuticals in use depending on subjective skin type

Satisfaction of Cosmeceuticals: The result of analyzing satisfaction of using cosmeceuticals against 212 who had experience of usage, the overall satisfaction score was average 3.59 out of 5.00.

Depending on the efficiency, capacity, texture, price, and purchasing process, and the overall efficiency of cosmeceuticals, the difference in users' satisfaction showed a significant difference as in Figure 6 ($p < .05$).

Particularly, when users have experience of using cosmeceuticals with main effect of anti-wrinkle or moisturizing, average level of satisfaction on each factor was high with the score of higher than 3.70 out of 5.00.

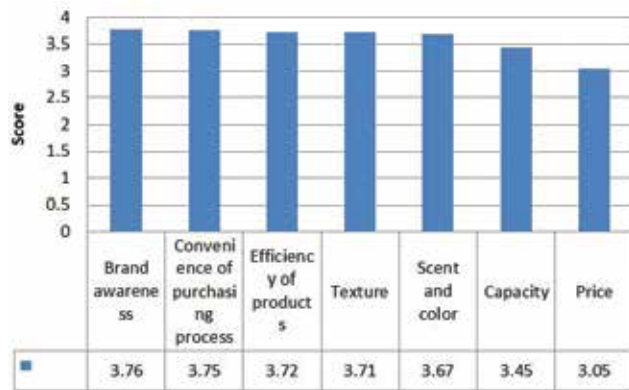


Figure 6: Satisfaction of cosmeceuticals

Difference in the Results of Usage Due to Consumers' Awareness: Based on the results of the research on awareness of cosmeceuticals, for this questionnaire, the definition, representative brand names, and products list of cosmeceuticals were given, then the second analysis were conducted to investigate the correlation between the awareness and usage of cosmeceuticals.

As a result explained in table 1, among Korean consumers who were aware of cosmeceuticals, 67.4% had an experience of using it, 17.4% had no experience of using it, and 15.2% actually had the experience of using it although they did not recognize cosmeceuticals at the beginning. Among those who were unaware of cosmeceuticals, 23.7% had an experience of using it, 50.4% had no experience of using it, but after learned about cosmeceuticals, the extra 25.9% answered that they actually had an experience of using.

Table 1: Difference in usage of cosmeceuticals due to consumers' awareness

Division		Usage of cosmeceuticals			χ^2 (p)
		Used or using cosmeceuticals	Used cosmeceuticals but did not recognize	Did not use cosmeceuticals	
Awareness	Aware	62(67.4)	14(15.2)	16(17.4)	59.040*** (.000)
	Unaware	65(23.7)	71(25.9)	138(50.4)	
Total		127(34.7)	85(23.2)	154(42.1)	

***p<.001

Difference in Skin Knowledge Due to Awareness and Usage of Cosmeceuticals: As a result shown in table 2, those who had experience of using cosmeceuticals had high scores on skin knowledge compared to those who did not have experience of using and who did not recognize it although had an experience on usage.

Table 2. Difference in skin knowledge due to awareness and usage of cosmeceuticals

Division		Mean (M)	Standard Deviation (SD)	F-value	p
Awareness	Aware	9.55	1.667	0.170	0.865
	Unaware	9.52	1.555		
Usage	Have an experience of using	9.98 ^c	1.431	10.551***	0.000
	Have an experience of using but did not recognize	9.56 ^b	1.467		
	Have no experience	9.14 ^a	1.665		
Total		9.53	1.582		

***p<.001 Duncan : a<b<c

Conclusion

The increase in the elderly population of the whole world led to higher interests in 'well-aging', hence the trend shows the growing in interests of managing their appearance even healthier and younger compared to their

actual age. This behavior led to the growing in the market of cosmeceuticals, highly functional cosmetics. Therefore, this study was aimed to examine the perception, usage, and satisfaction of cosmeceuticals and tried to provide data on the cosmeceutical market which is becoming more significant in this era of the aging society.

First of all, Korean consumers' knowledge about skin was relatively high with an average score of 79.0%. On the other hand, the result of analyzing perception of cosmeceuticals proved that the definition of cosmeceuticals was not widely known, and there was lack of promoting cosmeceuticals to general consumers: 57.9% of consumers had an experience about usage, but the extra 23.2% answered that they used cosmeceuticals without being aware of them.

Meanwhile, consumers who have already know about cosmeceuticals usually received information via the internet(SNS). The strength of cosmeceuticals was high reliability due to its professionalism, and the drawback was its high cost. So, for the development of cosmeceutical market, it is necessary to introduce a marketing method which can reduce its cost.

As a result of researching the satisfaction level of cosmeceuticals' users, many Korean consumers used cosmeceuticals with moisturizing effect, and the overall satisfaction level was 3.59 out of 5.00. Especially, the satisfaction level was high with the use of cosmeceuticals of anti-wrinkle or moisturizing effects.

This study was done against some of Korean consumers, so there is a limitation in not reflecting the opinions of all Korean consumers. However, it is expected to have growing in cosmeceutical market, which is becoming more significant in the aging society, if continuous researches on development in technology and marketing methods are done and a definition and regulations which commonly using in worldwide are set up.

Ethical Clearance: Not required

Source of Funding: Nil

Conflict of Interest: Nil

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Change of Quadriceps Muscular Strength and Muscle Activity According to Knee Extension Angle and Body Mass Index

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ABSTRACT

The purpose of this study was to investigate the effect of body mass index (BMI) on muscle strength and activity according to the knee angle. Muscle activity of vastus medialis (VM), vastus lateralis (VL), and rectus femoris (RF) was measured for 48 healthy adults. Isokinetic equipment was used to measure the isometric strength of the knee extensors at 0°, 30°, 60°, and 90° flexion. One-way ANOVA was used to compare isometric muscle strength and activity. The maximum isometric strength of the knee extensors according to the knee angle showed a significant difference between the groups at 0°, 30°, and 90° of knee flexion ($p < .05$). The maximum isometric strength at 0° flexion of the knee joint was significantly different between the normal and overweight, and the underweight and overweight, respectively. In knee flexion 30°, there was a significant difference between underweight and normal, underweight and overweight. In 90° flexion, there was a significant difference between the underweight and the overweight. There was a significant difference in VM at 0° and 30° knee flexion ($p < .05$). Post hoc test results showed a significant difference between underweight and overweight at 0° flexion. In 30° flexion, there was a significant difference between normal and overweight, and between underweight and overweight. It is considered that selective muscle strengthening according to a specific angle is necessary according to BMI.

Keywords: Body mass index, EMG, Isometric contraction, Knee extensors, quadriceps.

Introduction

The Asian population has a body mass index (BMI) of 18.5-22.9 kg/m² for normal, over 23 kg/m² for overweight, and over 25 kg/m² for obesity.¹ These BMI are recognized as a common standard for obesity and overweight.

Knee joints provide dynamic and static stability in activities of daily living (ALD). The stability of the knee is obtained by soft tissues such as muscles, tendons, and ligaments rather than the structural arrangement.^{2,3} The quadriceps is the main muscle of the knee extension and provides stability of the lower limb. It is an important muscle in terms of providing stability of the knee joint and is the driving force of sports and ADL.⁴ In the oriental

culture, there are many flexion movements of the knee during ADL⁵. This lifestyle causes knee joint overload and affect the high incidence of osteoarthritis.^{6,7} Women also have a greater risk of knee soft tissue damage than men, and obesity also affects knee dysfunction and pain.⁸ Obesity, in particular, increases the stress transmitted to the joint. Previous studies have shown that a reduction in body mass index of 2 kg/m² reduces the risk of degenerative arthritis by 50%.⁹

Isometric contraction produces near-maximum muscle strength and increases muscle strength only at given joint angles.¹⁰ This contraction occurs without changes in muscle length and joints, and because the joint angle is limited, it strengthens the muscles without damage to the joint.¹¹ As the advantages of muscle strength testing using isokinetic equipment have been highlighted, studies using isokinetic equipment have been continuing.¹²⁻¹⁴ The position of the hand, the angle of the hip and knee joint, the stability of the trunk affects the strength measurement of the hamstring or quadriceps.¹⁵ The position of joint angles as a guide to the mechanical properties of the muscles is important to reach maximum

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contraction and to assess muscle function.¹⁶ The maximum voluntary isometric contraction (MVIC) of vastus lateralis (VL) was significantly higher than vastus medialis (VM) and rectus femoris (RF) at knee flexion 90°. At 120°, the RF was significantly higher. At 150°, VL was higher than VM.¹⁷ Another EMG study reported that muscle activity was highest at 90° flexion in isometric contraction.^{18,19} Other researchers reported that the greatest muscle strength occurs between 60°-65° flexion.²⁰ The angle is important for the maximum strength.²⁰ In a comparison study of muscle strength according to BMI, the high BMI reported significantly higher fat-free mass (FFM) and absolute muscle strength than the normal. However, muscle strength per body weight was reported to be lower.²¹ In a comparison of strength according to BMI, there was a significant difference between normal, overweight, and obese, however, the muscle activity was not compared.²² The purpose of this study is to compare muscle strength and muscle activity according to BMI.

Method

Subjects: The forty-eight healthy adults participated in this study. Subjects with a history of surgery for knee and musculoskeletal disorders, participants in other exercise programs, knee edema or pain, and those with joint deformities were excluded. The subjects completed and participated in written consent for this study. Subjects were assigned to normal, overweight, and underweight groups. This study was conducted according to the protocol approved by the Institutional Review Board of Sun Moon University.

Table 1: General Characteristics

	Underweight (n = 13)	Normal (n = 20)	Overweight (n = 15)
Age (year)	20.33 ± 1.15	19.35 ± 1.04	19.8 ± 1.42
Height (cm)	166.25 ± 7.31	167.30 ± 10.0	166.0 ± 7.15
Weight (kg)	49.57 ± 4.45	60.8 ± 17.68	59.11 ± 5.31
BMI (kg/m ²)	17.54 ± 0.50	21.2 ± 1.42	26.72 ± 3.7
Mean ± standard deviation, BMI: Body mass index			

Procedure: The BMI was measured using a body composition analyzer (Inbody 570, Biospace, Republic of Korea, 2013). The criteria for the diagnosis of BMI were 18.5-22.9kg/m² for normal, overweight for over 23 kg/m², and underweight for below 18.5 kg/m² [Table 1].

Muscle activity was measured by EMG analysis (QUS100 Zero WIRE EMG, Italy, 2009). Isokinetic equipment (CSMI, Humax Co, USA, 2010) was used to measure the isometric strength of the knee extensors at 0°, 30°, 60°, and 90° flexion. The subjects were prepared for 5 minutes with a comfortable walking. The subject sat on the isokinetic equipment. The trunk and the opposite leg were fixed using a strap. Hip was fixed at 90° flexion. The lever arm pad of the was fixed 2cm above the ankle joint.²¹ The subjects performed maximum isometric contractions for 5 seconds at 0°, 30°, 60°, and 90° flexion, respectively. 5 times repeatedly, and the last 3 times were collected. A two-minute break between measurements at each angle was provided.

The electrode for VM was attached 5 cm above the superior medial border of the patella along the longitudinal axis of the femur. The electrode for VL was attached 2/3 from the greater trochanter of the femur to the patella, and the electrode for RF was attached at 1/2 from the anterior superior iliac spine to the patella [Figure 1]. The frequency of 1000 Hz was used to measurement. During the 5-second isometric contraction, EMG data for the middle three seconds were collected. The band-pass filter was set at 20-500Hz.

Statistical Analysis: Data were analyzed using SPSS 22.0 for windows program (SPSS INC, Chicago, IL). One-way ANOVA was used to compare isometric maximal muscle strength and muscle activity between groups. The LSD (Least Significant Difference) test was used for the post-hoc test. The statistical significance level was set at 0.05.



Figure 1: The placement of surface electrodes

Results

The maximum isometric strength of the knee extensors according to the knee joint angle showed a significant difference between the groups at 0°, 30°, and 90° of knee flexion ($p < .05$) [Table 2]. The results of the post hoc test showed that the maximum isometric strength at 0° flexion of the knee joint was significantly different between the normal and overweight, and the underweight and overweight, respectively. In knee flexion 30°, there was a significant difference between

underweight and normal, underweight and overweight. In 90° flexion, there was a significant difference between the underweight and the overweight [Figure 2].

There was a significant difference in VM at 0° and 30° flexion ($p < .05$) [Table 3]. Post hoc test results showed a significant difference between underweight and overweight at 0° flexion. In 30° flexion, there was a significant difference between normal and overweight, and between underweight and overweight [Figure 3].

Table 2: Maximum isometric strength of knee extensors according to knee angle. (Nm)

Knee angle	Group			F
	Normal	Overweight	Underweight	
0°	18.15 ± 4.42	25.07 ± 10.66	16.23 ± 4.20	6.57*
30°	53.90 ± 11.01	63.73 ± 19.89	39.84 ± 13.03	9.08
60°	92.35 ± 20.78	92.67 ± 38.81	71.85 ± 35.55	2.04*
90°	86.50 ± 24.47	94.80 ± 28.79	65.38 ± 33.24	3.94*

Mean ± standard deviation

* $p < 0.05$.

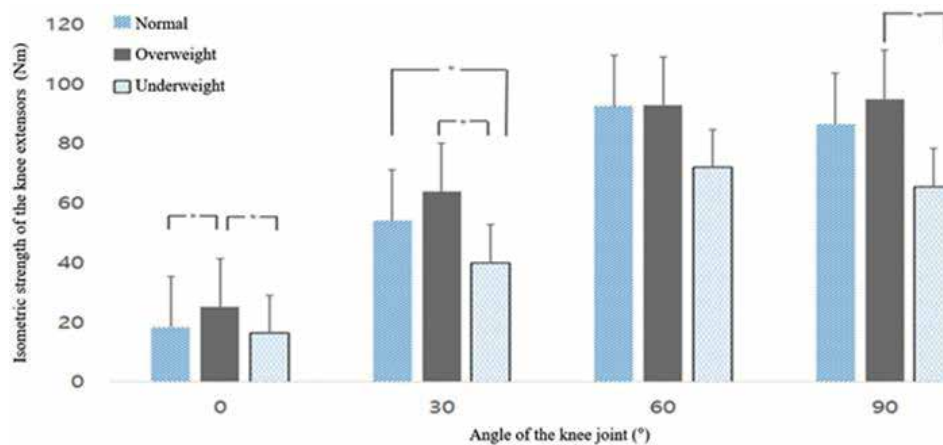


Figure 2: Isometric strength of the knee extensors according to body mass index in various angles

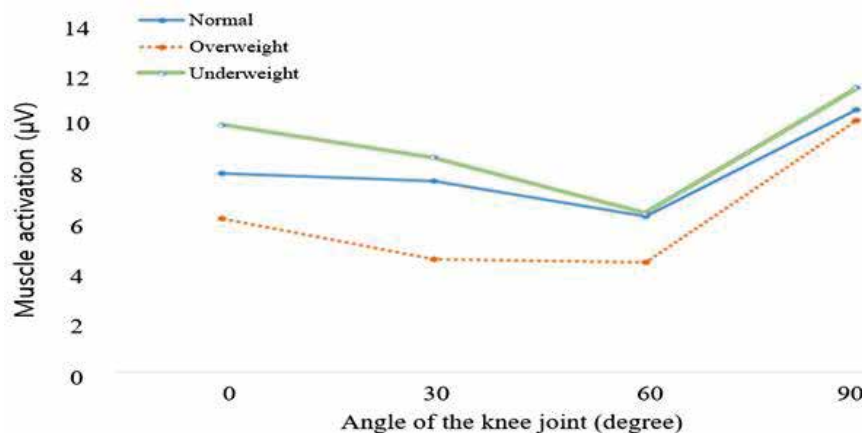


Figure 3: Muscle activation of the Vastus medialis according to body mass index

Discussion

Strength is one of the important factors in health.²³ In addition, quadriceps, which contributes most to knee extension, plays a key role in functional activity and walking by taking charge of force generation in knee extension.² Obesity often has a high absolute value of strength. This was reported to be due to high FFM.^{25,26}

It was reported that the group with high BMI had higher absolute fat mass and strength than the normal. However, muscle strength per body weight was lower.^{21,27} In adolescents, the peak torque was higher in obese, however, the normalized peak torque in unit weight was lower.²⁸ The cause of this result is that obesity has high FFM and therefore has high muscle mass.²⁹ It is also

reported that sustained weight bearing results in higher muscle strength because it causes a training effect on muscle mass.³⁰ Repeated loading causes higher muscle contraction activity. This process increases the cross-sectional area of the muscle and increases the number of myofilaments, resulting in a lot of cross-bridges. As a result, muscle strength increases.²² In the underweight, muscle strength and the fitness level was lower.³¹ It is predicted that absolute muscle strength is also lower because FFM is lower compared to overweight.

The VM and VL produce about 80% of the total extension torque of the knee joint, and the remaining 20% is produced by RF. The VM consists of two fibers with different orientations.

Table 3: Muscle activity according to knee angle between groups. (μV)

Knee angle	Muscle	Group			F
		Normal	Over weight	Under weight	
0°	RF	8.51 ± 3.00	7.71 ± 3.11	11.9 ± 7.73	3.13
	VM	7.97 ± 3.70	6.16 ± 2.22	9.91 ± 4.51	3.85*
	VL	9.39 ± 7.13	6.46 ± 3.12	9.51 ± 4.00	1.59
30°	RF	7.69 ± 2.20	6.71 ± 3.47	11.58 ± 10.95	2.44
	VM	7.65 ± 4.32	4.54 ± 2.44	8.6 ± 5.99	3.42*
	VL	7.82 ± 3.10	5.50 ± 4.00	9.05 ± 5.43	2.74
60°	RF	7.2 ± 3.29	6.26 ± 3.44	7.74 ± 7.16	0.87
	VM	7.65 ± 4.32	4.42 ± 2.46	6.38 ± 3.28	2.10
	VL	7.74 ± 3.82	5.13 ± 2.98	8.05 ± 4.36	2.76
90°	RF	9.83 ± 3.27	9.78 ± 6.22	9.01 ± 5.10	0.12
	VM	10.51 ± 3.60	10.10 ± 6.86	11.4 ± 7.70	0.16
	VL	12.31 ± 5.01	10.64 ± 7.77	10.7 ± 5.65	0.47

Mean ± standard deviation

* $p < 0.05$

RF: rectus femoris, VM: vastus medialis, VL: vastus lateralis.

Therefore, it plays the role of pulling the patella in the oblique direction. As a result, the patella stabilizes while passing or sliding through the intercondylar groove of the femur.³² The VM is mainly activated between the last 10° to 15° of the knee extension. In order to enhance the VM, muscle strengthening exercises should be performed within this angle.^{33,34} Damage to the VM limits the full extension of the knee joint.²⁰ VM activity at the knee joint 0° flexion showed the difference between the underweight and overweight. This suggests that the VM is not working normally. Abnormal activation of the VM in the overweight and

underweight may cause patellofemoral pain syndrome (PFPS).³⁵ The PFPS is a disease that causes pain in the anterior portion of the knee. In patients with the PFPS, VM activation was reported to be lower than the normal. Factors that cause PFPS include excessive muscle strength of VL and weakness of VM.^{36,37} The VM is the weakest muscle physiologically and the muscle weakness is reported to be rapid.³⁸ Muscle weakness breaks the alignment of the patella. As a result, the anterior part of the knee joint is painful and its functional role is reduced.³² Therefore, improper activation of VM due to obesity or underweight is a cause of diseases.

Person with obesity a high incidence of degenerative arthritis.³⁹⁻⁴¹ Obesity causes degenerative arthritis in the knee joint and 1st metatarsophalangeal joint.³⁹ The increase in the fat mass causes the genu varus. These deformities lead to a degenerative change as the load is concentrated on the medial of the knee joint. The weakness of VM causes genu varus. The overweight is at high risk of developing knee arthritis because of its high-fat content. The weakness of quadriceps increases pain. Pain limits activity and as a result, muscle weakness becomes worse.⁴² These results indicate that arthritis can be affected not only by repeated loading but also by muscle weakness.

The results of this study confirmed that BMI affects the isometric strength of the knee extensors and activity of VM according to the flexion angle. The overweight had the highest muscle strength because it had high FFM and high muscle mass. However, knee instability occurs due to low activity of the VM at 0 ° and 30 °. The maximum isometric strength occurs at 60°, however, it seems that the maximum muscle strength cannot be measured due to the low muscle activity of the VM. As a result of these abnormal muscle activity, knee stability is lower, leading to an increased incidence of diseases. It is predicted that BMI may also have an impact on disease incidence. This study has some limitations. First, muscle activity was not normalized. Second, because the subjects are young adults, it is difficult to generalize them to all ages. Third, this study did not perform a gender-specific comparison. Fourth, the imbalance between the upper and lower limbs was not investigated. Finally, the position of the ankle was not considered during muscle strength measurement.

Conclusion

This study confirmed that the strength of the overweight was significantly higher than that of the normal and underweight. VM muscle activity in the overweight was lower at knee flexion 0 ° and 30 °. This means that the VM is not being used properly. The VM weakness has disrupted the alignment of the knee and cause mechanical dysfunction and anterior pain of the knee joint. Muscle imbalance causes musculoskeletal disorders. Therefore, selective muscle strengthening is required according to BMI.

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Ethical Clearance: This study was conducted according to the protocol approved by the Institutional Review Board of Sun Moon University.

Conflict of Interest: The authors declare no conflict of interest.

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Study on the Needs of Health Care for Establishment of Regional Health Care Plan-Focused on Cheonan City

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ABSTRACT

The purpose of this study is to utilize the health services of Cheonan citizens as a basic data for establishing the 7th Regional Health Plan (2019 ~ 2022), respectively. Tools for measuring the health care needs of the subjects were revised and supplemented by the tools of the Community Health Survey. The data was collected from 440 Cheonan citizens by structural questionnaire. The collected data were analyzed with the SPSS 18.0 program. As a result of analyzing the satisfaction of the current medical care projects and health promotion programs, the vaccination was the highest at 3.37 out of the 4 points, the non - smoking service was 3.43, respectively. As a result of comparison between area A and area B, statistically significant differences were found in the prevention of epidemics ($t = -2.359$, $p = .019$), Management of mental disease ($t = -2.027$, $p = .045$) and oriental medicine treatment ($t = -2.698$, $p = .007$). In addition, there was a statistically significant difference in the oral care program ($t = -2.008$, $p = .046$). Also in analyzing the needs of the health care services and health promotion programs, arthritis management was the highest at 3.50, obesity management and oral health were 3.41. As a result of comparison between area A and area B, There was also a statistically significant difference in non - smoking ($t = -2.512$, $p = .012$) and obesity management ($t = -2.508$, $p = .012$). To improve the health potential of citizens and the ability to cope with the risk factors of diseases through the provision of the health promotion program.

Keywords: health care plan, need, satisfaction, health promotion, health care

Introduction

In the meantime, the healthcare environment is changing, such as changes in disease patterns, an increase in the elderly population, a decrease in fertility, and an increase in the demand for health and welfare services. In order to implement the division of medicine and promote health promotion projects, the need for basic data for establishing health plans and developing health promotion programs is increasing.

Local health projects in local governments are being carried out in public health centers, which are first-line

local health institutions. They need to be organized, manpower and financed so that the roles and functions of public health centers can be performed well¹. The public health center is the only public health institution in the county, county, and county, and it functions mainly as a preventive centered healthcare service, which is not profitable due to its functional merits and is avoided by private medical institutions. It is located in an area where local residents can use it economically^{2,3}.

The task of the public health center as a front line for the health administration is to broadly fulfill the primary health care needs of the local residents and at the same time to provide a new approach to the health management of the residents^{4,5}. In other words, by developing and expanding basic health services such as disease prevention and health promotion projects, it is urgently required to re-establish functions and roles so as to actively cope with primary health care and new healthcare demand for local residents

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In particular, local health care plans should improve the efficiency of health care projects by coordinating plans to meet the health care environment and national health care policy, and provide comprehensive, high quality health care services to the locals. It is desirable to establish a local health care plan focusing on opinions of users of public health centers in order to continuously carry out preventive activities such as health promotion and health education that meet the needs of local residents and systematically promote the contents of various businesses.

The Local Health Law stipulates that the head of local autonomous governments should set up a local health care plan every four years and establish an annual plan every year ^{6,7}. In addition, in the □National Health Promotion Act□, The plan for establishing and implementing a detailed plan for the promotion of public health is stipulated, and the importance of the local health care plan is increasing ⁸.

In addition, the World Health Organization (WHO) recommends regularly calculating health policy indicators, health-related social and economic indicators, healthcare management indicators, and health status indicators as indicators for evaluating the performance of health care policies ^{9,10}.

Korea has conducted a nationwide health index survey every four years since 1983. This survey is a sample survey to establish a national health care plan. Therefore, there is a limit to utilize the results in establishing the health care plan in different municipalities whose overall situation is different.

To establish a health care plan, comprehensive data on community health issues as well as health-related health indicators are needed. The results of this survey will serve as an index not only for evaluating the performance of the health projects that have been promoted but also for establishing the health center plan of the public health center that meets the needs of the citizens.

In order to promote the health business and the health promotion project for Cheonan citizens efficiently, the health level, needs of residents, for the 7th Regional Health Care Plan (2019 ~ 2022).

Method

Data Collection: The purpose of this study was to investigate the purpose of the study, the voluntary participation, and the confidentiality of the information

in written form and to inform citizens in Cheonan city who agreed to participate in the study. Participants were assured of their right of refusal to participate or to withdraw from the study at any stage. The anonymity and confidentiality of participants was assured. The data are collected through questionnaires from July 11 to August 23, 2018. 472 questionnaires were collected, but 440 copies were used, excluding 32 copies of the questionnaire which were unclear or missing.

Instruments

Health service satisfaction: Tools for measuring health service satisfaction were revised and supplemented by the tools of the Community Health Survey ¹¹. The items were divided into two categories: medical care projects and health promotion programs. It was rated on a four-point scale from one point representing 'very satisfied' to four points representing 'very positive'. The higher the score, the higher the satisfaction of health service, and The Cronbach's α was 0.976.

Health care needs: Tools for measuring health care needs were revised and supplemented by tools from the Community Health Survey [11]. The items were divided into two categories: health care projects and health promotion programs. It was rated on a four-point scale, 4 points for 'very necessary', 3 points for 'necessary', 2 points for 'not necessary' and 1 point for 'not necessary at all'. The higher the score, the higher the need for health care projects. The Cronbach's α value for health care needs was 0.959.

Data Analysis: The collected data were analyzed with the SPSS 18.0 program:

- The frequencies and percentages of the general characteristics of the subjects were calculated.
- To analyze the differences in the health service satisfaction and health service need according to the residence of the subjects, t-test was done.

Results

General Characteristics: Table 1 presents the general characteristics of the subjects. Table 1 presents the general characteristics of the subjects. 41.4% of males and 57.3% of females had the highest age of 20 ~ 49, 73.6% of the total. The highest educational level was 60.6% for college graduates and 28.7% for high school graduates. The marital status was the highest with 55.1% and the unmarried was 36.2%.

Table 1: General Characteristics n = 440

Categories		Total		A-area		B-area	
		n	%	n	%	n	%
Gender	Male	182	41.4	109	41.4	73	41.2
	Female	252	57.3	149	56.7	103	58.2
	No answer	6	1.4	5	1.9	1	0.6
Age (years)	20~29	101	23.1	68	26.0	33	18.8
	30~39	133	30.4	75	28.6	58	33.0
	40~49	88	20.1	50	19.1	38	21.6
	50~59	79	18.0	47	17.9	32	18.2
	60~69	21	4.8	9	3.4	12	6.8
	70~79	12	2.7	9	3.4	3	1.7
	80 over	4	0.9	4	1.5	0	0.0
Education	Over college	266	60.6	155	58.9	111	63.1
	High school	126	28.7	79	30.0	47	26.7
	Middle school	22	5.0	12	4.6	10	5.7
	Elementary school	18	4.1	13	4.9	5	2.8
	No answer	7	1.6	4	1.5	3	1.7
Housemate	Alone	159	36.2	103	39.2	56	31.8
	Spouse	242	55.1	136	51.7	106	60.2
	Bereavement	11	2.5	9	3.4	2	1.1
	Separation	3	0.7	0	0.0	3	1.7
	Divorce	4	0.9	1	0.4	3	1.7
	No answer	20	4.6	14	5.3	6	3.4

Health Service Satisfaction

Medical care projects: As a result of analyzing the satisfaction of the current medical care projects, the vaccination rate was the highest at 3.37 points from 4 points, 3.29 points for health education, 3.27 points for prevention of epidemics and 3.27 points for Maternal and child health, and 3.25 points for physical therapy. As a result of comparison between A-area and B-area, vaccination in A- area was the highest at 3.32 and prevention of epidemics in B-area was 3.48. In addition, statistically significant differences were found in the prevention of epidemics ($t = -2.359$, $p = .019$), Management of mental disease ($t = -2.027$, $p = .045$) and oriental medicine treatment ($t = -2.698$, $p = .007$). Table 2 shows the details.

Table 2: Difference in satisfaction of health care services by region

Division	Total		A-area		B-area		t	p
	M	SD	M	SD	M	SD		
General treatment	3.14	1.30	3.05	1.25	3.27	1.36	-1.660	.098
Health examination	3.24	1.97	3.13	1.36	3.41	2.62	-1.337	.182
Physical therapy	3.25	1.53	3.14	1.46	3.40	1.61	-1.723	.086
Vaccination	3.37	1.26	3.32	1.21	3.44	1.33	-.928	.354
Oral Health	3.22	1.57	3.13	1.46	3.36	1.70	-1.460	.145
prevention of epidemics	3.27	1.45	3.13	1.28	3.48	1.65	-2.359	.019*
Health education	3.29	1.39	3.20	1.27	3.43	1.54	-2.657	.098

Conted...

Maternal and child health	3.27	1.24	3.18	1.15	3.40	1.35	-1.723	.086
Management of mental disease	3.14	1.50	3.02	1.37	3.33	1.72	-2.027	.045*
Management of chronic disease	3.17	1.38	3.08	1.26	3.31	1.53	-1.622	.106
oriental medicine treatment	3.20	1.61	3.03	1.39	3.47	1.86	-2.698	.007**

* p< 0.5, ** p<0.01

Health Promotion Programs: As a result of analyzing the satisfaction of health promotion programs of the subjects, the non - smoking service was the highest with 3.43 points out of the 4 points, the exercise was 3.31, and the non – alcohol and nutritional service was 3.26. As a result of comparison between A-area and B-area, it was found that smoking and non - smoking projects in A and B-area had the highest satisfaction rate of 3.38 and 3.50, respectively. In addition, there was a statistically significant difference in the oral care program ($t = -2.008$, $p = .046$), and the details are shown in Table 3.

Table 3: Difference in satisfaction of health promotion programs by region

Division	Total		A-area		B-area		t	p
	M	SD	M	SD	M	SD		
Non - smoking	3.43	1.24	3.38	1.18	3.50	1.32	-0.948	.344
Exercise	3.31	1.36	3.21	1.16	3.47	1.61	-1.848	.066
Non - alcohol	3.26	1.44	3.14	1.24	3.43	1.67	-1.931	.054
Nutrition	3.26	1.32	3.17	1.18	3.40	1.50	-1.645	.101
obesity	3.23	1.36	3.14	1.18	3.37	1.58	-1.668	.096
Mental health(Stress, Depression)	3.24	1.46	3.12	1.26	3.41	1.70	-1.906	.058
Oral health	3.24	1.42	3.12	1.25	3.41	1.63	-2.008	.046*

* p< 0.5

Health Care Needs

Health Care Services: As a result of analyzing the needs of the health care services in table 4, arthritis management was the highest at 3.50 points out of 4 points, followed by hypertension management project 3.45, cerebrovascular disease 3.44, diabetes management 3.35, and mental illness management 3.31. As a result of comparing the area A and the area B, hypertension management was the highest in the area of 3.43, and the area of the area B had the highest requirement of the diabetes management 3.50. There is no statistically significant difference in the degree of need for health care projects between the two regions.

Table 4: Difference in demand for health care services by region

Division	Total		A-area		B-area		t	p
	M	SD	M	SD	M	SD		
Hypertension management	3.45	.75	3.43	.68	3.47	.84	- .563	.573
Diabetes management	3.35	.88	3.42	.70	3.50	.83	-1.103	.271
Mental illness management	3.31	.96	3.31	.86	3.42	.90	-1.249	.212
Disability Management	3.30	.85	3.26	.86	3.39	1.09	-1.364	.173
Management of cerebrovascular disease	3.44	.81	3.27	.80	3.34	.92	- .905	.366
Dementia Patient Management	3.28	.85	3.40	.75	3.50	.88	-1.252	.211
Cancer management	3.22	.89	3.22	.80	3.38	.92	-1.911	.057
Arthritis management	3.50	.75	3.20	.74	3.25	1.07	- .544	.587

Health Promotion Programs: Table 5 shows the results of analyzing the needs of health promotion programs of the subjects. Obesity management and oral health were the highest at 3.41 points, followed by 3.36 points for non - smoking and 3.35 points for exercise and nutrition, respectively. As a result of comparison between A-area and -area, the smoking and non - smoking activities in A and B-area were 3.42 and 3.60, respectively. There was also a statistically significant difference in non - smoking ($t = -2.512$, $p = .012$) and obesity management ($t = -2.508$, $p = .012$).

Table 5: Difference in demand for health promotion services by region

Division	Total		A-area		B-area		t	p
	M	SD	M	SD	M	SD		
Non - smoking	3.36	.90	3.42	.70	3.60	.81	-2.512	.012*
Exercise	3.35	.95	3.29	.82	3.46	1.01	-1.890	.059
Non - alcohol	3.29	.85	3.30	.90	3.42	1.03	-1.231	.219
Nutrition	3.35	.91	3.25	.81	3.35	.90	-1.207	.226
obesity	3.41	.81	3.27	.77	3.49	1.07	-2.508	.012*
Mental health(Stress, Depression)	3.29	.85	3.35	.75	3.50	.87	-1.912	.057
Oral health	3.41	.83	3.24	.69	3.37	1.04	-1.616	.107

* $p < 0.5$

Discussion

The purpose of this study is to investigate the satisfaction and needs of health care services in Cheonan city residents and provide necessary materials for long - term planning, strategy development, and project evaluation of the health care services.

Analysis of the needs of the subjects' health care business showed that they were arthritis management, hypertension management, management of cerebrovascular disease, diabetes management, and mental illness management. Also, the needs of health promotion projects were in the order of obesity management, oral health, non - smoking, exercise and nutrition.

Today, with the increase in income, people's desire for a healthy life is expressed in various ways. With the rapid economic growth and development of medical technology, the average life span of people has been extended and the aging society has been rapidly progressing¹. Thus, unlike in the past, where the health perspective focuses on preventive behaviors that are specific to disease, there is a need to improve the environment in relation to nutrition, exercise, stress adaptation, immune enhancement, and control of health risk factors. It is time to enter the era of health promoting that requires comprehensive health problems including interactions with the social environment.

Until now, the health center's health project has been mainly responsible for public health projects such as maternal and child health projects, preventive projects, family planning and tuberculosis projects for acute infectious diseases and some primary care. Most of the medical services rely heavily on the private sector, so preventive health services and health care services have been managed separately⁸. However, due to the implementation of the national health insurance system and the dramatic changes in disease patterns, the health service delivery system must be established and the functions of the public service sector should be strengthened^{12, 13}.

This study will provide basic data on the establishment and evaluation of the local health policy actively coping with the changing social environment, regional environmental characteristics and the local health care environment through surveys of the health care situation of Cheonan citizens. In order to effectively and actively respond to healthcare problems, active healthcare policies are required instead of passive methods that rely on treatment after illness. Therefore, it is believed that Cheonan citizens will improve their quality of life by improving their health potential and coping with the risk factors of disease through the practice of health care by themselves and the provision of various programs of public health centers.

Ethical Clearance: Not required

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Conflict of Interest: The authors declare no conflict of interest.

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A Study on Antioxidative and Antioxidative Effects of *Codonopsis lanceolata* and *Platycodon grandiflorum* Extracts

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ABSTRACT

The effectiveness of 70% ethanol (Ethanol, EtOH) extract of *Codonopsis lanceolata* and *Platycodon grandiflorum* was investigated to verify its applicability as a functional cosmetic material. Antioxidant activity of antioxidant, total flavonoid content, 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging activity and human dermal fibroblast (HDF) Experiments were conducted to confirm the effect of collagen. Antioxidant activities of *Codonopsis lanceolata* and *Platycodon grandiflorum* extracts were increased by concentration of polyphenol and polabonoid effect, and no toxicity was observed in Human Dermal Fibroblast (HDF) cells. It was confirmed that collagen production was further increased in Duckweed extract. Dodeca and bellflower extracts are considered to be valuable as various functional cosmetic materials having antioxidative effect and anti - aging wrinkle improvement effect.

Keywords: *Codonopsis lanceolata*, *Platycodon grandiflorum*, Anti-oxidant, Cosmetic material, Collagen

Introduction

Codonopsis lanceolata is a wild herbaceous perennial herb that is widely used for general food in Korea ^[1], China and Japan. It is widely used for food and medicine due to its unique taste and aroma. *Platycodon grandiflorum* is an alimentary food used for food such as *Codonopsis lanceolata*^[2]. Platycodin A, C, and D, which are triterpenoid saponins, are known to be the main ingredients. In addition, they contain inulin, betulin, stigmasterol, carbohydrate and fiber. *Codonopsis lanceolata* and *Platycodon grandiflorum* are the root of perennial herbaceous plant belonging to Campanulaceae and widely grown in China and Japan as Korea, and recent cultivation area has been expanded due to increased consumption of food and pharmacological health food ^[3,4]. *Codonopsis lanceolata* has sterol, triterpenoid, cycloartenol, N-formylharman, 1-carbomethoxy- β -carboline, perloyrine, norharman and volatile flavor components and has been reported to have pharmacological effects such as serum lipid reduction and antioxidant effects. *Codonopsis lanceolata* has long been used for food ^[5] because of its unique flavor and aroma. *Platycodon grandiflorum* contains triterpenoid saponins, carbohydrates and fibrin. It has been known to

be effective for genomic, genetic, anti-ulcer, antipyretic, sedative, anti-inflammatory, hypotensive and tonsillitis^[4]. The efficacy of *Codonopsis lanceolata* has been reported ^[6], serum lipid reduction ^[7], increased immunity ^[8], and antioxidant effects of cell wall materials ^[9,10]. Studies on *Platycodon grandiflorum* include mutagenic inhibition effects of general ingredients such as minerals, amino acids and fatty acids ^[11] and *platycodon grandiflorum* extracts ^[12], chemical composition and physiological activity ^[13], anti-carcinogenic and immunological activity of perennial *Platycodon grandiflorum* ^[14], anticholinergic action ^[15], hypoglycemic action ^[16] and improving cholesterol metabolism^[17]. Many studies have already been carried out using *Codonopsis lanceolata* and *Platycodon grandiflorum* extract, and most of them have been reported as herbal medicine such as herbal medicine. *Codonopsis lanceolata* and *Platycodon grandiflorum* ethanol extracts for the production and development of functional cosmetics. Therefore, in this study, we will investigate the effect of 70% ethanol extract from *Codonopsis lanceolata* and *Platycodon grandiflorum* on the antioxidant effect. In this study, *Codonopsis lanceolata* and *Platycodon grandiflorum* will be developed as cosmetic functional materials.

Materials

Sample Preparation: In this study, *Platycodon grandiflorum* and *Codonopsis lanceolata* were purchased from pearls, dried, and then removed. The extracts were extracted with 70% ethanol extracted. Ethanol extraction was carried out by adding 70% ethanol at 10 times the volume of rosewood broth for 72 hours at room temperature. The extract was centrifuged at 8000 rpm for 20 minutes to separate the supernatant. 2, and vacuum decompression was performed to remove ethanol as an extraction solvent. After concentrating with a decompressor and adding distilled water, it was stored at -70°C for 24 hours, lyophilized, and then the powder was collected and stored.

Cell Lin and Cell Cultuer: Human dermal fibroblast (HDF) cells were purchased from Korean Cell Line Bank, Korea and used in a high glucose Dulbecco's modified Eagle's medium (DMEM, Hyclone, USA) supplemented with 10% fetal bovine (Jeio Tech, Korea) supplemented with 1% penicillin/streptomycin (100 IU/50 $\mu\text{g/mL}$, Sigma-Aldrich) supplemented with serum (FBS; Sigma-Aldrich, USA) and kept at 37°C And cultured.

Method

The Total polyphenol compound content measurement: The total polyphenol content was determined by modifying the Folin-Denis method of the Association of Official Agricultural Chemists (AOAC) to produce molybdenum blue when the Folin-Ciocalteu's phenol reagent is reduced by phenolic compounds in the sample And quantified using the principle. Samples were diluted at concentrations of 5, 10, 15, and 20 $\mu\text{g/mL}$, and 400 μL of the sample and 400 μL of Folin-Ciocalteu's phenol reagent were mixed and reacted at room temperature for 3 minutes. After reacting, 400 μL of 10% Na_2CO_3 was added and reacted in a dark room for 60 minutes. 200 μL of the supernatant was dispensed into a 96-well plate at 760 nm and absorbance was measured. Caffeic acid was used as a standard substance. The total polyphenol content in the sample was determined by substituting the absorbance value (Y axis) of the standard curve sample of Caffeic acid (0-100 $\mu\text{g/mL}$) for the concentration (X axis). Calibration curves were prepared for the standard concentration of the substance on the X axis and the peak area on the Y axis. The calibration curve for each polyphenol component was used as a standard curve showing linearity of the correlation coefficient (R^2) (Fig. 1).

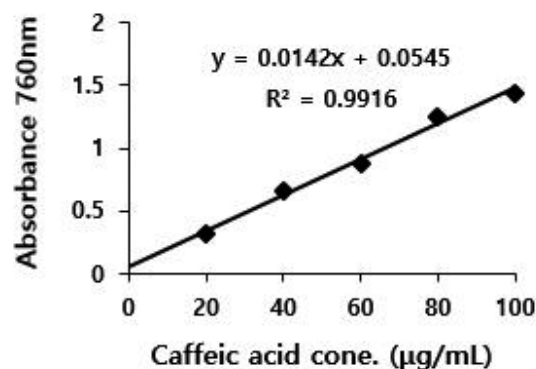


Figure 1: Standard curve of caffeic acid polyphenol content ($R^2 = 0.9916$)

The Total Flavonoid Content Measurement: Total flavonoid content was determined by Moreno et al. (2000) Method was modified and modified to measure. After diluting the sample to 5, 10, 15 and 20 $\mu\text{g/mL}$, 100 μL of the sample, 20 μL of 10% $\text{Al}(\text{NO}_3)_3$, 20 μL of 1 M CH_3COOK and 860 μL of ethanol were mixed in this order and left at room temperature for 40 minutes. The supernatant was submerged in a centrifuge (Fine PCR, Korea), and 200 μL of the supernatant was dispensed into a 96-well plate. Absorbance was measured at 415 nm. The average value was measured by repeated experiment three times under the same conditions, and the standard substance quercetin was used. The total flavonoid content in the sample was determined by substituting the absorbance value (Y axis) of the sample into the standard curve of quercetin (0 to 100 $\mu\text{g/mL}$) to determine the concentration (X axis). The calibration curves were prepared for each flavonoid component using the standard concentration and the peak area as the X axis and the Y axis, respectively. The calibration curve (R^2) showing the straight line showed good linearity of 0.9621 and used as a standard curve (Fig.2).

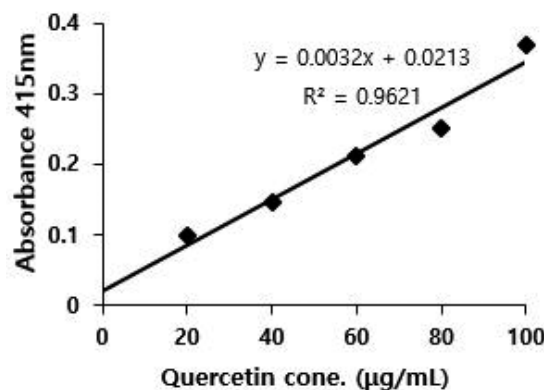


Figure 2: Standard curve of quercetin flavonoid content ($R^2 = 0.9621$)

DPPH Radical Scavenging Activity: DPPH radical scavenging activity was measured using the Blois (1958) method. After dilution of the samples by concentration, 180 µL of 10 mM DPPH solution and 20 µL of sample solution were mixed in a 96-well plate and reacted at 37 ° C for 30 min in the shade state. Then, Synergy HT (BioTek Instruments, USA) The absorbance was measured. The test was repeated three times under the same conditions and the mean value was measured. As a positive control, ascorbic acid was used.

$$\text{DPPH radical Scavenging (\%)} = 1 - \frac{\text{O.D. at 517 nm of the group with extract}}{\text{O.D. at 517 nm of the group without extract}} \times 100$$

Cell Viability Measurement: To investigate the effect of the extract on cell viability, a neutral red (NR) assay was used. Human dermal fibroblast (HDF) cells were seeded at a density of 3×10^4 cells/well in a 96-well plate and cultured for 24 hours. The cells were diluted to 6.25, 12.5, 25, and 50 µg/And cultured for 48 hours. After 48 hours, the medium was replaced with culture medium supplemented with 1% NR solution (Sigma-Aldrich) in serum-free medium, incubated for 3 hours, and then incubated with 10% formaldehyde (Sigma-Aldrich, USA) was added to each well, and 100 µL of each solution was dispensed into each well and fixed for 20 minutes. NR desorbed solution (1% glacial acetic acid (Sigma-Aldrich, USA), 49% ethanol (Duksan, Korea) and 50% distilled water) HT, BioTek Instruments, USA) was used to measure the absorbance at 540 nm. The cell viability of this experiment was calculated according to the following equation.

$$\text{Cell viability (\%)} = \frac{\text{O.D. at 540 nm of the group with extract}}{\text{O.D. at 540 nm of the group without extract}} \times 100$$

Measurement of Collagen Production Promotion: HDF cells were cultured in 96-well plates at a concentration of 1×10^4 cells/well and allowed to stand on the bottom for 24 hours. After confirming cell adhesion, diluted samples were added and cultured for 48 hours. After incubation, the culture supernatant was transferred to a 50-mL 96-well plate, and 100 mL of carbonate coating buffer ($\text{Na}_2\text{CO}_3 + \text{NaHCO}_3 + 10\% \text{NaN}_3$, pH 9.5) was added and fixed at 4 ° C for 24 hours. After washing three times with 200 mL of PBS-T, 100 mL of blocking solution (PBS, 0.1% BSA) was blocked at 37 ° C for 1 hour. After blocking, 100 mL of primary

antibody (anti-collagen type I-Ab mouse IgG) diluted 1000-fold with blocking solution was added to each well and incubated at 37 ° C for 1 hour. After washing three times with 200 mL of PBS-T, 100 mL of each anti-mouse IgG-antibody-conjugated secondary antibody (anti-mouse IgG-antibody) diluted in 4000-. After 1 hour, the plate was washed three times with 200 mL of PBS-T, and the substrate was treated with pH 9.8, p-nitrophenyl phosphate in 9.7% diethanolamine buffer, and 0.5 mM MgCl_2 in 200 mL of each well. And the absorbance was measured at a wavelength of 405 nm.

$$\text{Collagen production promotion (\%)} = \frac{\text{O.D. at 540 nm of the group with extract}}{\text{O.D. at 540 nm of the group without extract}} \times 100$$

Statistical Processing: Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) window version 17.0 (IBM, USA). The results were expressed as mean $\pm$ standard deviation (M $\pm$ SD) Statistical significance was tested by Student's t-test and $p < 0.05$ was considered statistically significant. All experiments were carried out three times or more independently under the same conditions, and the experimental results were obtained and analyzed.

Result and Discussion

1. Total Polyphenol Content Results: Natural antioxidants isolated from various natural products include ascorbic acid, tocopherols, carotenoids, maillardreaction products, aminoacids, peptides, phospholipids, and polyphenols and flavonoids. To determine the total polyphenol content of the 70% ethanol extracts, the concentrations of 5, 10, 15 and 20 µg/mL were measured. The total polyphenol content of each extract was calculated from the calibration curves prepared using caffeic acid as a standard solution. As a result, the total polyphenol content of CIE extract at 20 µg/mL was 150.3 mg/100 g and that of PGE extract was 74.9 mg/100 g (Fig. 3). The total polyphenol contents in the bellflower extracts were increased in a concentration dependent manner. The results were higher than those of the 70% ethanol extracts. The extraction with organic solvents was more effective than the extraction with distilled water as the solvent, The solubility of the polar solvent is considered to be high.

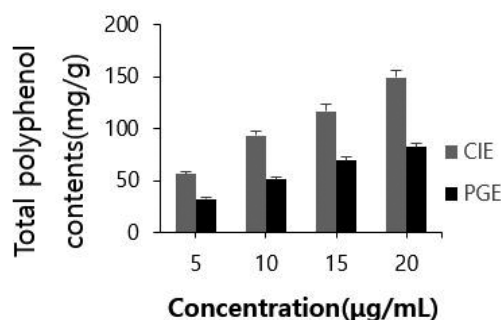


Figure 3: Total polyphenol content of *Codonopsis lanceolata* et *Platycodon grandiflorum* extract. Values represent mean $\pm$ standard deviation of three measurements. CIE: *Codonopsis lanceolata* extract, PGE: *Platycodon grandiflorum* extract

2. Total Flavonoids Content Results

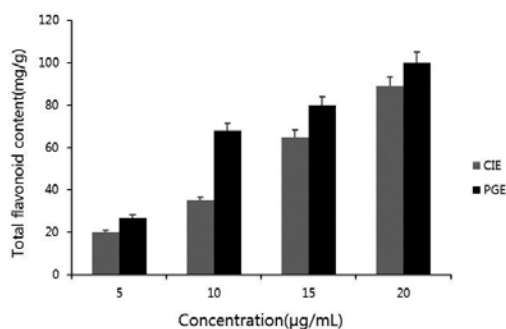


Figure 4: Total flavonoid content of *Codonopsis lanceolata* et *Platycodon grandiflorum* extract. Values represent mean $\pm$ standard deviation of three measurements. CIE: *Codonopsis lanceolata* extract, PGE: *Platycodon grandiflorum* extract

3. DPPH radical Scavenging activity Results:

Free radicals are known to be the cause of aging reaction with human body proteins and lipids. Free radical scavenging ability by DPPH method is widely used for verifying the antioxidant ability of antioxidant by reactive oxygen species (ROS). Figure. 5 shows the results of DPPH radical scavenging activity. The ascorbic acid used as a positive control showed a radical scavenging activity of 120% at a concentration of 1% and a CIE extract 0.5%, 109.0% of the radical scavenging activity, and 92.0% of the scavenging activity at the concentration of 0.5% of the PGE extract. Thus, it was confirmed that the radical scavenging activity of the CIE extract was higher than that of the PGE extract. As a result of measuring the DPPH radical scavenging activity, the DPPH scavenging activity showed a radical scavenging activity in a concentration dependent manner as the concentration of the extract increased.

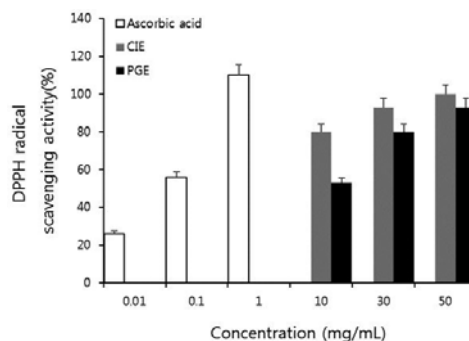


Figure 5: The DPPH radical scavenging activity of of *Codonopsis lanceolata* et *Platycodon grandiflorum* extract. After treating *Codonopsis lanceolata* et *Platycodon grandiflorum* extract at 1, 10, 30 and 50 mg/mL, High density dependent DPPH radical scavenging activity was identified. The results are presented as the Mean $\pm$ S.D. of three independent experiments. CIE: *Codonopsis lanceolata* extract, PGE: *Platycodon grandiflorum* extract

4. Measurement of cell viability on HDF cells

using Neutral red (NR) assay: In order to investigate the effect of CIE and PGE extracts on the cell viability of human fibroblasts, HDF cells, the concentrations of CIE extract and PGE extracts at 5, 10, 20, 50, and 100 µg/mL with 70% ethanol and cultured for 48 hours to perform NR assay. In the case of CIE extract, the cell proliferation rate was increased with increasing concentrations of 5, 10, 20, 50, and 100 µg/mL. Cell survival rate was higher than 100%. The cell viability was found to be 119% for CIE and 101% for PGE extract at 100 µg/mL concentration of marigold and calendula extract (Fig. 6).

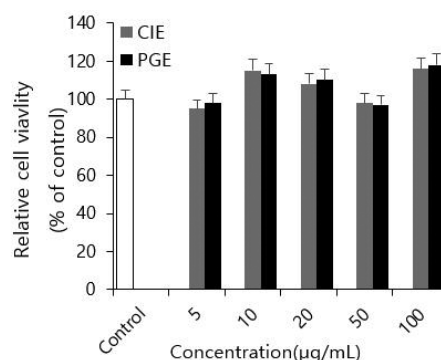


Figure 6: Effect of CIE et PGE extract on cell viability in HDF cells. Results is presented as mean $\pm$ SD, and three independent experiments were performed. The results are presented as the Mean $\pm$ S.D. of three independent experiments. CIE: *Codonopsis lanceolata* extract, PGE: *Platycodon grandiflorum* extract

5. Measurement of collagen production

promotion: In order to observe the change of collagen production promoting ability of CIE and PGE extracts on HDF cells of the sample, CIE and PGE extracts were treated with HDF cells for 48 hours, and the culture supernatants were analyzed by ELISA (Enzyme-Linked Immunosorbent Assay) The results are shown in Figure 7.

Compared with the untreated control group, collagen production was promoted by CIE and PGE extracts. At the concentration of 50 µg/mL of CIE extract, the highest increase of collagen production was observed at 109.62%, and collagen was increased in a dose dependent manner (** $p < .01$, *** $p < .001$). Compared with the positive control group, vitamin C, the concentration of vitamin C at 20 µg/mL and the concentration of CIE and PGE extract of 20 µg/mL showed similar amounts of collagen production. These results suggest that CIE and PGE extracts may be useful as cosmetic materials containing CIE and PGE extract.

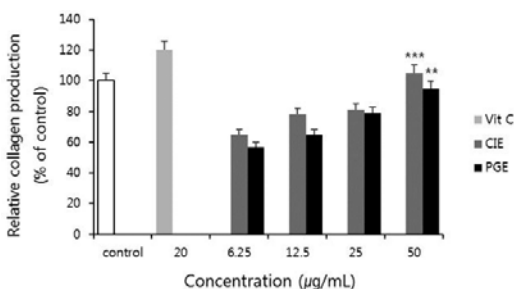


Figure 7: Effects of CIE et PGE extract extract on the collagen secretion by HDF cells. Results is presented as mean $\pm$ SD, and three independent experiments were performed. The results are presented as the Mean $\pm$ S.D. of three independent experiments. CIE: *Codonopsis lanceolata* extract, PGE: *Platycodon grandiflorum* extract($p < .01$, *** $p < .001$)**

Conclusion

In this study, the purpose of this study was to investigate the applicability of CIE and PGE extracts as cosmetic materials. The results of the antioxidative and skin cell activities of CIE and PGE extracts are as follows.

1. The 70% ethanol extract of CIE and PGE showed excellent antioxidative power against polyphenol, flavonoid and DPPH radical scavenging ability.

2. The cell viability and cytotoxicity of HDF cells were examined. The cytotoxicity was not observed in all the 70% ethanol extraction methods at all concentrations up to 5 ~ 100 µg/mL, and high survival rate was confirmed.
3. Collagen production was promoted in both extracts of CIE and PGE extracts. At the concentration of 100 µg/mL, the highest increase of collagen production was observed at 109.62%, and collagen increased in a dose dependent manner. Compared with the positive control group, vitamin C, a similar amount of collagen production was observed at a concentration of 20 µg/mL of vitamin C and 50 µg/mL of CIE extract. These results suggest that CIE and PGE extracts may be applicable as a cosmetic material containing CIE and PGE extract. Considering the results of the present study, CIE and PGE extracts showed antioxidant activity, cell viability and collagen effect. As a result, CIE and PGE extracts may be useful as functional cosmetic materials.

Ethical Clearance: Not required

Source of Funding: Nil

Conflict of Interest: Nil

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Effects of Various Squats Intervention Methods on the Muscle Activity of the Trunk and Lower Extremity

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ABSTRACT

Background/Objectives: The purpose of this study is to identify changes in the muscle activity of the trunk and lower extremity during squats with various interventions(general squats, machine squats, laser squats).

Method/Statistical Analysis: 18 people were selected to measure the muscle activity of the elector spinae(ES), gluteus maximus(GM), vastus medialis oblique(VMO), and vastus lateralis(VL). One-way Anova with repeated measurements was conducted to determine the difference in muscle activity in various squats intervention. The Bonferroni correction was used as a post-test to check the difference in muscle activity between the various interventions, and the significance level was set to 0.05. Statistical programs used SPSS Version22.0(Statistics Package for the Social Science).

Findings: There were significant differences in GM, VMO and VL during the various squat interventions. GM showed higher muscle activity in machine squats than general squats. VMO showed higher muscle activity machine squats than general squats and laser squats during descending phase. VL showed higher muscle activity in machine squats than general squats and laser squats during descending and holding phase.

Improvements/Applications: This study suggests that machine squat is effective as an intervention to increase muscle activity of GM and VMO during squat exercise.

Keywords: *Gluteus maximus, Laser squat, Machine squat, Muscle activity, Vastus medialis oblique.*

Introduction

Weight training is preferred by many people because it consumes more energy than other sports and helps improve body composition and prevent osteoporosis^[1]. One of the most representative exercises in weight training is squat exercise, which can develop lower extremity muscles. Squat exercise can variety of ways. Squat also reduces the risk of injury to athletes as well as improving their athletic ability^[2]. Squat exercise is an important exercise to develop several muscle groups and to develop stability for walking and balancing.

Squat is closed kinetic chain(CKC) movement that moves multi-joint. CKC exercise has been cited as producing superior eccentric contraction and co-contraction of muscles, as well as reducing shear forces while adding compressive forces to the joints, thereby enhancing joint stability^[3].

But heavy weight and faulty movement patterns can damage to back and knee joint during squat exercise^[4,5].

Therefore, the squat should be performed with correct motion. In a correct squat exercise, eyes should be facing up to the front, the waist should be kept tense so that it does not flexion or extension, and the knees should not cross the toes. If the knees are cross the toes, the anterior cruciate ligament(ACL) may damage. Damage to the ACL results in knee instability and stress, and is prone to secondary trauma to other tissues. In order to prevent such damage, various interventions are performed in the physical therapy area.

One of them is to enhance the ability to control exercise through a proprioceptive sense and visual sense. The proprioceptive sensation plays a very important role in the rehabilitation for the restoration of the exercise capacity^[6]. Visual feedback integrates with centripetal information from vestibular and bodily sensations to contribute to postural control, reduce postural movement^[7], also It is a self-regulating technique that regulates involuntarily the body's movements^[8]. Visual feedback transfers conscious information about the

position of the body to the central nervous system so that proper posture or exercise can be maintained^[9]. Postural adjustment relies heavily on somatic senses information than vision or balance sense, resulting in sustained feedback^[10]. Visual feedback training using laser pointer is more effective than the general physical therapy method, oral instruction of the therapist, and posture training using the tactile sense, as an effective way to symmetrical the line position in patients with asymmetrical posture^[11]. Tactile feedback can identify errors and improve movement^[12,13].

However, there is very little research using feedback interventions during squat exercise. Therefore, the purpose of this study is to compare muscle activity

of ES, GM, VMO, and VL muscles using visual squat, machine squat, and general squat.

Method

Subjects: Eighteen subjects were recruited for this study. The subjects voluntarily participated in the study after hearing explanation enough. Exclusion is those who had an orthopedic and neurosurgical disease during the last 6 months, and those with musculoskeletal pain. All subjects signed a study participation agreement, and no subjects were excluded due to exercise intensity or muscle pain during the study period. General characteristics of the subjects are as shown in[Table1].

Table 1: Characteristics of subjects

Subject (n)	Age (yrs)	Height (cm)	Weight (kg)	BMI*
Man(12)	21.83 ± 2.19	173.08 ± 4.41	73.83 ± 16.30	23.94 ± 4.17
Woman(6)	21.67 ± 1.11	163 ± 5.54	53.33 ± 5.15	20.26 ± 3.12

*BMI: body mass index

Experiment Equipment and Tool

Surface EMG signal collect and analysis system: BTS Free EMG 1000(BTS Bioengineering, Milano, Italy) was used to measure muscle activity of the trunk and lower extremity muscles during various squat intervention[Figure1]. The EMG signal sampling rate is 1024Hz and 20~500Hz band pass filter is used to remove noise. The EMG signal The EMG signals measured at the electrodes are amplified 10 times through amplification to prevent noise and interference, and then moved along the cables to the patient unit and converted to digital data using an A/D converter at 16 bits. As soon as the collection was completed, the data collected in the patient unit was received via the WIFI to the Access pointer connected to the computer and LAN cable, and the Row data was automatically displayed by the YORAB(software, BTS co, Italy) software used by the FREEEMG. The RMS(root-mean-square) values of the EMG signals of each muscle for each movement were rectified in Row data, and the data were analyzed through RMS process after integration.



Figure 1: BTS FREEEMG 1000

Squat Machine: The Squat machine was used to secure the knee joint and the knee femoral apply the correct squat position. The Squat machine is 60cm high, 50cm wide, and 100cm long. The pedestal supporting the calves can be adjusted from 43cm to 50cm, depending on the user [Figure2].



Figure 2: Squat machine

Patellar Laser: To apply the visual correction feedback of the subject, a laser beam was inserted into a molded plastic with a diameter of 15 cm. It is designed so that the center of the laser beam can be orthogonal to the molded plastic by the rubber band[Figure 3].



Figure 3: Patella laser

Visual Path Guide: Visual path guide was produced to guide the normal route of the knee. The visual path guide is 54 cm in width, 78 cm in height, and the line spacing is 1 cm [Figure4].

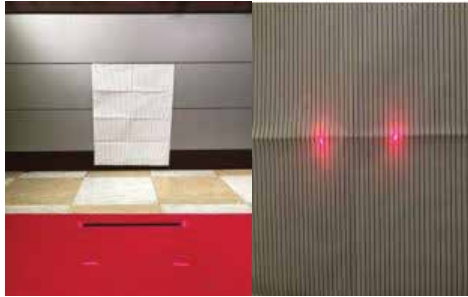


Figure 4: Laser path guide

Experimental Method

EMG Signal Normalization: We used the MVIC(maximal voluntary isometric contraction) and RVC(reference voluntary contraction) collected for 5 seconds to normalization the EMG signal. VMO, VL used the %MVIC method and ES, GM used the %RVC method. For the measurement posture, refer to muscle testing method^[14]. The normalization process of each muscle is as follows.

$$\%MVIC = RMS \times \frac{1}{MVIC} \times 100$$

$$\%RVC = RMS \times \frac{1}{RVC} \times 100$$

During the MVIC measurement, average of 3 seconds except 1 second in the beginning of 5 seconds and 1 second in the back of 5 seconds was used^[15]. The average value of the three measurements was used. During RVC measurement, the patient was lying down on the therapeutic table, placing his arm naturally side to the hip joint, bending the knee 90 degrees, and then subjects legs lift up to 5 cm from the therapeutic. We used an average of 3 seconds except 1 second in the beginning of 5 seconds and 1 second in the back of 5 seconds. We evaluated the average value of the three measured values. We gave a one-minute break between measurements.

Exercise Method: In this study, the exercise was conducted after the subjects were given a sufficient explanation and demonstration of the exercise method before the exercise. All squats were standardized on both feet by measuring the shoulder width before exercise and marking the shoulder width with tape on the floor. Each subject was asked to position their feet in shoulder width and then to get ready and the gaze to look straight ahead. Both arms crossed and unified in a position of shoulder. The knee flexion angle was unified because it differed depending on the depth of the seat^[16]. A parallel squat was performed to allow the thigh to sit until the thigh was parallel to the floor, because the activity of the quadriceps was the largest at the knee flexion angle of 88-120 degrees^[17][Figure 5].

(1) General Squat			
(2) Machine Squat			
(3) Laser Squat			
	Descending	Holding	Ascending

Figure 5: Squat exercise

The speed at which the squat was performed was verbalized every second. The squat was performed five times. Each squat was given a two-minute break to minimize muscle fatigue^[18]. When the machine squat was mediated, the talus was fixed with an ankle support. Place a calf on the support and fixed the height of the support at popliteal level. The laser squat wore a knee laser and was spaced 100cm apart from visual route guidance. In addition, the movement of the lower extremities to the sagittal plane was controlled by the subjects themselves, and the squats were performed so that the laser points do not deviate as much as possible from the vertical visual path guide line. In order to apply the same to all the interventions, the subject's shoulder width was displayed, and the gaze was observed at the front, and the knee joint was made at 90 ° when descending.

Data Processing Method: To compare differences in muscle activity(GM, VMO, VL, ES) between various squat interventions(General squat, Machine squat, Laser squat), Repeated one-way Anova was performed by repeated measurements..If statistical significance was verified, the post-test performed the Bonferroni test. All statistical significance levels were set at $\alpha = .05$. Statistical program used SPSS Version 22.0 (Statistical Package for the Social Science).

Result

EMG activity in muscle activity during descending phase is shown Table3.

Table 3: Descending phase (0°-90°)

Amount of activation	General squat	Machine squat	Laser Squat	F	P
LES	34.27±9.47	39.88±14.82	33.23±8.94	2.15	0.14
RES	33.86±12.11	44.56±18.65	34.93±10.47	2.15	0.14
LGM	8.33±6.02 ^a	13.56±13.16	10.48±9.17	5.10	0.01
RGM	9.59±7.68 ^a	13.12±10.16	11.46±7.74	11.73	0.00
LVMO	30.64±7.87 ^a	38.82±14.88 ^b	30.84±13.94	10.53	0.00
RVMO	29.56±11.84 ^a	37.46±13.66 ^b	30.26±14.15	6.73	0.00
LVL	27.07±9.33 ^a	37.82±14.56 ^b	25.48±10.43	18.22	0.00
RVL	25.84±9.55 ^a	35.36±10.28 ^b	22.92±9.25	35.44	0.00

a: There is a significant difference between general squats and machine squats.
b: There is a significant difference between machine squat and laser squat.
c: There is a significant difference between general squats and laser squats

EMG activity in muscle activity during holding phase is shown Table4.

Table 4: Holding phase (90°)

Amount of activation	General squat	Machine squat	Laser Squat	F	P
LES	45.23±14.80	43.23±22.00	44.88±12.12	0.030	0.970
RES	44.40±15.49	53.89±39.96	46.12±16.27	0.537	0.595
LGM	7.81±5.41 ^a	17.51±11.86	12.09±10.87	9.562	0.002
RGM	8.07±6.80 ^a	18.60±18.06 ^b	11.78±10.22	6.221	0.010
LVMO	46.72±15.61 ^a	61.02±21.39 ^b	51.53±18.45	4.275	0.033
RVMO	45.78±20.05 ^a	57.73±16.91	54.23±24.67	5.124	0.019
LVL	38.51±1.67 ^a	51.69±20.05 ^b	41.71±18.21	6.015	0.011
RVL	39.32±17.19 ^a	54.08±16.63 ^b	42.16±16.89	7.854	0.004

a: There is a significant difference between general squats and machine squats.
b: There is a significant difference between machine squat and laser squat.
c: There is a significant difference between general squats and laser squats

EMG activity in muscle activity during ascending phase is shown Table5.

Table 5: Ascending phase(90°-0°)

Amount of activation	General squat	Machine squat	Laser Squat	F	P
LES	38.44±11.40	42.11±14.49	38.81±8.75	0.61	0.55
RES	38.78±15.08	45.94±22.18	39.43±14.10	1.37	0.28
LGM	19.97±10.32 ^a	29.88±16.93	24.06±13.40	13.43	0.00
RGM	21.06±12.46 ^a	27.92±16.73 ^b	24.84±14.18	14.01	0.00
LVMO	34.07±13.80	38.78±14.78	39.31±17.22	2.45	0.11
RVMO	33.67±12.34	34.52±10.93 ^b	42.06±17.22 ^c	6.57	0.00
LVL	30.73±13.68 ^a	38.17±15.28	33.08±12.41	5.34	0.01
RVL	28.87±10.99 ^a	34.77±11.91	31.88±11.25	4.13	0.03

a: There is a significant difference between general squats and machine squats.
b: There is a significant difference between machine squat and laser squat.
c: There is a significant difference between general squats and laser squats

Discussion

In this study, we sought to find effective exercise methods that can difference ES, GM, VMO, and VL

muscle activity under various interventions (general squats, machine squats, laser squats). During the incorrect squat exercise, knee complex results in genu valgum, genu varum and knee anterolisthesis, which can lead to potential damage [jumper's knee, patella-femur syndrome, ACL tear, iliotibial band tendonitis]. Therefore, in order to perform correct squat intervention, guidance of the patient are frequently performed through various methods in the physical therapy field. Due to there were few studies on machine squat, general squat and laser squat, this study tried to investigate muscle activity according to various squat intervention methods.

According to the results of this study, the muscle activity of both GM during the squat using the three intervention methods showed a significant difference in all intervals (descending, holding, ascending) ($p < .05$). In the descending section of LGM, general squat (8.33 ± 6.02) showed lower muscle activity than machine squat (13.56 ± 13.16). In the holding section of LGM, the general squat (7.81 ± 5.41) showed lower muscle activity than the machine squat (17.51 ± 11.86). In the ascending section of LGM, general squat (19.97 ± 10.32) showed lower muscle activity than machine squat (29.88 ± 16.93). In the descending section of RGM, general squat (9.59 ± 7.68) showed lower muscle activity than machine squat (13.12 ± 10.16). In the holding section of RGM, the laser squat (11.78 ± 10.22) showed lower muscle activity than the machine squat (18.60 ± 18.06), general squat (8.07 ± 6.89) showed lower muscle activity than machine squat (18.60 ± 18.06). In the ascending section of RGM, general squat (19.97 ± 10.32) showed lower muscle activity than machine squat (29.88 ± 16.93). The reason for the high muscle activity of the GM in the machine squat compared to the general squat in this study is thought to be the leverage of the ankle support on the machine squat. In a study by Lorenzetti et al. (2012)^[19], the unrestricted squat and the restricted squat were compared, when comparing the torques of the hip and knee joints at the time of the squat. In the unrestricted squat, the knee joint torque was greater than the hip joint torque, and in the restricted squat, the hip joint torque was greater than the knee joint torque. We thought that restricted squat is similar to that of a machine squat. Therefore, in this study, it is thought that the muscle activity of GM was increased in the machine squat.

In the descending section of both VMO, there was a significant difference the general squat and machine

squat, machine squat and laser squat ($p < .05$). In LVMO, general squat and laser squat showed lower muscle activity than machine squat. In the holding section of LVMO, general squat (46.72 ± 15.61) showed lower muscle activity than machine squat (29.88 ± 16.93). Significant differences between the general squat (46.72 ± 15.61) and the machine squat (61.02 ± 21.39). Also, significant differences between the machine squats (61.02 ± 21.39) and the laser squat (51.53 ± 18.45) ($p < .05$). The general squat showed lower muscle activity than the machine squat, and the laser squat showed lower muscle activity than the machine squat. In the ascending section of RVMO, general squat (29.56 ± 11.84) showed lower muscle activity than machine squat (37.46 ± 13.66) and laser squat (30.26 ± 14.15) showed lower muscle activity than machine squat (37.46 ± 13.66). There was a significant difference between the general squat and the machine squat in the holding section of RVMO ($p < .05$). The general squat (45.78 ± 20.05) showed lower muscle activity than the machine squat (57.73 ± 16.91). There was a significant difference between the general squat and the laser squat in the ascending section, and there was also a significant difference between the machine squat and the laser squat. ($p < .05$) Machine squat (34.52 ± 10.93) showed lower muscle activity than laser squat (42.06 ± 17.22). In addition, general squat (33.67 ± 12.34) showed lower muscle activity than laser squat (42.06 ± 17.22). Patella tends to be subluxated outward by VL and iliotibial band, but VMO plays a role to prevent subluxation. However, VMO has physiologically weak muscles, muscle weakness is the fastest, and the recovery rate is slow after the weakening. Once weakened, the anatomical alignment of the patella is broken, the mechanical function is decreased and the pain is anterior to the knee joint do. Particularly when the balance of strength between the VMO and the VL is lost, the patella is moved outwardly, which can damage the patellofemoral joint. Therefore, selective strengthening of the VMO is required. The common feature of the VMO in various squat intervention methods in this study is that it showed higher muscle activity in the machine squat than in the general squat in the descending section and the holding section. This suggests that the ankle bending angle is decreased and the knee bending angle is increased relative to the general squat due to the ankle support of the squat machine. Lorenzetti et al. (2012) also show that the VMO activity increases as the knee joint bending angle increases, and Thomas et al. (2018) also reported that quadriceps muscle activity increased with increasing knee angle^[19,20].

The muscle activity of both VL during the squat using the three intervention methods was significantly different between the general squat and the machine squat at all sections(descending, holding, ascending)($p < .05$). In the descending section of LVL, general squat(27.07 ± 9.33) and laser squat(25.48 ± 10.43) showed lower muscle activity than machine squat(37.82 ± 14.56). In holding section of LVL, general squat(38.51 ± 1.67) and laser squat(41.71 ± 18.21) showed lower muscle activity than machine squat(51.69 ± 20.05). In the ascending section of LVL, general squat(30.73 ± 13.68) showed lower muscle activity than machine squat (38.17 ± 15.28). In the descending section of RVL, general squat(25.84 ± 9.55) and laser squat(22.92 ± 9.25) showed lower muscle activity than machine squat (35.36 ± 10.28). In the holding section of RVL, general squat(39.32 ± 17.19) and laser squat(42.16 ± 16.89) showed lower muscle activity than machine squat (54.08 ± 16.63). In the ascending section of RVL, the general squat(28.87 ± 10.99) showed lower muscle activity than the machine squat(34.77 ± 11.91). The imbalance between VMO and VL is reported to be one of PFPS(Patellofemoral pain syndrome). The VMO and VL muscle activity ratios are indicators of medial and lateral forces on the patella, indicating muscle dysfunction and mobilization pattern changes^[21]. Aglietti et al.(1993) reported that quadriceps angle(Q-angle) is a factor affecting patella instability and PFPS^[22]. When the quadriceps contraction, the patella is pulled toward the patella tendon. Therefore, as the Q-angle increases, the patella moves laterally as the muscle activity of the VL becomes higher than that of the VMO. The increase in Q-angle is related to imbalance of knee joint movement, PFPS, and patella instability. In this study, machine squat was considered to be the most efficient intervention to control the internal rotation of the femur due to the increase of the VMO muscle activity, although the muscle activity of VL was higher in the machine squat than other intervention methods.

A limitation of this study is that the subjects were targeted at normal people, not PFPS. Therefore, in future studies, it is necessary to examine the effect of various squat intervention methods on patients with PFPS. Other limitations include the weakness of hip joint abductor and hip joint external rotator, characterized by PFPS^[23,24]. A study on the effect of various squat intervention methods on the muscle activity of the muscles around the hip joints should be preceded.

Conclusion

This study investigated the muscle activity of ES, GM, VMO, and VMO/VL during squat exercise under various intervention methods (general squat, machine squat, laser squat). This study suggests that machine squat is effective as an intervention to increase muscle activity of GM, VMO and VMO/VL during squat exercise.

Ethical Clearance: Not required

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Conflict of Interest: Nil

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The Effect of Self-Control and Parenting Attitude on Cyberbullying: Focus on Mediating Cyber Ethics

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ABSTRACT

Violence and crime are taking place in the cyber space that is forming a new culture and ethics, and internet ethical consciousness is required. This study was to investigate whether self - control and parenting attitude directly affect cyberbullying. Also, it was confirmed that this self – control and parenting attitude affects cyber ethics. In addition, we tried to confirm whether there is a mediating effect of cyber ethics on cyberbullying. For this, 283 data were collected from cyber violence experienced people. The research method used factor analysis and covariance structure analysis. The results of the study are as follows. First, self - control and parenting attitudes had a significant effect on cyber ethics. Second, the mediating effect was confirmed in the causal relationship between parenting attitude toward children and cyberbullying. These findings suggest that parents' democratic attitude and cyber ethics should be strengthened to prevent and reduce cyberbullying. It should develop the ability to recognize cyber space correctly through parent education program, cyber ethics awareness program, cyber violence reduction and prevention program.

Keywords: *self-control, parenting attitude, cyberbullying, responsibility ethics, respect ethics, cyber ethics*

Introduction

Cyber space is an information activity space created by the Internet, and it is a social, economic, and cultural space beyond information communication that simply exchanges information. It is possible to communicate variously through cyberspace, experience positive functions such as information sharing and creation, and social solidarity¹. On the other hand, the dysfunctional phenomena of information and communication society such as cyberbullying, cyber defamation and hacking are increasing not only for the general public but also for adolescents. The development of information and communication technologies and the high penetration rate of smart devices are accompanied by dysfunctional and pure functions⁴. The abuse of cyber violence in online and SNS as well as in the domestic are raised as a serious social

problem. Domestic cyber violence is mainly focused on smartphones¹¹ that can use KakaoTalk or SNS, rather than computer based ones. The rate of traditional school violence accompanied by money laundering or violence decreases¹⁰ on the other hand, the proportion of cyber violence or language violence using e-mail, smartphone, and SNS has increased rather than increased.

As the age of cyber-violent perpetrators decreases, cyber-violence does not know that it is a crime. Instead, it recognizes cyber violence as “play” and does not feel guilty “just bored”. Juveniles who have been victimized are again perpetrators⁶. There are some researches to find the cause of cyber violence in the form of internet use of adolescents. The more cyber violence the more the adolescents who have a lot of internet contact and use the internet excessively.^{5,15,17} In addition, among the psychological characteristics of adolescents, sensory pursuit propensity and impulsiveness are also factors that directly affect cyber violence. Impulsiveness among adolescent psychological characteristics is a risk factor affecting adolescents' Internet related delinquency, and it is found to be the main cause of increasing cyber verbal violence. Much research has been done in the field of juvenile delinquency. Adolescents with high self-control

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will suppress impulsive and temporary needs, and follow the norms and values required by society, schools, and parents. Lack self-control cause their colleagues to become bullied and alienated^{9,12}. Attack behaviors due to these personality traits reduce the opportunities to acquire social skills from their positive colleagues, which leads to problems such as smoking, drinking and violence. The relationship between self-control and cyber-violence experiences, the lower self-control, the more cyber violence increases.

Effects of parenting attitudes and parental relationships on cyber violence³. Cyber violence is more frequent among adolescents with low family cohesion and low parental attachment¹⁶. In addition, the more cyber violence the adolescents perceive, the more the authoritative and controllable parenting attitude and the negative parent-child relationship were revealed. Therefore, it was found that the relationship between the family and parent perceived by adolescents has a direct effect on cyber violence.

As a member of cyber space, it can be said that normative standard system is needed to judge right and wrong, good and bad, ethical and unethical behaviors in living information society¹³. The point of view of internet ethics means the ability to pursue ideals through rational thinking and establish self-moral principles and follow them. All words and behaviors that occur in cyberspace must observe the principle of respecting individual autonomy, it is responsible for all activities¹⁴. Therefore, in cyberspace more sense of responsibility is required than in the real world. Nonetheless, the fact that violence and crime are carried out without guilt under the name of relieving stress by anonymity and other loss on cyber is the reason why the necessity of internet ethical consciousness becomes more urgent.

Each scholar presents various principles of internet ethical consciousness. But in this study the ethical consciousness of the internet is defined as 'the moral idea that the social member finds his original self in the new framework of information society formed by cyberspace, reflects whether his choice is reasonable and morally justified, And the ability to make judgments of right and wrong that should be basically achieved through self-understanding. We will also examine how ethical consciousness influences cyber violence, focusing on the principle of respect and responsibility.

Factors affecting cyber violence are very diverse including personal variables, environmental variables, and family - related variables. In this study, cyber violence is defined as all activities that cause physical, mental and physical damage to a specific object regardless of the other's intention in the cyber space, investigates the effects of self-control and parental rearing attitudes on cyber violence and cyber-ethical consciousness as well as prevention and reduction of cyber violence.

Method

Research Hypothesis

Hypothesis 1: Self-control will have a positive impact on cyber ethics.

Hypothesis 1-1: Self-control will have a positive impact on respect ethics.

Hypothesis 1-2: Self-control will have a positive impact on the sense of responsibility

Hypothesis 2: Parenting attitudes toward children will have a positive impact on cyber ethics.

Hypothesis 2-1: Parenting attitudes will have a positive impact on respect ethics.

Hypothesis 2-2: Parenting attitudes will have a positive impact on the sense of responsibility.

Hypothesis 3: Cyber ethics will have a positive impact on cyberbullying.

Hypothesis 3-1: Respect Ethics will have a positive impact on cyberbullying.

Hypothesis 3-2: Responsibility Ethics will have a positive impact on cyberbullying.

Hypothesis 4: Self-control will have a positive impact on cyber-violence.

Hypothesis 5: Parenting attitudes toward children will have a positive impact on cyberbullying.

Hypothesis 6: Self - control will affect cyberbullying as a mediator of cyber ethics.

Hypothesis 6-1: Self – control will affect cyberbullying as a mediator of respect ethics.

Hypothesis 6-2: Self – control will affect cyberbullying as a mediator of responsibility ethics.

Hypothesis 7: The parenting attitude toward children will affect cyberbullying by mediating cyber ethics.

Hypothesis 7-1: The parenting attitude toward children will affect cyberbullying by mediating respect ethics.

Hypothesis 7-2: The parenting attitude toward children will affect cyberbullying by mediating responsibility ethics.

The purpose of this study is to identify the research hypotheses based on previous research results on cyberbullying, self - control and parenting attitude, and cyber ethical consciousness. For this, we set up the research model as figure 1.

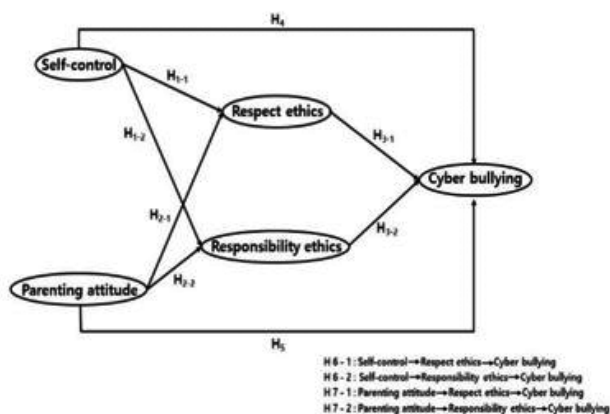


Figure 1: Research model

Subjects: The data used in the analysis for this study are 283 except for the insincere response and non – response.

Measurement

Self-control Scale: Self-control means that you can control your own cognition, emotion and behavior as you wish. In this study, 5 items were used to measure self-control among the PSI (Problem-Solving Inventory). Cronbach's $\alpha = .807$ was confirmed as a result of internal consistency of items constituting self-control.

Parenting Attitude: In order to measure parenting attitudes in this study, ⁷ used four items measured as acceptance - rejection and autonomy – control⁷. Cronbach's $\alpha = .829$ was confirmed as a result of the reliability analysis of parents' parenting attitude.

Cyber Ethics: The cyber-ethical consciousness is a measure of the ethical awareness of individual members of society by creating comprehensive norms for the members of society who live in information society. In this study, we used 10 items of the Respect and Responsibility domain of 20 items including the detailed factors ⁸. As a result of the reliability analysis of cyber ethics, Cronbach's $\alpha = .588$ and Cronbach's $\alpha = .773$.

Cyberbullying: Cyberbullying refers to any act that occurs in cyberspace or related to cyberspace, and that gives physical, mental, and physical damage to a specific object regardless of the other's intention. In order to measure this, five items were selected based on the items of cyber violence survey of the Korea Communications Commission (KISA) and Korea Internet Security Agency. Cronbach's alpha = .823 for the reliability analysis of cyberbullying.

Data Analysis: A causal relationship model among these variables was established and its validity was verified. The covariance structure analysis was performed using AMOS 21.0. confirmatory factor analysis was used to confirm the validity of the scales used in this study, and Cronbach's α coefficient was used for reliability.

Results and Discussion

Research Model Verification: In order to verify the fit of the research model prior to the verification of the research model, the indexes commonly used in existing causal studies were used. First, χ^2 test was conducted to confirm the fit of the study model. RMR, RMSEA, GFI, and AGFI were used as absolute fit indices, and NFI, CFI, and TLI were used as incremental fit indices. Table 1 shows the initial and final model fit and results for the causal model of self-control and parenting attitudes on cyberbullying.

As a result of the validation, GFI = .914 AGFI = .884 and NFI = .866 among the fitness indexes of the study model. Therefore, this study improved the fit of the research model by removing one item of cyber verbal violence which is confirmed as a measurement variable of the measurement error with the modification index. This study adopts the revised model extracted through the modification process as the final model. 2, the final model is derived.

Table 1: Comparison of the Research Model and the Final Model Fit Indices

Fit Indices	RMR	RMSEA	GFI	AGFI	NFI	CFI	TLI
Research model	.069	.054	.914	.884	.866	.934	.919
Finalized model	.068	.053	.920	.890	.868	.936	.920
Acceptance level	>.05	<0.8	>.90	>.90	>.90	>.90	>.90

Research model: $\chi^2=284.932$, $df=156$, $p<.000$

Finalized model: $\chi^2=247.468$, $df=138$, $p<.026$

Research Hypothesis Testing: Based on the results of the final model analysis, the results of the hypothesis testing proposed in this study are shown in Figure 2, Table 2. First, hypothesis 1-1 tried to confirm that self-control will have a positive effect on respect ethics. As a result, the standardized path coefficient between two variables was .048 ($t = .415$, $p > .01$), which did not have a significant effect. Therefore, hypothesis 1-1 was rejected.

Hypothesis 1-2 confirmed that self-control will have a statistically significant effect on the sense of responsibility ethics. As a result, the standardized path coefficient between the two variables was .130 ($t = 1.979$, $p < .05$) and had a positive effect. In other words, the higher the self-control, the higher the level of responsibility ethics. Therefore, Hypothesis 1-2 was adopted. Hypothesis 2-1 confirmed that parenting attitude will have a statistically significant effect on respectful ethics. As a result, the standardized path coefficient between the two variables was .346 ($t = 3.724$, $p < .001$), which had a significant effect. That is, the more democratic the parenting attitude was, the higher the esteem was. Therefore, Hypothesis 2-1 was adopted.

Hypothesis 2-2 that examine the standardized path coefficient between two variables was .266 ($t = 4.924$, $p < .001$), which had a significant effect. In other words, the higher the democratic parenting attitude, the higher the sense of responsible ethics. Therefore, Hypothesis 2-2 was adopted.

Hypothesis 3-1 that examine the respect ethics will have a positive effect on cyber violence. As a result, the standardized path coefficient between the two variables was .421 ($t = 4.359$, $p < .001$), which had a positive effect. In other words, the more cyber violence was, the lower the people who lacked respect for ethics. Therefore, Hypothesis 3-1 was adopted.

Hypothesis 3-2 effect of responsibility ethics and cyber violence as a result, the standardized path coefficient between the two variables was .460 ($t = 5.182$,

$p < .001$), which had a positive effect. In other words, cyber violence was higher among people who lacked (low) consciousness of responsible ethics. Therefore, Hypothesis 3-1 was adopted.

Hypothesis 4 seeks to confirm that self-control will have a positive effect on cyber-violence. As a result, the standardized path coefficient between two variables was .020 ($t = .286$, $p > .05$), which did not have a significant effect. Therefore, Hypothesis 4 was rejected.

Hypothesis 5 seeks to confirm that parenting attitudes will have a positive impact on cyber violence. As a result, the standardization path coefficient between two variables was $-.025$ ($t = -.407$, $p > .05$), which did not have a significant effect. Therefore, Hypothesis 5 was rejected.

Hypothesis 6-1 seeks to confirm the mediating effect of self-control will affect cyber violence through mediation of respect ethics. As a result of examining the mediating effect on the basis of the statistical significance of the path coefficient, the standardization coefficient of the direct path on the self-regulating self-esteem was not affected by .048 ($t = .415$, $p > .01$) so Hypothesis 6-1 was rejected.

Hypothesis 6-2 seeks to confirm the mediating effect of self-control will affect cyber violence through mediation of responsibility ethics. As a result, we found that the standardization factor of the direct path of self-control on the sense of responsibility ethics was significantly influenced by .130 ($t = 1.979$, $p < .05$) The standardized coefficient of direct path for self-control on cyber violence was .020 ($t = .286$, $p > .05$). In addition, the standardization factor of the direct path of responsibility ethics to cyber violence was .460 ($t = 5.182$, $p < .001$), which had a significant effect. Therefore Hypothesis 6-2 is adopted.

Hypothesis 7-1 tried to confirm the mediating effect of parenting attitude will affect cyber violence through mediation of respect ethics. As a result, it was found that the standardization factor of the direct

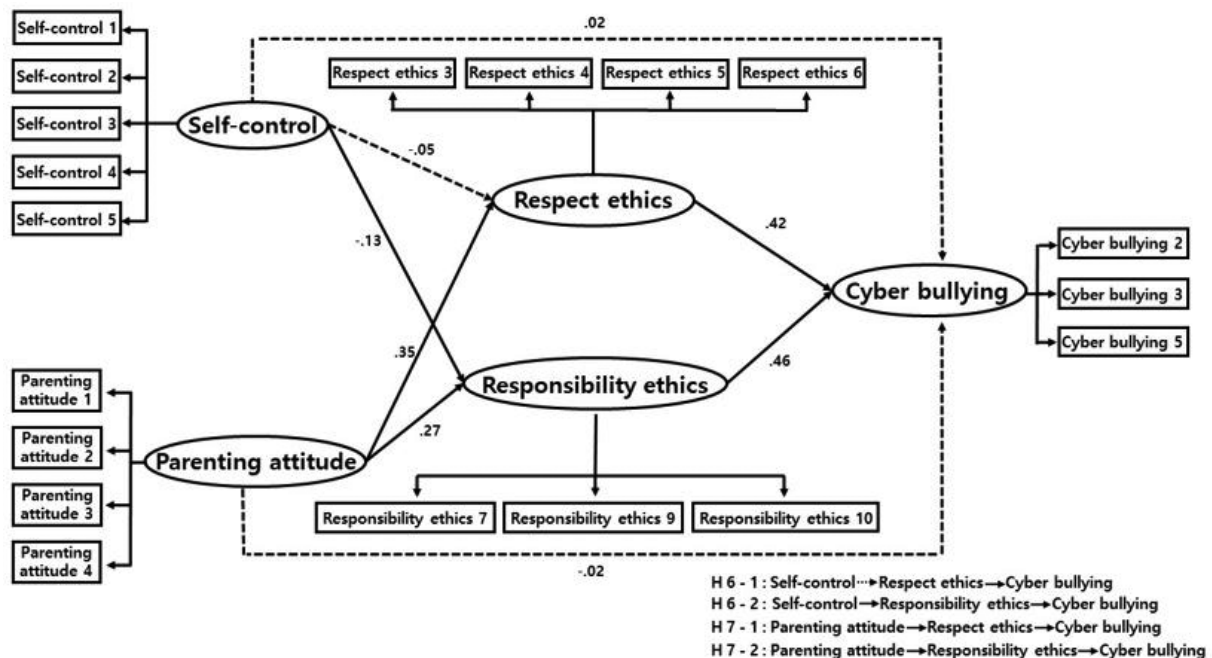
path of parenting attitude toward respect ethics was significantly influenced by .346 ($t = 3.724$, $p < .001$). And the standardization factor of the direct path of parental rearing attitude toward cyber violence was -0.25 ($t = -.407$, $p > .05$). In addition, the standardization factor of the direct path of respect ethics to cyber violence was .421 ($t = 4.359$, $p < .001$), which had a significant effect. Therefore, the hypothesis 7-1 was adopted.

Hypothesis 7-2 seeks to confirm the mediating effect of parenting attitude will affect cyber violence

through mediation of responsibility ethics. As a result, we found that the standardization factor of direct path of parental rearing attitude toward responsibility ethics was significantly influenced by .266 ($t = 4.924$, $p < .001$). And the standardization factor of the direct path of parental rearing attitude toward cyber violence was -0.25 ($t = -.407$, $p > .05$). In addition, the standardization factor of the direct path of responsibility ethics to cyber violence was .460 ($t = 5.182$, $p < .001$), which had a significant effect. Therefore, it is confirmed that there is complete mediation effect, and Hypothesis 7-2 is adopted.

Table 2: Hypothesis testing Results

Channel			Estimate	S.E.	C.R.	p	Result
Respect ethics	←	Self- control	-.048	.116	-.415	.678	Reject
Responsibility ethics	←	Parenting attitude	.266	.054	4.924	***	Accept
Responsibility ethics	←	Self- control	-.130	.066	-1.979	.048	Accept
Respect ethics	←	Parenting attitude	.346	.093	3.724	***	Accept
Cyberbullying	←	Respect ethics.	.421	.097	4.359	***	Accept
Cyberbullying	←	Responsibility ethics	.460	.089	5.182	***	Accept
Cyberbullying	←	Self- control	.020	.068	.286	.775	Reject
Cyberbullying	←	Parenting attitude	-.025	.061	-.407	.684	Reject
Self-control→ Respect ethics→ Cyberbullying			-				Reject
Self-control→ Responsibility ethics → Cyberbullying			Partial mediation				Accept
Parenting Attitude→ Respect ethics→ Cyberbullying			Complete mediation				Accept
Parenting Attitude→ Responsibility ethics→ Cyberbullying			Complete mediation				Accept



※ A solid line is an adopted hypothesis; a dotted line a rejected one

Figure 2: Finalized Research Model

Conclusion

The purpose of this study was to investigate whether self - control and parenting attitude directly affect cyberbullying. Also, it was confirmed that this self – control and parenting attitude affects cyber ethics. In addition, we tried to confirm whether there is a mediating effect of cyber ethics on cyberbullying.

The research implications are as follows: First, self - control and parenting attitude affects cyber ethics consciousness. Especially, it is confirmed that parenting attitude is very effective in strengthening the awareness of cyber ethics. Second, parenting attitude directly affects cyber violence. In addition, it was confirmed that the attitude of parental rearing has a full mediation effect on the causal relationship between cyber violence and cyber ethics. These findings have contributed to reveal that cyber ethics is playing an important role in understanding cyber violence academically.

Practical implications are as follows.

First, it is worth the research that it is necessary to prepare a self-control training program in the field of education because the effort to increase self-control of students can strengthen the sense of responsibility ethics. Second, the parenting attitude strengthens the cyber ethical consciousness and establishes a parent education program that establishes the perception that it is important to maintain a democratic parenting attitude by parents through causality that results in reducing cyber violence I need something. Third, strengthening the awareness of cyber ethics plays a crucial role in reducing cyber violence. Based on the results of the study, it is necessary to prepare an educational program to strengthen students' awareness of cyber ethics in the school scene. Finally, cyber violence, such as attacking a large number of people who do not know anonymity as a weapon, can be interpreted as an act of deviance in adolescence, but since these behaviors constitute a crime, cyber-ethics education and cyber violence reduction and prevention programs It is necessary to develop competence to recognize cyber space correctly. Despite these findings, the limitations of this study and suggestions for future research are as follows. This study has limitations because it is limited to college students. Therefore, it does not include all age groups who have cyber violence. In the future, it will be necessary to make efforts to generalize the research results by conducting

research including youth. In addition, there is a limitation that this study considers only the self - control and parenting attitude variables affecting cyber violence. In the future, it is necessary to construct a comprehensive research model that considers other variables that may affect cyber violence.

Ethical Clearance: Not required

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Conflict of Interest: Nil

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A Study on Pregnancy Stress and Related Factors in Pregnant Women

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ABSTRACT

Background/Objectives: This study has been attempted to identify the pregnancy stress of Korean women by considering antenatal depression, maternal fetal attachment, and social support.

Method/Statistical Analysis: The data were collected by means of a questionnaire of 195 pregnant women between June 1 and August 30, 2018. Data were analyzed by frequency analysis, Cronbach's alpha coefficients, Pearson's correlation using SPSS 18.0.

Findings: The average score of pregnancy stress was 85.0, antenatal depression was 7.3, maternal fetal attachment 70.2, and social support 36.0. Pregnancy stress was significantly correlated with antenatal depression ($r=.29$, $p<.001$), maternal fetal attachment ($r=.23$, $p<.001$), and social support ($r=.19$, $p<.001$). Pregnancy stress level was not significantly different depend on age, marriage age, pregnancy period, children, miscarriage experience, religion, educational level, vocational state, and household income.

Improvements/Applications: These findings suggest that healthcare professionals have more attention about pregnancy stress, and they should provide pregnancy stress screening and intervention programs for management and prevention of pregnancy stress period during whole pregnancy period.

Keywords: *Pregnancy stress, antenatal depression, maternal fetal attachment, social support, pregnant women*

Introduction

Pregnancy, the important process required to give birth to the next generation, involves numerous changes, along with procedures to adapt to these changes. Pregnancy has been identified as a stressful event in a women's life that asks a significant physical and psychological adaptation^[1]. While some pregnant women experience these dramatic changes in their lives as part of a happy and satisfying maturing process, others suffer from emotional difficulties such as main stress and depression. Pregnancy stress occurs when a pregnant woman is unable to appropriately respond to the various changes and stimuli encountered during

the pregnancy. The major causes of pregnancy stress include the physiological, psychological, emotional and socioeconomic changes associated with the pregnancy, anxieties about labor pain and childbirth, and concerns about the unborn baby and parenting^[1,2]. This type of stress incident and depression is most commonly experienced by pregnant women. Pregnancy stress and depression during pregnancy can cause a huge number of maternal as well as neonatal negative effects in many fields. Pregnancy stress increases the frequency of cesarean section and premature in pregnant women, as well as the prevalence of fetal disorders including lowered immunity and infection^[3,4]. Pregnancy stress and depression also increases inappropriate fetal activity, adversely affecting the physical health of a fetus or inhibiting fetal growth. In this way, pregnancy stress may negatively affect both pregnancy and childbirth, and may become a serious problem even in the later parenting of the child^[5,6]. Moreover, pregnancy stress causes postpartum depression as well as decreased attachment to the fetus, leading to negative effects on the family's quality of

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life. Mother's mental health, like anxiety and depression recognized as a main public health problem in the world due to serious consequences for the pregnancy as well as nurturing baby after their birth^[7]. Changes in social relations during the pregnancy are also a pregnancy stress factor. The persons important to a pregnant woman include the fetus and the spouse. The fetus is a very important person to a pregnant woman, and the two mutually affect each other through the physiological communion during the pregnancy. A pregnant woman develops an intimate emotional relationship and actions with the fetus during the pregnancy. The intimacy and the feeling of connectedness between a pregnant woman and her fetus are referred to as maternal fetal attachment, which is closely related to pregnancy stress^[5,6]. The spouse, another important person to a pregnant woman, is also closely associated with various pregnancy stress factors, including the psychological, physical, and social adaptation of the pregnant woman. The spouse's support may serve as a buffer to pregnancy stress by decreasing the pregnant woman's stress, increasing her self-efficacy, and inducing positive childbirth, but the support may also sometimes have a negative effect^[3,7,8]. Therefore, the pregnancy stress may be decreased as the pregnant woman forms maternal fetal attachment, while at the same time the social support system, including the spouse, provides appropriate support to the pregnant women^[7,8]. Recent reports have shown that in addition to the human social support system, social media are recognized as an important support system before, during, and after pregnancy, and that many pregnant women receive social support through social media. When they have available time, pregnant women access social media to acquire various types of information and knowledge that are necessary in each stage of pregnancy and to receive effective support for the pregnancy. This information and knowledge support may reduce the stress related to pregnancy^[8]. Therefore, this quantitative study was conducted to explore the level of pregnancy stress, antenatal depression, maternal fetal detachment, and social support to fully understand pregnant women and to be utilized as basic data in nursing intervention and research on pregnancy stress.

Materials and Method

Setting and Recruitment: From June to August 2018, recruitment was taken place in the mom support center in Cheonan City of Republic of Korea. Research

staff explained the study in detail and answered any questions. After approving of the study participation, they completed questionnaires.

Data Collection

Instruments and Variables: Pregnancy stress scale^[9] was used to measure the degree of stress during pregnancy and the scale contains 26 items. Each item is rated from 1 to 5 points where the higher the score the higher the pregnancy stress. The score of Cronbach's α was .84^[9], and .93 in this study. Antenatal depression scale^[10] was used to measure the degree of antenatal depression during pregnancy and the scale contains 10 items. Each item is rated from 0 to 3 points where the higher the score the higher the antenatal depression. The score of Cronbach's α was .87^[10], and .92 in this study. Maternal fetal attachment scale^[11] was used to measure the construct of maternal fetal attachment during pregnancy and the scale contains 24 items. Each item is rated from 1 to 4 points where the higher the score the higher the maternal fetal attachment. The score of Cronbach's α was .85^[11], and .94 in this study. Social support scale^[12] was used to measure the support from others during pregnancy and the scale contains 10 items. Each item is rated from 1 to 5 points where the higher the score the higher the social support. The score of Cronbach's α was .82^[12], and .83 in this study.

Data Collection Process and Data Analysis: Participants were asked to complete the baseline questionnaires for their socio-demographic information and research questionnaire when they visiting the mom center program. Collected data were analyzed using SPSS 18.0 by numeric number, percentile, mean scores and standard deviation, Pearson's correlation. The reliability of the measurement was done by Cronbach's alpha.

Ethical Considerations: Participants were informed that the collected data would not be used for any purposes except this study, and that they could withdraw their participation at any time. Written informed consent was obtained from each participant. After completing questionnaires provide a present.

Results and Discussion

All participants were married, and the age of the participants was the majority (80.0%) in the thirties. Marriage age was the majority (69.2%) in the thirties and

twenties was the next. Duration of their pregnancy was more than twenty weeks in 94.9%. The majority (62.0%) was in their first pregnancy, 71.8% did not experience abortion. More than half (54.8%) of participants were no religion, and they graduated more than college in 85.6%. In total 36.9% of women had an occupation during pregnancy, and 64.7% of participants had a monthly family income more than three million won. Additionally, pregnancy stress level was not significantly different depend on age, marriage age, pregnancy period, children, miscarriage experience, religion, educational level, vocational state, and household income[Table 1].

The results showed that the average score of pregnancy stress was 85.0 ± 18.7 , antenatal depression, 7.3 ± 3.5 , maternal fetal attachment, 70.2 ± 11.8 , and social support, 36.0 ± 5.5 [Table 2].

Pregnancy stress was significantly correlated with antenatal depression($r=.29$, $p<.001$), maternal fetal attachment($r= -.23$, $p<.001$), and social support($r= -.19$, $p<.001$). Antenatal depression was significantly correlated with maternal fetal attachment($r= -.24$, $p<.001$), and social support($r= -.43$, $p<.001$). Maternal fetal attachment was also correlated with social support($r=.46$, $p<.001$)[Table 3].

The average pregnancy stress score of the participants in the present study was 85.0 points out of 100 points. The pregnancy stress was at a medium high level, probably owing to concerns about childbirth,

because the study participants included pregnant women in all stages of pregnancy, with most in stages after 20 weeks. The pregnancy stress level may differ between stages of pregnancy in which different pregnancy stress factors are involved; therefore, further study may be required to investigate pregnancy stress levels in the individual stages of pregnancy. The average antenatal depression score of the participants in the present study was 7.3 points out of 30 points. If antenatal depression of 10 points or higher is considered a high level of antenatal depression, the overall level of prenatal depression among the present study participants was not high. Other studies revealed that the depression score in England women after their birth was 6.70, and Ireland women's score was 7.20 after their birth^[13,14]. The average maternal fetal attachment score of the participants in the present study was 70.2 points out of 96 points. As the pregnancy was the first one in 62% of the participants, and 63.1% of the participants were unemployed or on leave of absence, the antenatal depression level was likely low among the participants because their pregnancy was desired or because they had the opportunity to concentrate on their pregnancy. The average social support score of the participants in the present study was 36.0 points out of 60 points. Considering that the pregnancy was the first one in the majority of the participants, without the experience of childbirth, they might have not searched for a social support system or received social support. A high level of pregnancy stress has been reported as a cause of antenatal depression^[6].

Table 1: General Characteristics (N = 195)

Characteristics	Cate-gories	n (%)	Pregnancy stress Mean $\pm$ SD	P. stress t, F (P)
Age (yr)	20~29	30 (15.4)	85.13 ± 16.04	2.08 (.482)
	30~39	156 (80.0)	85.28 ± 11.38	
	40~49	9 (4.6)	84.90 ± 15.71	
Marriage age	20~29	56 (28.7)	84.33 ± 11.65	0.41 (.225)
	30~39	135 (69.2)	85.52 ± 12.15	
	40~49	4 (2.1)	87.24 ± 14.39	
Pregnancy period (weeks)	10~ under 20	10 (5.1)	85.88 ± 12.66	1.42 (.354)
	20~ under 30	78 (40.0)	85.57 ± 16.22	
	over 30	107 (54.9)	82.44 ± 12.09	
Children (including this pregnancy)	1	121 (62.0)	85.88 ± 12.66	1.22 (.223)
	2	62 (31.8)	83.57 ± 15.22	
	3	12 (6.2)	85.44 ± 12.09	
Miscarriage experience	Yes	55 (28.2)	82.76 ± 12.08	0.02 (.284)
	No	140 (71.8)	85.01 ± 14.87	

Conted...

Religion	Christianity	60 (30.8)	87.03 ± 11.66	2.11 (.241)
	Catholicism	14 (7.2)	84.07 ± 12.89	
	Buddhism	14 (7.2)	84.67 ± 13.05	
	None	107 (54.8)	85.60 ± 16.16	
Educational level	High school	28 (14.4)	86.88 ± 12.66	1.18 (.207)
	College	144 (73.8)	85.57 ± 14.22	
	More than college	23 (11.8)	85.44 ± 12.09	
Vocational state	Yes	72 (36.9)	84.88 ± 17.66	0.74 (.360)
	No	77 (39.5)	85.57 ± 11.22	
	Layoff	46 (23.6)	87.44 ± 15.09	
Household income	Under three million won	69 (35.4)	85.88 ± 16.66	1.35 (.161)
	Three~five million won	82 (42.1)	85.57 ± 14.22	
	Over five million won	44 (22.6)	83.44 ± 13.09	

Table 2: Pregnancy Stress, Antenatal Depression, Maternal Fetal Attachment, and Social Support (N = 195)

Variables	Mean ± SD
Pregnancy stress	85.0 ± 18.7
Antenatal depression	7.3 ± 3.5
Maternal fetal attachment	70.2 ± 11.8
Social support	36.0 ± 5.5

Table 3: Correlation of Pregnancy Stress, Antenatal Depression, Maternal Fetal Attachment, and Social Support

Variables	Pregnancy stress	Antenatal depression	Maternal fetal attachment
Antenatal depression	.29**		
Maternal fetal attachment	-.23**	-.24**	
Social support	-.19**	-.43**	.46**

High levels of antenatal stress were significantly related with antenatal depression. The results of the some study also indentified a significant positive relationship between pregnancy stress and antenatal depression. It coincidence with prior studies showing a correlation between depressive symptoms or psychiatric disorders and increased pregnancy stress^[14,15]. Pregnancy stress may be caused by various factors, but levels of antenatal

depression are high in cases in which the pregnant woman is less helped by the husband and family, has a low degree of satisfaction with the marriage life, and has poor health, and in which the pregnancy is unplanned. Therefore, much attention should be paid to the physical and emotional conditions of pregnant women, and positive support should be provided accordingly. Antenatal depression is a mood disorder caused by the hormonal changes during the pregnancy and the accumulated difficulties in pregnancy. Previous studies have shown that antenatal depression was increased along with pregnancy stress, and that maternal fetal attachment was low in pregnant women with high levels of antenatal depression.

Maternal fetal attachment is the starting point of the relationship between the pregnant woman and the fetus before childbirth, and it refers to the degree of the interaction that the pregnant woman has with the fetus or the participation in actions showing affection. As a developmental task of a pregnant woman, maternal fetal attachment is a part of the pregnancy adaptation process and works as a predictor of the postnatal infant attachment^[16]. A meta-analysis examining the factors involved in maternal fetal attachment showed that the strongest factor was social support, and other significant factors included anxiety and depression, consistent with the findings of the present study^[16]. Because maternal fetal attachment is the source of successful interaction between the mother and the baby after childbirth, it is absolutely necessary for both the pregnant woman and the baby to form a positive maternal fetal relationship

from the period of pregnancy^[6]. One of the major factors that hinder maternal fetal attachment is antenatal depression^[17]. An investigation of the correlation between antenatal depression and maternal fetal attachment showed that antenatal depression in pregnant women is negatively correlated with maternal fetal attachment. Antenatal depression has a long-lasting effect^[18], as it is significantly correlated with not only the fetal period but also with sleep disorders of the child in infancy. Therefore, pregnancy stress and antenatal depression must be managed carefully and positively, as key risk factors to the health and development of children. An overall review of intervention programs for pregnant women showed that the women prefer face-to-face education, which allows them to ask questions of nurses, over programs using videos or books^[19]. The study also emphasized that nursing is more often required for individual pregnant women who have weaker support systems. Therefore, intervention programs for reducing antenatal depression need to be developed in consideration of the circumstances of individual pregnant women.

In particular, antenatal depression was about six times higher among pregnant women who felt that they lacked support from their spouses. These results showed that the sample of Korean women in this study received a moderate-low level of social support. Of various social support systems, support from spouses had the greatest effect. Therefore, prenatal education programs for pregnant women and their spouses need to include methods to increase the understanding of pregnancy and to enhance support by the spouses. Healthcare professionals need to be aware of and identify the meaningful contribution of social support, especially from spouse, family and friends in positively affecting mothers' mental health and well-being till the postpartum period. Reports have additionally shown that antenatal anxiety also increased antenatal depression, and that predisposing factors for depression are antenatal anxiety and depression, and history of depression prior to pregnancy^[19,20]. Therefore, intervention programs must be provided for emotional management of women preparing for pregnancy before, during, and after pregnancy.

Conclusion

In conclusion, this study showed that perceived pregnancy stress was medium and stress level was higher

than that of other female adults. The present study is significant in that it verified that the psychological state of a pregnant woman affects her interest in her fetus. Various factors associated with pregnancy stress must be identified, and intervention programs to decrease them should be implemented. In addition, the sharing of information through the internet should be facilitated as one of the social support systems, and the relevant apps must be developed and applied so that pregnant women may acquire information in the desired stages of pregnancy at the desired time in the customized support system. Healthcare professionals need to monitor antenatal depression from the early stage of pregnancy to identify risk groups. The predictors of antenatal depression and the pregnancy stress level should be continuously investigated during the pregnancy in order to provide necessary prenatal education as well as pregnancy stress and antenatal depression prevention education through consultation. In addition, a longitudinal follow-up study of pregnant women may need to be conducted to identify pregnancy stress factors in each stage of pregnancy, and to allow development of intervention programs based on the results. Also, accurate assessment for both subjective and objective pregnancy stress, and better assessment for factors that affect pregnancy stress such as duration of pregnancy, support from in-laws, and physical change are needed as well as an intervention to reduce pregnancy stress. Moreover, further studies may need to be performed to investigate and compare the pregnancy stress, antenatal depression, and maternal fetal attachment among normal pregnant women, unmarried pregnant women, older pregnant women, and high-risk pregnant women.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: The authors declare no conflict of interest.

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A Study on Resveratrol on the Antioxidative and Whitening Cosmeceutical Ingredients

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ABSTRACT

Objectives: Resveratrol is a variety of physiological active substances and is an excellent ingredient in antioxidant, anti-inflammatory and anti-aging action. Therefore, I would like to find out the possibility of adding cosmetics.

Method: The cytotoxicity test using MTT solution was carried out to check the safety of reverse control. Also DPPH assay was performed to measure antioxidant activity in resveratrol itself, and ROS was measured to measure antioxidant activity in cells. NO production was measured to observe anti-inflammatory action, and tyrosinase activity measurement and melanin production were measured to measure skin whitening activity.

Findings: we were able to confirm the safety of resveratrol's cytotoxicity. At concentration of 1, 10, 100 µg/mL of Resveratrol, the DPPH radical scavenging activity was observed to show high concentration - dependent activity of free radical scavenging. And In order to check the antioxidant properties within the cell, the ROS (reactive oxygen specifications) using DCF-DA were observed to reduce the effects. The addition of resveratrol 1, 10, 100 µg/mL on RAW 264.7 macrophages stimulated with lipopolysaccharide resulted in NO produce inhibition in concentration dependent and a strong inhibition rate of 53% at 100 µg/mL concentration. Tyrosinase active action was found to inhibited dose dependant. Melanin produce was also prevented by dose dependant.

Applications: These results suggest that the active oxygen - induced skin inflammation process is delayed as much as possible, so that it can be utilized as a functional cosmetic material having an effect on skin diseases and skin aging.

Keywords: Resveratrol, Antioxidant, DPPH, ROS, Nitric oxide, melanin

Introduction

Resveratrol (3,5,4'-trihydroxy-trans-stilbene) is included in poly-phenol compounds found in various natural substances such as grapes, peanuts, and berries. Trans resveratrol is an antibiotic produced in the vine

against the invasion of fungi, and is often found in grape shells and seeds¹. The amount of resveratrol that is contained in the shell varies depending on the variety, region, and how much mold is exposed². It is well known for its phytosterone and antioxidant³, and in response to the wound, it is a naturally phyto-alexin, produced by several spermatophytes, likes vines⁴. Long-term studies have shown that polyphenols are known as natural antioxidants⁵, especially protecting against oxidative damage caused by human active oxygen⁶. Resveratrol, which belongs to these polyphenols compounds, has been used in various treatments for heart disease, and has been found to have excellent anti-cancer⁷, anti-oxidant⁸, anti-aging effects⁹. Recently, skin whitening has become

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an excellent ingredient¹⁰. As such, Resveratrol is an ingredient in plant systems that has been studied for various physiological and pharmacological effects.

Living things that need oxygen forms are formed by biochemical reactions during metabolic processes and by external environments. This is known as the cause of various diseases such as inflammation, skin aging, and cancer, as it acts as oxidative stress and destroys DNA, substrate and enzymes in the body, causing serious damage to tissue^{11,12}. However, free radicals are not necessarily harmful to the human body. For example, the hydroxide arrow produced as a result of the decomposition of hydrogen peroxide in the body acts as a disinfectant by indiscriminately attacking the hospital. The problem is that it attacks even the molecules that the human body needs. Therefore, substances that have antioxidant efficacy, such as compounds that can kill active oxygen species or substances that suppress the production of peroxide, are expected to be treated for various diseases that are caused by oxidative stress as well as age retardant. Antioxidants produced in the body include catalase, an enzyme that breaks down the calcium hydroxide, and other glutathion and peroxidase. The active site contains Selenium (Se), which can reduce the concentration of active oxygen if the intake of selenium helps to break down hydrogen peroxide in the body. There are also three types of enzymes (SODs) that convert ions of excess oxidation into oxygen and hydrogen peroxide. Their enzymes contain metal ions such as copper, manganese, and zinc. Currently, BHA (butylated-hydroxy-anisole), PG (protylgallate), BHT(butylated- hydroxy-toluene) and TBHQ (t-butylhydroquinone) have been used for synthetic antioxidants, but there is a growing interest in natural antioxidants as safety issues arise, such as avoidance of compounds and toxic effects in heavy use¹³.

Therefore, the possibility of natural antioxidants and anti-inflammatories using resveratrol belonging to polyphenol compounds is monitored to see if they can be expected to be cosmetic materials from a spice point of view.

Reagents and Method

Material: Resveratrol, L-DOPA, (3-(4,5-dimethyliazol-2-yl)-2, 5-diphenyl thrazolium bromide (MTT), Mushroom Tyrosinase, L-tyrosine were obtained from Sigma-Aldrich, Inc. 2',7'-dichlorofluorescein di-acetate (DCF DA) was purchased from the Molecular Probe Co. RAW

264.7 cells and B16 F10 melanin cells were purchased from Seoul National University's Cellular Bank.

Cell Culture: RAW 264.7 macrophages and B16 F10 melanin cells were grown at a concentration of 37°C with 10% phthalate serum and a 5% concentration of phenicillin/streptomysin (100 IU/50 µg/mL).

Cytotoxicity Measurement Using MTT: To confirm the cytotoxicity of Resveratrol, the MTT method was applied. RAW 264.7 cell was used, and divided 1 X 10⁴ cells per well in 96 well plates, cultivated for 24 hours, added sample by concentration, and cultivated at 37°C, CO₂ incubator for 72 hours. After 72 hours, the cultivation solution was removed, and 1mL of 500 µg/mL of MTT solution dissolved in Krebs solution (mM : KCl 2.7, NaCl 137, MgCl₂ 0.5, Na₂HPO₄ 0.4, HEPES [pH 7.4] 10, CaCl₂ 1.8, glucose 5) to each well and cultivated for 4 hours in dark place. Then, the supernatant was removed, and 200 µL of D.M.S.O. was added to dissolve MTT formazan. After completely dissolving MTT formazan for 15 minutes in room temperature, the absorbance was measured in 570nm.

DPPH Radical Scavenging Activity Measurement: 180µL of 0.1 mM DPPH (1,1-diphenyl-2-picrylhydrazyl) solution dissolves in ethanol to 96 well plates resveratrol prepared in each concentration was added 20 µL each, cultivated for 30 minutes in 37°C in the dark were processed to absorbance measurement in 517nm using FL 600 spectrofluorometer (BioTek, Winooski, VT, USA).

$$\text{DPPH radical scavenging activity(\%)} = 100 - \left\{ \frac{\text{Absorbance of added}}{\text{Absorbance of non-added}} \right\} \times 100$$

Intracellular Oxidation Stress Measurement: This experiment statistical analysis was performed using the SPSS Window Version 17.0 (SPSS Inc., Illinois), and the significance was tested by Student's t-test. Was carried out three times or more independently under the same conditions noted in Mean ± standard deviation (Mean ± SD).

Intracellular Nitric Oxide Measurement: RAW 264.7 cell was divided 1ml to each well as 1 X 10⁶ cells/mL to 24 well plates. After mixing 100 µL of cell culture supernatant and 150 µL of Griess reagent to 96 well plates, and reacted 5 minutes and used ELISA reader(BioTek, Winooski, USA) to measure absorbance in 540nm. To create calibration curve, the study used sodium nitrite(NaNO₂) as standard for comparison.

Measuring in-vitro Tyrosinase Activity: As for the activity habit of tyrosinase, the study used L-DOPA and L-tyrosine. L-DOPA was dissolved with 2 mg/mL of phosphate buffer (PBS 0.1 M, pH 6.8), and the concentration of tyrosinase was 25 units/mL. To 90 μ L of tyrosinase, 10 μ L of resveratrol dissolved in different concentration was put into eppendorf tube, mixed, divided into 40 μ L to 96 well plates, added 200 μ L of L-DOPA (2 mg/mL), let it react for 1 hour in 37°C, and measured absorbance in 475 nm. 0.3 mg/mL of L-tyrosine was completely dissolved with potassium phosphate buffer (PBS 0.1 M, pH 6.8) and the tyrosinase concentration was 100 units/mL. To 90 μ L of tyrosinase, 10 μ L of resveratrol dissolved in different concentration was put into eppendorf tube, mixed, divided into 40 μ L to 96 well plates, added 200 μ L of L-tyrosine (0.3 mg/mL), let it react for 1 hour in 37°C, and measured absorbance in 475 nm.

Measured Melanin Product Inhibition: After dividing B16F10 melanin cell into 3 mL to 6 well plates, it was cultivated for 12 hours in phenol red-free DMEM solution include 10 % FBS. And the sample with different concentration were cultivated for 10 minutes in 37°C for preprocessing, and processed 1 μ M of α -MSH(melanocyte stimulating hormone) and cultivated for 72 hours in 37°C. After cultivation, 100 μ L of 10mM phosphate buffer pH 6.8 containing 1 % Triton was added, shook for 5 minutes, moved to tube and centrifuged for 5 minutes in 10,000 rpm. Then, 100 μ L of 1 N NaOH and 100 ml of purified water was added to cell pellet, and cultivated in 60°C for 1 hour to completely dissolve melanin, moved 200 μ L to 96 well plates to measure absorbance of 405 nm. The experiment was conducted 4 times repeatedly in same condition, and obtained average to calculate melanin produced from each well using calibration curve from melanin standard.

Data Analysis and Statistical Verification: Result of experiment was displayed in average $\pm$ S.D and the experiment outcome was verified by non-paired student's t test.

Results and Review

Cytotoxicity Measurement: To determine the cell survival rate of Resveratrol, cytotoxicity was observed using the MTT measurement method using RAW 264.7 cells. All concentrations tested for 72 hours using resveratrol 1, 10, and 100 μ g/mL were not toxic[Figure 1]. Therefore, we were able to confirm the safety of

resveratrol's cytotoxicity. These results are similar to the results of cell survival of more than 90% at the highest concentration of 100 μ M in the study conducted by Ivan M. Petyaev¹⁴.

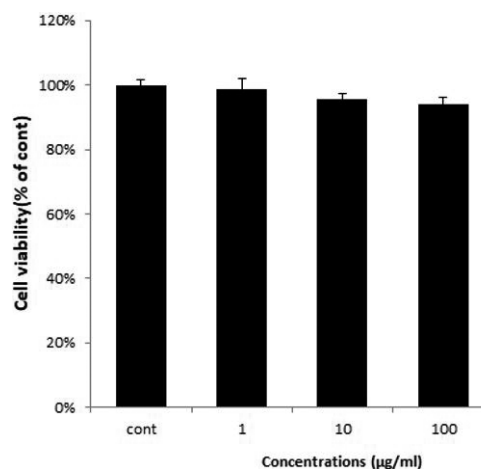


Figure 1: Cell toxicity of Resveratrol in RAW 264.7 cells. No toxicity appeared at all concentrations. Results are averages $\pm$ SD from four times experiments

In Vitro anti-oxidation: Resveratrol is a member of the polyphenolic compounds and is known for its plant-like hormone phytoestrogen, and is reported to have an antioxidant effect in particular¹⁵. The results of observing the cellular protection and antioxidation effect of resveratrol in a study at Jo et al.¹⁶ showed higher antioxidant efficacy than control L-ascorbic acid. Polyphenolic sound is an element closely related to the antioxidant action, which is considered to be part of Resveratrol's own anti-oxidant efficacy and thus was measured by DPPH radiological. At concentration of 1, 10, 100 μ g/mL of Resveratrol, the DPPH radiological activity was observed to show high concentration - dependent activity of free radical scavenging[Figure 2].

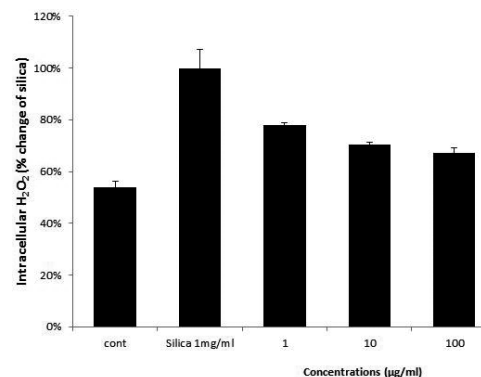


Figure 2: Antioxidant activity of Resveratrol in DPPH Assay. Dose dependent on activity of antioxidant. Results are averages $\pm$ SD from four times experiments

Reactive-oxygen species (ROS) scavenging activity of RAW 264.7 macrophage: Aerobic organisms, through their respiration, obtain oxygen, which is absolutely necessary, as energy. In the process, they constantly produce active oxygen such as super-oxide radical, hydroxyl-radical and hydrogen- peroxide¹⁷. These free radicals are known to damage the lipids, proteins, sugars and DNA that make up the cells, causing various diseases and aging such as skin and heart diseases, cancer, digestive disorders, inflammation, rheumatoid and autoimmune diseases^{18,19}. Resveratrol, which belongs to a polyphenolic compound with a rich antioxidant efficacy, was verified in a previous experiment to verify the activity of DPPH free radiological removal in the test tube, and In order to check the antioxidant properties within the cell, the ROS (reactive oxygen specifications) using DCF-DA were observed to reduce the effects. ROS was inhibited by 33% at the highest concentration of 100 µg/mL in cells induced by 1 mg/mL of silica[Figure 3]. These results are consistent with the DPPH radiological denotential results.

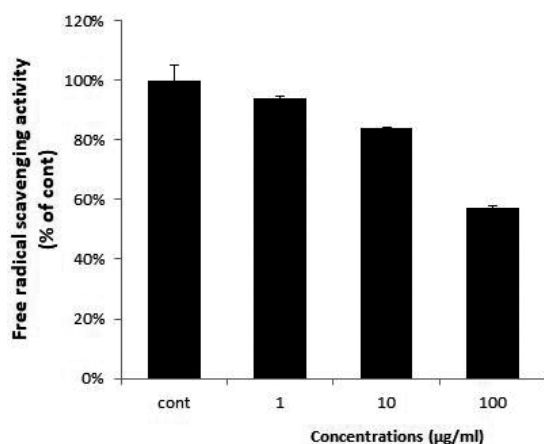


Figure 3: Antioxidant activity of Resveratrol 1 mg/mL silica-induced ROS production in Raw 264.7 macrophage. ROS produce was inhibited at all concentrations. Results are averages ± SD from four times experiments

Nitric Oxide Product Inhibition Activity of RAW 264.7 Cell: When inflammation occurs during the oxidation process, nitric oxide, interleukin-6, prostaglandin E₂, tumor necrosis factor -α. nitric oxide is synthesized by nitric oxide synthase in L-arginine in tissues and cells and is known to function as immune function regulation, vasodilation, neurotransmission, and blood coagulation^{20,21}. However, the accumulation of nitric oxide due to excessive active oxygen production has a deleterious effect on human body. These nitric

oxide induce excessive activity of macrophages which are involved in the immune function of the human body, and cause inflammatory diseases by causing excessive activation of inflammation by a necessary defense function *in vivo*²². And Excessive inflammation also directly affects skin aging and wrinkles. The mediators of the reaction are known as nitric oxide, active oxygen, prostaglandin (PG) and cytokines. In previous studies, resveratrol has been reported to exhibit anti-inflammatory activity at low concentrations. It has been shown to inhibit the production of inflammation cytokine and nitric oxide such as IL-6 and TNF-α from macrophages^{23,24}.

The addition of resveratrol 1, 10, 100 µg/mL on RAW 264.7 macrophages stimulated with lipopolysaccharide resulted in NO produce inhibition in concentration dependent and a strong inhibition rate of 53% at 100 µg/mL concentration[Figure 4]. These results suggest that the active oxygen - induced skin inflammation process is delayed as much as possible, so that it can be utilized as a functional cosmetic material having an effect on skin diseases and skin aging.

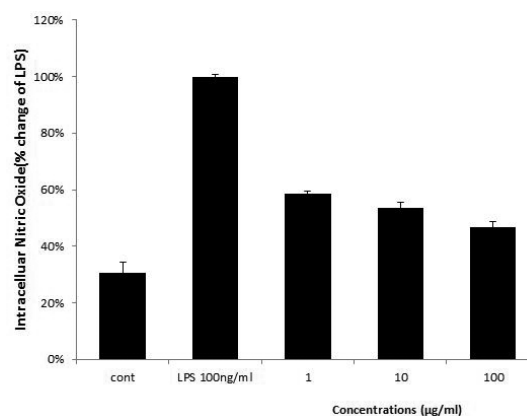


Figure 4: Effects of Resveratrol on NO production by 1 µg/mL lipopolysaccharide in Raw 264.7 macrophage. NO production was inhibited at all concentrations. Results are averages ± SD from four times experiments

Whitening Effect: Melanin is produced by oxidation of tyrosinase, an enzyme called tyrosinase, in the melanocyte of melanocyte when exposed to ultraviolet rays. The enzymes such as catalase, peroxidase, dopa-chrome tautomerase and glutathione reductase and IF(interferon), prostaglandin, It is known that mediators such as cyclooxygenase and metal ions likes copper and zinc are involved²⁵. tyrosinase is an enzyme that binds to Cu²⁺ and is a polyphenol oxidase widely

distributed in plants, microorganisms, and humans. It is an enzyme that represents a major regulatory step in melanin synthesis, such as limiting the rate of melanin synthesis²⁶. Melanin binds to phospholipids or proteins to form melanin granules. It enters the keratinocyte and excretes out of the skin by keratinization. This action melanin protects the skin from ultraviolet rays²⁷. This melanin acts as a protective agent to remove toxic substances in the human body, but excessive production causes hyperpigmentation such as spots and freckles in the human body, promotes skin aging, and causes skin cancer²⁸. Currently, the mechanism of melanogenesis is relatively clear, and tyrosinase is involved in the conversion of tyrosine to dopaquinone (DOPA-quinone) during the production process. Indirectly regulates the biosynthesis of the melanin pigment and inhibits tyrosinase activity in most whitening studies^{27,29}. The inhibition of tyrosinase activity by L-DOPA as an active substrate was controlled by resveratrol dependent on the concentration and was inhibited by 42% at 100 $\mu\text{g}/\text{mL}$ [Figure 5]. The inhibition on tyrosinase activation was also strongly inhibited in dose dependent, and 43% inhibition at 100 $\mu\text{g}/\text{mL}$ [Figure 6]. To investigation the effect of resveratrol on melanin-pigmentation synthesis at the cellular level, melanin-pigmentation production was observed by adding MSH to B16F10 melanocyte. Resveratrol 100 $\mu\text{g}/\text{mL}$ significantly inhibited melanin production by MSH to 26% [Figure 7].

These results are similar to those obtained by Lee et al[29]. In the inhibition of 28.2% melanogenesis in B16 F10 melanocyte. Therefore, resveratrol is expected to be very useful as a functional whitening cosmetic material.

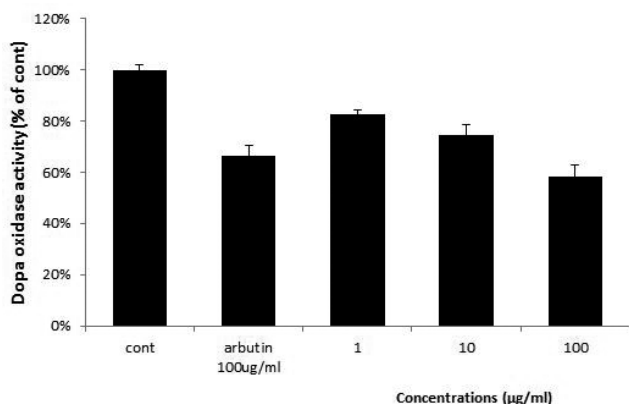


Figure 5: Effect on Resveratrol on L-dopa induced tyrosinase active. Results are averages $\pm$ SD from four times experiments

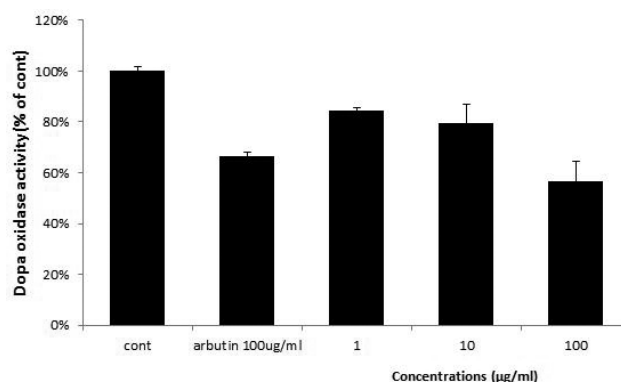


Figure 6: Effect on Resveratrol on L-tyrosine inducible tyrosinase active. Results are averages $\pm$ SD from four times experiments.

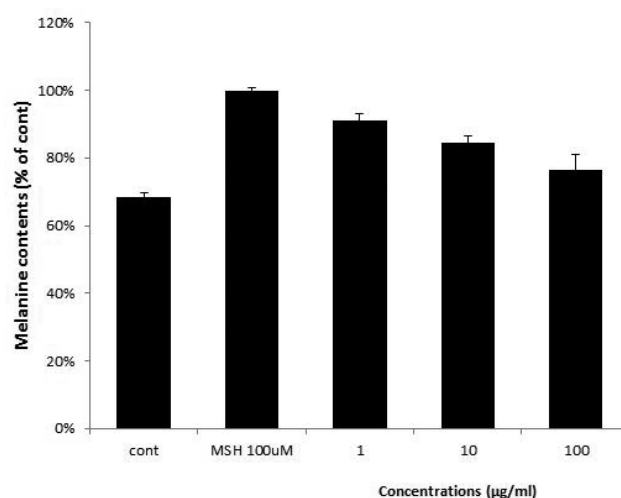


Figure 7: Effects of Resveratrol on melanin production by 1 μM MSH in B16F10 melanocyte. Results are averages $\pm$ SD from four times experiments.

Conclusion

In this study, we observed the anti-inflammatory and antioxidant effect of resveratrol, a polyphenolic compound, and observed the possibility of it as a cosmetic additive component. Since RAW 264.7 cells did not show toxicity at dose of Resveratrol 1, 10, 100 $\mu\text{g}/\text{mL}$, safety of the cosmetic products can be confirmed. Resveratrol concentrations of 1, 10, 100 $\mu\text{g}/\text{mL}$ were shown to inhibit D.P.P.H. activity and showed free radical scavenging activity. In particular, antioxidant activity was inhibited by about 43% at 100 $\mu\text{g}/\text{mL}$ concentration. It was observed that resveratrol belonged to a polyphenol compound rich in antioxidant efficacy and that DPPH free radical erasing activity was confirmed in the test tube, and DCF-DA produced ROS

(reactive oxygen specs) to inhibit antioxidant activity in cells. 1 mg/mL of silica was used as an ROS-generated stimulator at resveratrol 1, 10 and 100 µg/mL. Resveratrol inhibited ROS generation by concentration. Especially, the antioxidant activity was about 33% at 100 µg/mL. The addition of resveratrol 1, 10, 100 µg/mL to Raw 264.7 macrophage stimulated with Lipopolysaccharide resulted in Nitric Oxide production inhibition in a concentration dependent and a strong inhibition rate of 53% at 100 µg/mL concentration. The inhibition of tyrosinase activity by L-DOPA and L-tyrosine was inhibited by resveratrol in a dose dependent and was inhibited 42% and 43% at 100 µg/mL. To investigate the effect of resveratrol on melanin synthesis at the cellular level, MSH was added to investigate the production of melanin. Resveratrol 100 µg/mL significantly inhibited melanin production by 26%.

These results suggest that resveratrol can delay the skin inflammation process by active oxygen to maximize the skin diseases and functional cosmetic material with skin whitening effect.

Ethical Clearance: Not required

Source of Funding: Nil

Conflict of Interest: Nil

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The Effect of Embelin's Physiological Activity as Cosmetics Ingredients

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ABSTRACT

Objectives: Embelin has been used in various treatments for skin diseases have excellent efficacy and have been widely used in folk remedies. Therefore, we want to observe the possibility of embelin as an additive to cosmetics.

Method: The cytotoxicity test was conducted to observe the safety of the component, and the antioxidant force of the component itself was observed using a DPPH solution. The effects on ROS generation using DCF-DA were observed. We observed the potential as a inhibitor of NO produced by inflammatory reactions and measured tyrosinase activity and melanin production to observe the possibility of utilization as skin whitening.

Findings: The results of observing the decimals using DPPH showed weak inhibition due to be weakly suppressed. Antioxidants were observed using Raw 264.7 macrophage. It inhibited ROS production in the cells induced by silica. In particular, production was inhibited on a concentration-dependent basis. As a result, the embelin has its own antioxidant function, has been shown to act as antioxidant in cells, and its concentration has inhibited NO production. Although the tyrosinase activity using L-dopa and L-tyrosine as substrates did not have any significant effect, melanin production in melanin cells resulted in concentration - dependent suppression.

Applications: Based on these results, it was found that embelin was highly antioxidant and was likely to be used as an anti-aging cosmetics ingredient.

Keywords: Embelin, Cosmetic, Whitening, ROS, anti-inflammation, anti-aging

Introduction

Embelin (2,5-dihydroxy-3-undecyl,1,4-benzoquinone) is a traditional medicinal herb effective ingredient that works against cancer¹ and various diseases, increasing the cytotoxic effects as well as the anti-bacterial activity and inhibiting the proliferation of various cancer cells². In addition, embelin is quinone with an alkyl-substituted hydrophilic acid, an important active ingredient contained in the seeds of *E. ribes*. Embelin's various pharmacological activities include

anti-inflammatory, fever, pain, anti-tumor, anti-cancer properties³. Recent interest in natural orientation or health has been increasing among modern people, and the preference for naturalism and well-being throughout life has led to numerous development of products using natural materials for both food and cosmetics, and the study of natural substances has emerged as a major challenge in the development of functional raw materials for cosmetics that impede aging. Among all the chemicals that are made from plant roots, leaves, flowers, and berries, the ingredients that exist in plants are called phytochemical⁴. Most cosmetics currently on the market are phytochemical, the main ingredients of vegetables and fruits that are actually available for consumption, and development of these products is on the rise. Therefore, in this study, we would like to explore the potential as a cosmetic material by measuring the antioxidant activity of Evelin, which is separated from natural products.

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Oxidative stress can be amplified by a continuous cycle of metabolic stress, tissue damage and apoptosis, leading to increased reactive oxygen production and destruction of free radical scavengers and scavenger systems, further exacerbating oxidative stress⁵. The skin is inherently very good antioxidant defense. However, it cannot protect damaged tissue from free radicals. Therefore, it is recommended that the body delay the rate of aging by minimizing oxidative stress through antioxidant supplements. ROS accelerates senescence by decreasing the DNA regeneration ability of cells and decreasing cell proliferation ability. ROS may also be produced during the process of making melanin pigments. Melanin is a pigment present in an organism that exists in the human skin and represents the color of the skin and acts as a defense function to protect the skin from ultraviolet rays. This melanin is formed by the melanin synthesis process that takes place in the melanocytes, which causes oxidative stress⁶.

Therefore, we monitor the possibility of natural antioxidants and whitening cosmetic ingredients using embelin belonging to polyphenol compounds, and confirm that they can be expected as a cosmetic material in terms of spices.

Material and Method

Reagent and Cell Culture: Embelin(2,5-Dihydroxy-3-undecyl-2,5-cyclohexadiene-1,4-dione, Embelic acid, Embetine), 3-(4,5-dimethyliazol-2-yl)-2, 5-diphenyl tetrazolium bromide(MTT), L-DOPA, Mushroom Tyrosinase, L-tyrosine purchased from Sigma-Aldrich, Inc.(St. Louis. Mo. USA). 2',7'-dichlorofluorescein diacetate (DCF-DA) was purchased from the Molecular Probe Co. (Eugene, OR, USA). Raw 264.7 macrophage and B16 F10 melanocyte were purchased from Seoul National University's Cellular Bank. Raw 264.7 macrophage and B16 F10 melanocyte were grown at a concentration of 37°C with 10% phthalate serum and a 5% concentration of phenicillin/streptomycin (100 IU/50 µg/mL).

Cytotoxicity Measurement using MTT: To confirm the cytotoxicity of embelin, the MTT method was applied. Raw 264.7 macrophage was used, and divided 1×10^4 cells per well in 96 well plates, cultivated for 24 hours, added sample by concentration, and cultivated at 37°C, CO₂ incubator for 72 hours. After 72 hours, the cultivation solution was removed, and 1 mL of 500 µg/

mL of MTT solution dissolved in Krebs solution (mM :NaCl 137, KCl 2.7, Na₂HPO₄ 0.4, MgCl₂ 0.5, HEPES [pH 7.4] 10, CaCl₂ 1.8, glucose 5) to each well and cultivated for 4 hours in dark. Then, the supernatant was removed, and 200 µL of DMSO was added to each well to dissolve MTT formazan. After completely dissolving MTT formazan for 10 minutes in room temperature, the absorbance was measured in 570nm.

DPPH Radical Scavenging Activity: 180 µL of 0.1 mM 1,1-diphenyl-2-picrylhydrazyl (DPPH) solution dissolved in ethanol to 96 well plates embelin prepared in each concentration was added 20 µL each, cultivated for 30 minutes in 37°C in the dark were processed to absorbance measurement in 517 nm using FL 600 spectro fluorometer (BioTek, Winooski, VT, USA).

$$\text{DPPH radical scavenging activity (\%)} = 100 - \left\{ \frac{\text{Absorbance of added}}{\text{Absorbance of non-added}} \times 100 \right\}$$

Intracellular Oxidation Stress Measurement: This experiment statistical analysis was performed using SPSS Window Version 17.0 (SPSS Inc., Illinois, USA), and the significance was tested by Student's t-test. Was carried out three times or more independently under the same conditions noted in Mean $\pm$ standard deviation (Mean $\pm$ SD), The experiment determined that there was a statistically significant difference when the p value was less than 0.05.

In-vitro Tyrosinase Activity: L-DOPA was dissolved with 2 mg/mL of PBS(potassium phosphate buffer 0.1 M, pH 6.8), and the concentration of tyrosinase was 25units/mL. To 90 µL of tyrosinase, 10 µL of Embelin dissolved in different concentration was put into eppendorf tube, mixed, divided into 40 µL to 96 well plates, added 200 µL of L-DOPA (2 mg/mL), let it react for 1 hour in 37°C, and measured absorbance in 475 nm. 0.3 mg/mL of L-tyrosine was completely dissolved with PBS(potassium phosphate buffer 0.1 M, pH 6.8) and the tyrosinase concentration was 50 units/mL. To 90 µL of tyrosinase, 10 µL of Embelin dissolved in different concentration was put into eppendorf tube, mixed, divided into 40 µL to 96 well plates, added 200 µL of L-tyrosine (0.3 mg/mL), let it react for 1 hour in 37°C, and measured absorbance in 475 nm.

Melanin Product Inhibition: After dividing B16F10 melanin cell into 3 mL to 6 well plates, it was cultivated for 12 hours in phenol red-free DMEM solution include 10 % FBS. And the sample with different concentration were cultivated for 10 minutes in 37°C for preprocessing,

and processed 1 μM of $\alpha\text{-MSH}$ (melanocyte stimulating hormone) and cultivated for 72 hours in 37°C . After cultivation, 100 μL of 10mM PBS (sodium phosphate buffer pH 6.8) containing 1 % (w/v) Triton was added, shook for 5 minutes, moved to tube and centrifuged for 5 minutes in 10,000 rpm. Then, 100 μL of 1 N NaOH and 100 ml of purified water was added to cell pellet, and cultivated in 60°C for 1 hour to completely dissolve melanin, moved 200 μL to 96 well plates to measure absorbance of 405 nm. The experiment was conducted 4 times repeatedly in same condition, and obtained average to calculate melanin produced from each well using calibration curve from melanin standard.

Data Analysis and Statistical Verification: Result of experiment was displayed in average $\pm$ S.D and the experiment outcome was verified by non-paired student's t- test.

Results and Discussion

Cell Viability Assay: The cell viability of embelin by MTT assay was 95% at 1 $\mu\text{g/mL}$, but the survival rate was 86% at 100 $\mu\text{g/mL}$ [Figure 1]. These results support research data demonstrating the efficacy of embelin to inhibit cancer cell proliferation⁷ and emelin, which is associated with IR inhibition, to induce cell growth to inhibit cell death and maintain cell viability⁸. Therefore, the cell death observed in this study is not caused by the cytotoxicity of embelin but rather by the cytotoxicity observed in the process of inhibiting cell proliferation. When the MTT assay time is reduced from 72 hours to 48 hours, The results can be guessed. Therefore, embelin is considered to be a safe ingredient when used as a cosmetic ingredient.

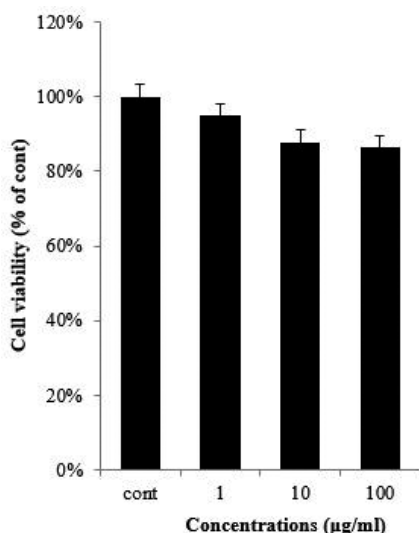


Figure 1: Cell toxicity of Embelin in Raw 264.7 macrophage. Results are means $\pm$ SD from four separate experiments

Free Radical Scavenging Activity: Cold Ron⁹ observed radiation-induced ROS damage in DNA. In this study, the administration of embelin is regulated by reducing DNA damage due to UVB. Also, The skin is inherently very good antioxidant defense¹⁰. However, it cannot protect damaged tissue from free radicals. Therefore, it is desirable that the human body minimize oxidative stress through antioxidant supplements. ROS accelerates senescence by decreasing the DNA regeneration ability of cells and decreasing cell proliferation ability¹¹. Emelin is known to have antioxidant properties and was DPPH assay to observe antioxidants and activity on its own. At concentrations of 1 and 10 $\mu\text{g/mL}$, 1% and 5% radical scavenging ability was shown, respectively, and 14% scavenging activity was observed at 100 $\mu\text{g/mL}$. As a result, the antioxidant activity of the low concentration embelin was very small, but it was found that the thickening of the embelin caused the antioxidant activity [Figure 2].

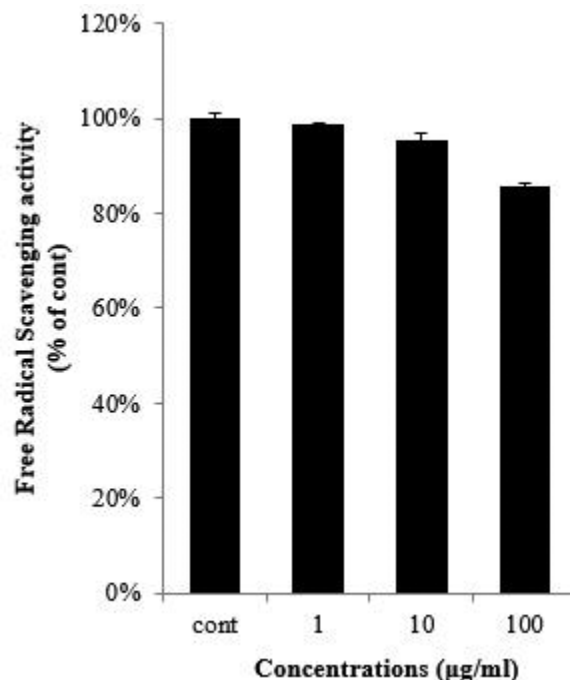


Figure 2: Antioxidant activity of Embelin in DPPH Assay. Results are means $\pm$ SD from four separate experiments

In order to measure the antioxidative activity of embelin itself, the effect of inhibiting ROS formation was observed by using DCF-DA fluorescent material in Raw 264.7 macrophage induced at 1 mg/mL of Silica. Experimental results showed that the inhibitory effect on ROS production in cells was very strong and inhibited ROS production in a concentration dependent manner.

The inhibition of intracellular oxidation inhibited the production of 21% ROS at a low concentration of 1 $\mu\text{g/mL}$, while the inhibition of intracellular oxidation inhibited the production of 10 $\mu\text{g/mL}$ 25% and 29% at 100 $\mu\text{g/mL}$ [Figure 3], respectively. These results support the finding that embelin reduces lipid peroxidation levels in UVB-damaged cells and prevents DNA damage by UVB radiation¹².

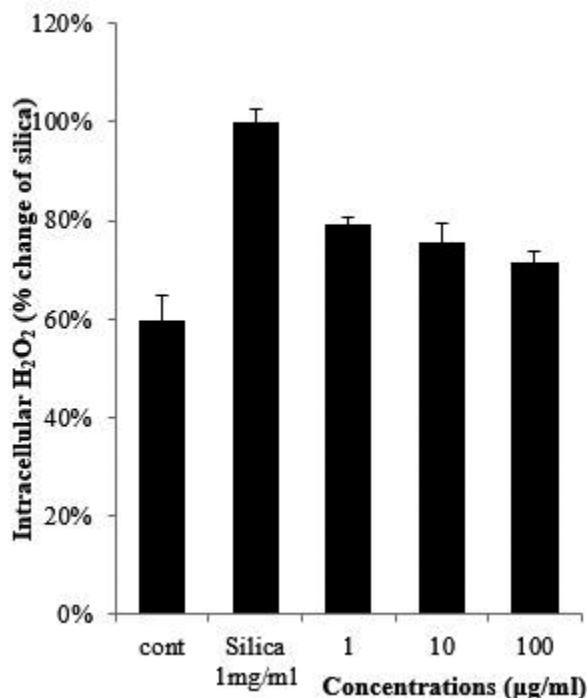


Figure 3: Antioxidant activity of Embelin
1 mg/mL silica-induced ROS production in Raw 264.7 macrophage. Results are means $\pm$ SD from 4 separate experiments

Whitening Action of Embelin: Tyrosinase, a polyphenol oxidizing enzyme, is deeply involved in the synthesis of melanin. In addition, tyrosinase inhibitors are used as skin whitening cosmetic materials, such as melanin, which is formed abnormally, as a pigment¹³. The effect of embelin on tyrosinase activity was measured using two substrates (L-Dopa, L-Tyrosine). Tyrosinase plays an important role in the early stages of melanin synthesis by oxidizing L-tyrosine (L-Tyr) to 3,4-dihydroxyphenylane (DOPA) and oxidizing DOPA to dopaquaone¹⁴. The effect of embelin on tyrosinase activity was measured using two substrates. As a result of measuring the activity of L-dopa by the substrate of mushroom tyrosinase 25unit, no enzyme inhibitory activity was observed[Figure 4], and the activity of L-tyrosine substrate was measured by using 50-unit tyrosinase enzyme. It did not appear[Figure 5]. Therefore, embelin did not inhibit the activity of

tyrosinase enzyme, and the possibility of using it as a whitening cosmetic ingredient due to inhibition of enzyme activity is small.

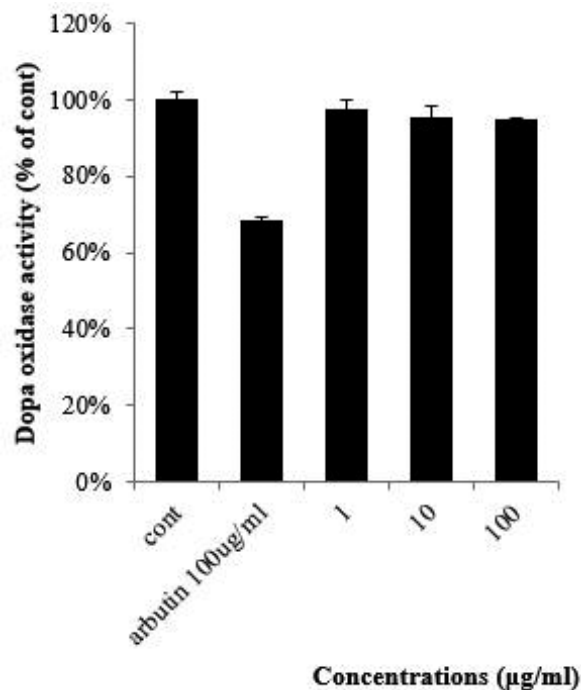


Figure 4: Effect of Embelin on L-dopa induced tyrosinase activity in Mushroom tyrosinase. Results are means $\pm$ SD from four separate experiments

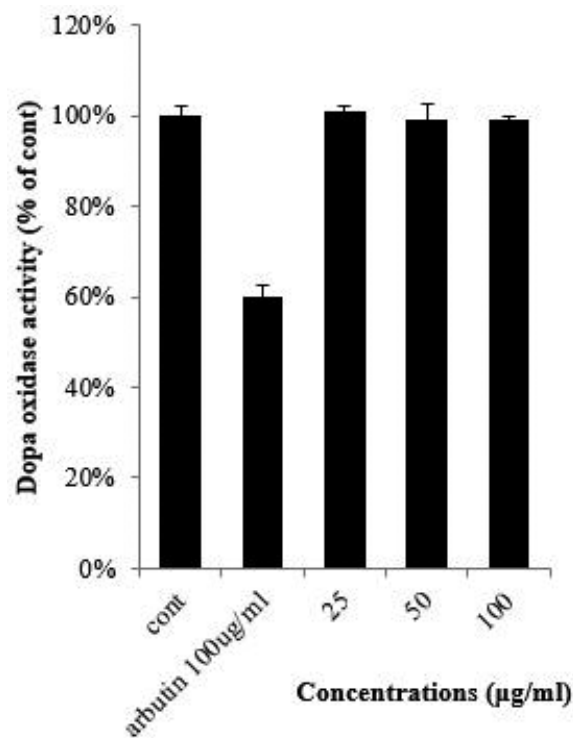


Figure 5: Effect of Embelin on L-tyrosine induced tyrosinase activity in Mushroom tyrosinase. Results are means $\pm$ SD from four separate experiments.

In order to investigate the effect of embelin on B16 F10 melanocyte, melanin production was measured by 1 μ M MSH-induced melanocyte-treated melanocytes, and melanin production was strongly inhibited. 33% Inhibition[Figure 6]. These results suggest that embelin can be used as a cosmetic ingredient for skin whitening function. It is not a mechanism to inhibit melanin production by inhibiting tyrosinase enzyme activity during the formation of melanin pigment, but it is directly involved in melanocyte cells to inhibit the formation of melanin pigment. Therefore, it is considered that embelin is useful value as a whitening cosmetic product.

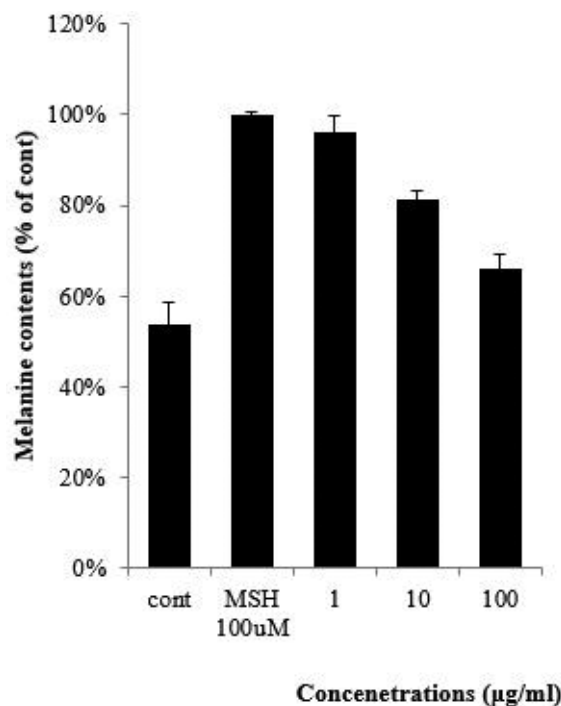


Figure 6: Effects of Embelin on melanin production by 1 μ M MSH in B16F10 melanocyte. Results are means $\pm$ SD from four separate experiments.

Ethical Clearance: Not required

Source of Funding: Nil

Conflict of Interest: Nil

Conclusion

Embelin has been used in various treatments for skin diseases have excellent efficacy and have been widely used in folk remedies. Therefore, we want to observe the possibility of embelin as an additive to cosmetics.

The cytotoxicity test was conducted to observe the safety of the component, and the antioxidant force of the

component itself was observed using a DPPH solution. The effects on ROS generation using DCF-DA were observed. We observed the potential as a inhibitor of NO produced by inflammatory reactions and measured tyrosinase activity and melanin production to observe the possibility of utilization as skin whitening.

The results of observing the decimals using DPPH showed weak inhibition due to be weakly suppressed. Antioxidants were observed using Raw 264.7 macrophage. It inhibited ROS production in the cells induced by silica. In particular, production was inhibited on a concentration-dependent basis. NO production was observed in Raw 264.7 macrophage stimulated by LPS. It was strongly inhibited at all concentrations. As a result, the embelin has its own antioxidant function, has been shown to act as antioxidant in cells, and its concentration has inhibited NO production. Although the tyrosinase activity using L-dopa and L-tyrosine as substrates did not have any significant effect, melanin production in melanin cells resulted in concentration - dependent suppression. Based on these results, it was found that embelin was highly antioxidant and was likely to be used as an anti-aging cosmetics ingredient.

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Effects of Treadmill Walking Speed on Lower Extremity Muscle Activity Ratio in College Students

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ABSTRACT

The purpose of this study was to investigate the interaction between the activity ratio and the muscles of the lower extremity muscles according to the treadmill walking speed. The subjects measured the MVIC (Maximum Voluntary Isometric Contraction) of the tibialis anterior, semitendinosus, medial gastrocnemius, biceps femoris using wireless surface electromyography. After walking for 1 minute at the speed of 3km/h, 4km/h, and 5km/h on the treadmill, muscle activities of the tibialis anterior, semitendinosus, medial gastrocnemius, biceps femoris. % MVIC (muscle activity/MVIC $\times$ 100) was used for the generalization of the measurements. In the treadmill walking at the speed of 3km/h, 4km/h, and 5km/h, the muscle activity ratios of the tibialis anterior, semitendinosus, medial gastrocnemius and the biceps femoris are as follows. There was a significant difference in muscle activity ($P < 0.05$) in the tibialis anterior, medial gastrocnemius and the biceps femoris at 3km/h speed, 4km/h speed, 3km/h speed and 5km/h speed. There was a significant difference ($P < 0.05$) in the semitendinosus muscle activity ratio between the 3 km/h and 4km/h speed walk, 3km/h speed and 5km/h speed walk, 4km/h speed walk and 5km/h speed walk. As the walking speed increased to 5km/h, the semitendinosus connected to the knee joint led to the gait rather than the ankle joint, so that it was found that the lower and the lower shoulder tend to walk with the tendency of bending and inner rotation.

Keywords: Treadmill walking, Co-contraction, Muscle activity ratio, Biceps femoris

Introduction

Walking is one of the most important functions for human beings and one of the important factors that determine the quality of life². In addition, walking is the most frequently used movement in daily living, through the interaction between the flexor muscles of the hip, knee, and ankle joints⁸. A stable posture during walking is essential for performing complex motor functions, which involves complex nervous system⁹. For normal and stable walking, factors such as posture control, exercise control, and reaction time should be harmonized. Walking is a vital condition for vigorous daily life and functional activities. Walking during daily life repeats and progresses over various conditions such as slopes,

plains, and stairs. Therefore, the body moves through the walking, and the interaction of the ankle muscles and the muscles around the knee joints affects the walking¹⁹. Particularly, to walk on slopes, stairs, and rugged areas, rather than on flat grounds, a combined contraction of functional lower limb muscles is required²⁰.

It has been reported that the walking speed, especially walking speed, is the most basic evaluation method for the daily life movements and functions in patients with hemiplegia due to brain damage¹². For patients with hemiplegia, improvement in gait is an essential and essential therapeutic goal for independent living¹⁸. Thus, Walking is a prerequisite for the recovery rate and functional behavior of nervous system patients. Brain injured patients are mobilized by various methods of strengthening the legs for functional walking. For patients with brain damage, treadmill training is based on the central pattern generator theory in gait control and recovery⁴. This is controlled by a series of neurons located at the level of the spinal cord, and these central pattern generators are known to activate afferent input

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due to limb movement, weight shift, and posture alignment with passive or assistive assistance. This mass repetition movement training is thought to improve walking ability for brain injured patients due to neural reorganization⁶. Treadmill walking training increased the stance of the uninjured lower limb by increasing the stance of the lower limb during walking, and consequently promoted a symmetrical walking pattern. It is used for the improvement of the walking ability¹⁷.

Also for the elderly, walking is an important factor for independent and functional daily life. Over the age of 60, the elderly average body muscle volume decreases over 60 years, especially when the muscular volume of the lower limbs is reduced further, increasing the likelihood of falls¹⁵. Thus, cardiovascular endurance, agility, flexibility and balance are greatly reduced making independent life impossible¹³. The weakening of leg strength and the reduction of balance ability are important causes of fall, especially weakness of lower leg strength is a major cause of falls. The weakening of leg strength leads to a decrease in balance ability¹¹ and a decrease in walking ability, which is a major cause of daily life disability and falls⁷. Therapeutic methods using treadmill, elastic band, etc have been applied to the elderly to prevent and maintain such lower leg muscle weakness.

Interventions for functional walking are being applied not only to patients with brain injuries and the elderly, but also to healthy people who want to live life. The study for enhancing walking ability of women in their twenties through core muscle strengthening¹⁴ claims that improving walking ability improves posture balancing ability and posture control ability regardless of sex and age. However, it is still the most preferred method for the brain damage patients, the elderly, and the normal people to increase the walking ability safely is the walking training using the treadmill. Walking with a treadmill is safe and has the advantage of taking individual characteristics into consideration, and healthy people use a lot of strengthening of leg strength. In this study, we investigate the speed at which the lower extremity muscles can be activated most effectively during treadmill walking and the interaction of the muscles according to their speed.

Method

Subjects: Subjects participated in the experiment were 17 students (male = 11, female = 6) who were 20 to 24 years old and had normal orthopedic and neurological problems. The subjects were informed about the overall progress and safety of the experiment, asked for consent for personal information, and written consent was obtained from the subjects who indicated their willingness to participate voluntarily. The experiment of this study was based on the Helsinki Declaration of Medical Research Ethics Principles.

Research Design: The subjects measured the MVIC (Maximum Voluntary Isometric Contraction) of the tibialis anterior, semitendinosus, medial gastrocnemius, biceps femoris using wireless surface electromyography. After walking for 1 minute at the speed of 3km/h, 4km/h, and 5km/h on the treadmill, muscle activities of the tibialis anterior, semitendinosus, medial gastrocnemius, and biceps femoris. % MVIC (muscle activity/MVIC × 100) was used for the generalization of the measurements. % MVIC were measured and the muscle activity ratios of 4 muscles were compared at 3km/h, 4km/h, and 5km/h velocities.

Intervention: The subjects first measured MVIC of four muscles using wireless surface electromyography. The subjects first measured MVIC of four muscles using wireless surface For the MVIC measurement of the tibialis anterior, ankle flexion and inversion were performed to find the most active muscle position of the tibialis anterior. After that, electrodes were attached to the most active site 2/3 of the proximal side of the tibia bone body, 7 cm below the lateral surface of the tibia tuberosity. The sole was fixed on the floor while sitting comfortably in the chair. After that, 5 exercises were performed to allow dorsi flexion and inversion of the foot, followed by dorsi flexion and inversion for a maximum of 5 seconds. Measurements were taken for 3 seconds except 1 second for each of the front and back, and the mean value was measured 3 times in the same way and rested for 1 minute between measurements. For MVIC measurements of the semitendinosus, the knee was flexed and internal rotated in the prone position. In this state, the electrode was attached to the middle part of the midline between the femur and the ischial tuberosity, which is the most active region with resistance. After attaching the electrode, the knee joint flexion and the internal rotation posture were

taken in the prone posture, resistance was given, and after 5 exercises, resistance was measured and the resistance was measured for 5 seconds. Resistance was given in the prone posture with knee flexion and lateral rotation for biceps femoris(long head) MVIC measurements. After that, electrodes were attached to the distal two-thirds of the fibular head and ischial tuberosity, which is the most active part of the biceps femoris(long head). After attaching the electrode, the knee joint flexion and the lateral rotation were put in the prone position, resistance was given, and after exercising 5 times, the resistance was measured and the resistance was measured for 5 seconds. Measurements were taken for 3 seconds except 1 second for each of the front and back, and the mean value was measured 3 times in the same way and rested for 1 minute between measurements. In order to measure the MVIC of the gastrocnemius(medial side), the foot was flexion at the prone position and the electrode was attached 9 cm below the medial epicondyle, the most active site³. After the electrodes were attached, they were allowed to resist the planter flexion in the prone position and then exercised 5 times so as to withstand and measured for 5 seconds with the maximum resistance. After this, the subjects walked at a speed of 3km/h, 4km/h, and 5km/h on the treadmill. At this time, the order of the speed was determined randomly and the walking was performed. Subjects performed treadmill walking for 1 minute. EMG signals of 15 ~ 20 seconds, 20 ~ 25 seconds, and 30 ~ 35 seconds after gait were collected and 3 seconds values were used except 1 second before and after. The average value was used after three measurements in this way.

Measurement of Muscle Signals: For the purpose of this study, myoRESEARCH 3 (Noraxon, Arizona USA) was used for wireless surface EMG (Fig. 1). The surface EMG electrode was attached with two disposable electrodes of 40 mm width and 20 mm length, one of the active electrodes and one of the reference electrodes. When the electrode was attached, the surface of the skin was shaved cleanly, then wiped with alcohol cotton, and the electrode was attached. Two active electrodes of the tibialis anterior, semitendinosus, medial gastrocnemius and the biceps femoris were attached to the attachment site at intervals of 2 cm, and the reference electrode was attached to the 3 cm side of the active electrode. The sampling rate of EMG signal was set to 1,000 Hz and the frequency bandwidth was 10 ~ 350 Hz. The RMS values were measured by smoothing the rectified raw data.



Figure 1: Wireless surface EMG

Statistical Processing: We used repeated measures analysis of variance to measure treadmill walking at speeds of 3 km/h, 4 km/h, and 5 km/h. The statistical program was SPSS 12. 0 (SPSS Inc., USA). Statistical significance was 0.05.

Result

Subject Characteristics: The subjects were 11 men and 6 women. The average age of male was 22.09 old, the average weight was 69.45kg, the average height was 175. 28cm, the average age of female was 21.33, the average weight was 57.66kg, And the average height was 160.83 cm. Result of the subject characteristics in table 1 below:

Table 1: Subject characteristics

	Age (old)	Height (cm)	Weight (kg)
Male (n = 11)	22.09 ± 2.21	175.28 ± 5.71	69.45 ± 12.06
Female (n = 6)	21.33 ± 0.81	160.83 ± 4.62	57.66 ± 6.28
Total (n = 17)	21.82 ± 1.84	170.17 ± 8.81	65.29 ± 11.70

Comparison of Muscle Activity Ratio of Lower Extremity Muscle: In the treadmill walking at the speed of 3km/h, 4km/h, and 5km/h, the muscle activity ratios of the tibialis anterior, semitendinosus, medial gastrocnemius and the biceps femoris are as follows. There was a significant difference in muscle activities ($P < 0.05$) in the tibialis anterior, medial gastrocnemius and the biceps femoris at 3km/h speed, 4km/h speed, 3km/h speed and 5km/h speed. There was a significant difference ($P < 0.05$) in the semitendinosus muscle activity ratio between the 3 km/h and 4km/h speed walk, 3km/h speed and 5km/h speed walk, 4km/h speed walk and 5km/h speed walk. Result of the comparison of muscle activity ration in table 2 below:

Table 2: Comparison of muscle activity ratio

%MVIC

	3km/h	4km/h	5km/h	F
Tibialis anterior	13.13 ± 9.81 ^{ab}	15.35 ± 11.01 ^a	18.02 ± 7.06 ^b	5.868
Medial gastrocnemius	27.62 ± 14.07 ^{ab}	30.54 ± 15.49 ^a	35.47 ± 15.14 ^b	7.766
Biceps femoris	8.88 ± 7.90 ^{ab}	10.40 ± 9.55 ^a	12.08 ± 9.09 ^b	6.299
Semitendinosus	12.92 ± 6.89 ^{abc}	15.60 ± 9.62 ^{abc}	23.02 ± 12.53 ^{abc}	10.279

P<0.05

Discussion

Treadmill walking training has been shown to be a useful way to improve endurance for brain damage patients with low levels of aerobic capacity and improve energy metabolism during walking¹⁰. It is also used to maintain the strength of the elderly and to control dynamic and static balance. It is widely used for the normal exercise of the normal people and the activation of the lower extremity muscles. The purpose of this study was to investigate the walking speed of the lower extremity muscles for the most efficient co-contraction. Appropriate joint contractions of the leg muscles in gait can produce functional gait. In this study, we measured the muscle activity ratio of the tibialis anterior and medial gastrocnemius corresponding to the dorsi flexion and planter flexion of the ankle joint, and measured the muscle activity ratio of the semitendinosus and the biceps femoris involved in flexion and rotation of the knee joint.

The muscle activity ratios were significantly increased in the tibialis anterior, the medial gastrocnemius, and the biceps femoris at 3km/h-4km/h, 3km/h- 5km/h. In the semitendinosus, the muscle activity ratio increases in both 3km/h-4km/h, 3km/h -5km/h, 4km/h-5km/h. These results show that the angular velocity of the ankle joint and the knee joint increases as the walking speed increases. In particular, the increase of the muscle activity rate in each case of the 1-km/h increase in the velocity of the semitendinosus indicates that the semitendinosus are most affected by the increase in the walking speed. The other three muscles increased muscle activity ratios at 3km/h-4 km/h, but did not show significant muscle activity ratios at 4km/h-5 km/h. Thus, tibialis anterior, medial gastrocnemius and biceps femoris are all activated until the walking speed is increased to 4km/h, but when the speed is increased to 5km/h, only the activity rate of the semitendinosus is significantly increased.

In a study by Cho & Kim¹, we studied 4km/h of treadmill walking at 3km/h, 4km/h, and 5km/h in normal young people using four video cameras. As a result, the angular velocity of the ankle increased with the increase in the treadmill walking speed, but there was no difference in the angular velocity between the knee joints. The increase in the angular velocity of the ankle joint as the walking speed increases can be deduced as a result of this study. The increase in muscle activity when the velocity of the tibialis anterior and medial gastrocnemius increased from 3km/h to 4km/h means that the angular velocity of the ankle joint was increased as a result. The study of Cho & Kim¹ is the result of motion analysis through a video camera. In this study, the result is the same as the study of muscle activity using wireless EMG. In addition, the result of the difference in angular velocity between the knee joint and the knee joint was not different from the result of this study. However, if there is any correlation between angular velocity and joint angle, it is uncertain what these associations and muscle activity mean.

In the study of Yi & Kim²¹, the treadmill walking is similar to the general ground walking type, and the vertical repulsive force generated when walking on the treadmill is also similar to the normal walking. The result of this study is the result of treadmill walking, but it is thought that similar muscle activity ratio will appear when walking on the ground. Walking exercises or walking exercises through a treadmill are used for patients with brain lesions, the elderly, and the normal people. There was no difference in the angle of the ankle joint and the angle of the knee joint as the speed of the treadmill increased during treadmill walking in the 60-70 age group. These results suggest that the elderly tend to use sufficient flexion of the knee joint to reduce the impact on the joints as the walking speed increases by the study of Eun & Lee⁵. In this study, the muscle activity ratio of the muscles of the ankle joint

and the knee joint was increased as the walking speed was increased. When the walking speed is increased more, the semitendinosus that affect the knee joints lead the walk to the leading edge rather than the ankle joints. However, this result could be different according to age and function difference.

According to the results of this study, as the walking speed increases in young normal subjects, the semitendinosus connected to the knee joint lead the gait rather than the ankle joint. It should be noted that the semitendinosus, which are connected to the knee joint but have flexion and internal rotation, lead to the pace of gait rather than the flexion and lateral rotation of the biceps femoris. However, since the speed of this experiment is limited at 5 km/h, the results may differ for further increased speeds and further studies are needed. The relationship between the angular velocity of the joints, muscle activity ratio, and range of motion should be studied and the fatigue of each muscle should be reinforced.

Conclusion

The purpose of this study was to measure the muscle activity ratio of the tibialis anterior and medial gastrocnemius of the ankle joint with 3km/h, 4km/h and 5km/h treadmill walking in young normal subjects. We also measured the ratio of muscle activity of the semitendinosus and biceps femoris of the knee joint. As the walking speed increased to 5km/h, the semitendinosus connected to the knee joint led to the gait rather than the ankle joint, so that it was found that the lower and the lower shoulder tend to walk with the tendency of flexion and internal rotation.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: The authors declare no conflict of interest.

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Effects of Elastic Band Exercise Using Proprioceptive Neuromuscular Facilitation on Strength and Dynamic Balance of Adults with Ankle Instability

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ABSTRACT

The purpose of this study was to assess the effects of proprioceptive neuromuscular facilitation (PNF) with elastic band exercise on strength and dynamic balance in ankle instability. A total of 19 subjects with ankle instability. Subjects were randomly divided into ST(Stretching group, n=10) and STPNF(Stretching with Proprioceptive Neuromuscular Facilitation group, n=10). Two groups measured strength dynamic balance. The differences in ankle muscle strength and balance ability between pre- and post-intervention were analyzed using paired t-test and independent t-test. In the within-group pre-post comparison, STPNF showed significant increase in muscle strength at RPF30°, LPF30°, and RPF90°. In the between-groups comparison, significant difference in muscle strength was found at RPF30°, LPF30°, LDF30°, RDF90°, LPF90°, and LDF90° ($p<0.05$). In the within-group pre-post comparison of dynamic balance, STPNF showed significant increase in leftward and rightward ($p<0.05$). In the between-groups comparison, significant difference in rightward balance was found ($p<0.05$). The results from this study indicated that PNF with elastic band have improved the strength and balance in ankle instability.

Keywords: PNF, Elastic band, strength, Balance, Ankle instability

Introduction

The ankle joint plays an important role in controlling leg movement during sports activities that require running and jumping, as well as for walking and supporting body weight. Recently, more and more people are spending more time on sports and leisure, which has resulted in increased number of ankle injuries¹⁾. Ankle instability, which is usually accompanied by a feeling of the ankle giving way during activities of daily living or reinjury of ankle sprain due to lack of stability in the ankle, negatively affects muscle reflex, muscle strength, motor sense, and postural stability to cause decline in physical balance ability and proprioception²⁾. Lack of stability in the ankle joint appears when there is a problem in controlling postural balance and when there

is a recurrence of ankle sprain³⁾, while it may also occur from lack of proprioceptive function and postural reflex altered by tissues surrounding the ankle⁴⁾.

Balance refers to the ability to maintain the center of the body on the supporting surface with minimal postural sway⁵⁾. Numerous studies have reported on improving balancing through training musculoskeletal factors, such as muscle tone, muscle strength, endurance, and joint flexibility or stability, as well as training of neurological factors, such as visual, auditory, vestibular, and proprioceptive senses. The ability to control balance may be lost due to impairment of these factors⁶⁾. Among these, muscle strength plays a role in maintaining body alignment when standing or sitting, and in particular, weakened leg muscle strength can cause unstable posture. Therefore, effective muscle strengthening exercise strategies are needed to maintain balance⁷⁾.

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A study by Hess and Woollacott⁸⁾ reported that functional balance ability can be improved through high-intensity muscle strength training. In a study by Rosa et al.⁹⁾ on changes in balance control ability after

inducing muscle fatigue near knee and ankle joints of healthy elderly subjects, the results showed that muscle fatigue reduced balance control ability. These results indicated the need for muscle strength training on muscle near specific joints to improve balance ability. Balance control is achieved by musculoskeletal movement and control based on processing of visual, equilibrium, and proprioceptive cues by the central nervous system, where a major cause of ankle injury is impairment of proprioception ¹⁰. Niam et al. ¹¹ reported that subjects with damaged proprioception suffered leg injuries due to impaired proprioceptive functions associated with ankle stability and expression of muscle strength, while LePhart et al. ¹² reported that proprioception exercise is an effective form of exercise for preventing and rehabilitating ankle injury. As mentioned, proprioception exercise has been reported to be associated with change in irritability of the leg by increasing the ability to control muscle nerves ¹³.

Elastic bands activate only the target muscle and has less force applied to the joints that weight-bearing exercise, and thus, they offer the advantage of reduced shock during exercise even when motions are performed at various angles ¹⁴. Brill et al. ¹⁵ reported that resistance exercise using elastic bands can provide the necessary effect for rehabilitation exercise after an injury, health management, muscle strengthening, and stability of flexibility for wide range of age groups, and when elastic band exercise was applied to healthy subjects, the results showed 10~27% improvement in muscle strength, stability, and basic physical fitness.

There have been many previous studies on using proprioceptive neuromuscular facilitation (PNF) pattern exercise with elastic bands, but there are not many previous studies on its effect on the ankle muscle strength and dynamic balance. Moreover, while there have been studies that applied exercise on healthy adults or stroke patients, studies on adults with ankle instability are lacking.

Accordingly, the present study applied elastic band exercise using PNF lower extremity pattern on adults with ankle instability to measure muscle strength by isokinetic knee exercise test and to assess balance ability. The objective was to determine the effects of this exercise on ankle muscle strength and balance ability through proprioceptive improvement.

Materials and Method

Subjects: The participants in the present study consisted of 19 students with ankle instability who were enrolled in “N” College in Cheonan. To obtained reliable statistical significance, the participants were divided into two groups: 10 in the control group and 9 in the experimental group [Table 1]. Ankle instability was defined as having Cumberland ankle instability tool (CAIT) score of ≤ 24 points. The selection criteria were set as those who experienced pain due to an ankle sprain in the past 3 months and those and who have no difficulty walking during the experiment. Those with psychological problems in understanding the treatment protocol, those showing psychiatric signs, and those who are pregnant were excluded from the experiment. The study purpose and the methods were explained to all participants, who provided written informed consent as defined by the Declaration of Helsinki before participating:

Table 1: General characteristics of participants

Variable	ST (n = 10)	STPNF (n = 9)
	Mean $\pm$ SD	Mean $\pm$ SD
Age (yrs)	21.22 $\pm$ 1.474	20.80 $\pm$ 1.720
Height (cm)	163.27 $\pm$ 6.298	168.88 $\pm$ 8.522
Weight (kg)	62.26 $\pm$ 9.400	65.22 $\pm$ 12.999

ST: Stretching group, STPNF: Stretching with Proprioceptive Neuromuscular Facilitation group

Measurement Tools: The present study used a body composition analyzer (Inbody720, Korea) to measure the physical characteristics of the subjects; a professional balance assessment and training system (BT4, Finland) to measure balance ability; and a functional rehabilitation exercise equipment (PRIMUS RS, USA) for isokinetic test on the ankles.

Procedures

1. Elastic Band: Elastic bands need to be used according to one's own ability to allow efficient and effective exercise. The strength of the elastic band can be adjusted according to the color and the length and position by which is it held. The elastic band was selected based on the maximum resistance corresponding to the color representing 10 maximum repetitions, after which, the Rating of Perceived Exertion (RPE) designed by Brog ¹⁶

was used to select the band with 15-16 RPE that the participant felt was difficult (Borg 1982:377-81).

- 2. Exercise Program:** Warm-up exercise consisted of 10 minutes of stretching each joint and dynamic ankle stretching. Dynamic ankle stretching, which was performed on an inclined plate, consisted of maintaining plantar flexion for 10 s; returning to the neutral position and resting for 5 s; maintaining plantar flexion again for 10 s; and returning to the original position. Four repetitions of motions comprised one set and a total of 10 sets were

performed. For the main exercise, one set consisted of exercises listed from a) to d) in Figure 1. Each time the position and pattern was changed, 1 min of rest was given. The exercise program consisted of 3 sets per session; 3 sessions per week; for a total of 6 weeks. For cool-down exercise, the same stretching used for warm-up exercise was performed for 5 min. The exercise with elastic bands using PNF lower extremity patterns of sprinter and skater proposed by Dietz ¹⁷⁾ was performed by adults with ankle instability [Table 2]

Table 2: Exercise program protocol

Group	Position	Pattern	Program	Intensity
Warm-up	Standing		Stretching & Dynamic Stretching	10min
Main Exercise	Standing Quadruped	Sprinter	Knee Ex, Hip Ext-Ab-IR, Ankle DR-In Knee Flx, Hip Flx-Ad-ER, Ankle PF-Ev	Left/Right 1min 1set, 1min rest/ between sets
		Skater	Knee Ex, Hip Ext-Ad-ER, Ankle DR-Ev Knee Flx, Hip Flx-Ab-IR, Ankle PF-In	
Cool-down	Standing		Stretching	5min

Ab=abduction, Ad=adduction, Ex=Extension, Flx=Flexion, IR=Internal Rotation, ER=External Rotation, PF=Plantar flexion, DR=Dorsi Flexion, In=Inversion, Ev=Eversion

- 3. Isokinetic ankle muscle strength test:** For the measurements, each participant placed the ankle on the measurement plate in neutral position while wearing shoes. The hip joint was flexed by 70° and the knees were flexed 10° and 70° to assume a position that would allow smooth range of motion in the ankles. To minimize errors and movement between foot and shoe and between shoe and measurement plate, a strap was used to firmly fix it. After providing detailed explanation about the testing procedure to the participant, auditory cue was used to draw out maximum muscle strength. Muscle strength during plantar flexion and dorsiflexion was measured, 3 times each at angular velocity of 30°/sec for maximum muscle strength and at 90°/sec for motor test in angular velocity and muscle strength required during motion with fast joint movement, such as running and jumping. The mean value of maximum muscle strength for motion of each group was derived.

- 4. Balance ability:** Dynamic balance was tested using the limit of stability test method. As drawn on the balance plate, the heels were placed with the center point of the plate at the center and spread apart by 2 cm. The feet were pointed

outward at an angle of 15° and the hands were placed naturally on the side of the pants. The participant was instructed to bend the body as much as possible in the direction indicated by the test (order or forward, backward, left, and right). Here, the participant was instructed to keep both feet on the ground, and if the feet came off the ground, the test was re-started. Dynamic balance in all four directions was measured by the maximum inclination angle.

Statistical Analysis: SPSS version 20.0 for Windows was used for data processing. General characteristics were presented as mean and standard deviation. For the characteristics of the study, normal distribution was tested using Kolomgorov-Smirnov test (K-S test). Pre- and post-intervention differences in isokinetic ankle muscle strength and balance ability of each group were analyzed using paired t-test and independent t-test. Statistical significance level was set to $\alpha = 0.05$.

Result and Discussion

Ankle Muscle Strength: In the within-group pre-post comparison of ankle muscle strength, ST showed no significant difference in all muscles [Table 3].

Meanwhile, STPNF showed significant increase at RPF30°, LPF30°, and RPF90° ($p<0.05$). In the between-group pre-post comparison, significant differences were found at RPF30°, LPF30°, LDF30°, RDF90°, LPF90°, and LDF90° ($p<0.05$) [Table 4]

Kim et al.¹⁸⁾ reported that exercise with elastic band using PNF pattern significantly increased isokinetic knee muscle strength of softball players, while Lim¹⁹⁾ reported

that application of leg stretching, muscle strengthening, proprioception, and muscle endurance exercise program showed significant difference in dorsiflexion at ankle angular velocity of 30°/sec in patients with chronic ankle instability. PNF exercise not only provides visual and auditory information, but it also stimulates all senses that humans can use to activate and strengthen the neuromuscular system. Consequently, combining elastic band and PNF pattern resulted in increased muscle²⁰⁾.

Table 3: Within-group pre-post comparison of isokinetic muscle strength

Variables	ST (n = 10)		p	STPNF (n = 9)		p
	pre(M ± SD)	post(M ± SD)		pre(M ± SD)	post(M ± SD)	
RPF30°	162.30 ± 61.02	143.10 ± 73.57	0.54	147.44 ± 48.48	206.11 ± 93.40	0.02*
RDF30°	92.50 ± 44.78	86.30 ± 52.50	0.61	66.00 ± 46.25	43.56 ± 24.66	0.31
LPF30°	171.70 ± 84.48	163.00 ± 84.39	0.47	180.11 ± 89.50	233.56 ± 80.87	0.00*
LDF30°	67.20 ± 53.37	70.40 ± 39.99	0.63	71.78 ± 29.63	68.22 ± 35.86	0.72
RPF90°	123.00 ± 76.85	141.00 ± 81.78	0.20	128.89 ± 52.19	163.33 ± 67.32	0.02*
RDF90°	48.80 ± 52.73	52.80 ± 41.70	0.23	47.00 ± 26.64	55.89 ± 40.37	0.58
LPF90°	151.10 ± 80.56	128.60 ± 68.97	0.21	135.67 ± 67.10	176.78 ± 91.35	0.12
LDF90°	53.40 ± 47.05	46.90 ± 33.61	0.28	46.22 ± 17.56	52.44 ± 41.23	0.73

ST: Stretching, STPNF: Stretching + Proprioceptive Neuromuscular Facilitation, RPF: Right Plantar Flexion, RDF: Right Dorsi Flexion, LPF: Left Plantar Flexion, LDF: Left Dorsi Flexion, * $p<0.05$

Table 4: Between-groups pre-post comparison of isokinetic muscle strength

Variables	ST (n = 10)	STPNF (n = 9)	p
	post-pre (M ± SD)	post-pre (M ± SD)	
RPF30°	-19.20 ± 94.84	58.67 ± 58.15	.05*
RDF30°	-31.20 ± 49.35	-22.44 ± 61.90	0.74
LPF30°	-8.70 ± 36.88	53.44 ± 37.62	0.00*
LDF30°	-38.80 ± 28.47	-3.56 ± 28.47	0.02*
RPF90°	18.00 ± 40.79	34.44 ± 37.24	0.37
RDF90°	-33.00 ± 34.76	8.89 ± 45.99	0.04*
LPF90°	-22.50 ± 52.56	41.11 ± 71.73	0.04*
LDF90°	-52.50 ± 33.65	6.22 ± 51.72	0.01*

ST: Stretching, STPNF: Stretching + Proprioceptive Neuromuscular Facilitation, RPF: Right Plantar Flexion, RDF: Right Dorsi Flexion, LPF: Left Plantar Flexion, LDF: Left Dorsi Flexion, * $p<0.05$

Dynamic Balance: STPNF showed significant increase in leftward balance ($p<0.05$) and rightward balance ($p<0.05$) [Table 5]. In the between-groups comparison after the intervention, there was a significant difference in rightward balance ($p<0.05$) [Table 6].

Elastic band exercise can improve muscle strength and hand grip; increase joint range of motion and flexibility; and improve gait ability, postural balance,

and proprioception and sense of equilibrium²¹⁻²⁵⁾. Kwak et al.²⁶⁾ reported that applying 12 weeks of elastic band exercise improved flexibility and sense of balance in the elderly, while Topp et al.²⁷⁾ reported that applying 12 weeks of elastic band exercise improved gait ability and balance ability in the elderly. PNF stimulates proprioceptors to improve control of nerves and muscles and have a positive effect on muscle strength, flexibility,

and balance. Accordingly, greater improvement in dynamic balance was found in the group that performed stretching and PNF than the group that performed stretching alone in the present study ²⁸⁾.

The participants in the present study were limited to adults aged 20-29 years and the sample size was small with only 19 participants. Therefore, it is difficult

to generalize the findings. Moreover, it was difficult to control the lifestyle habits of the participants during the study period, while studies with larger training period than 6 weeks, which is the minimum training period for significant difference in balance, are also needed. Therefore, additional future studies are needed to apply various PNF patterns over a sufficient period with participants in different age groups.

Table 5: Within-group pre-post comparison of dynamic balance

Variables	ST (n = 10)		P	STPNF (n = 9)		P
	pre (M ± SD)	Post (M ± SD)		pre(M ± SD)	post(M ± SD)	
forward	4.42 ± 1.15	4.59 ± .91	0.81*	5.21 ± 1.37	5.52 ± 1.19	0.55
rearward	4.56 ± 1.34	5.09 ± .67	0.17	4.41 ± 1.27	4.61 ± .96	0.74
leftward	5.87 ± .73	6.10 ± .93	0.25*	6.29 ± 1.12	7.11 ± .88	0.04*
rightward	6.15 ± .83	6.52 ± .82	0.27	6.01 ± 1.18	7.31 ± 1.31	0.01*

ST: Stretching, STPNF: Stretching + Proprioceptive Neuromuscular Facilitation, RPF: Right Plantar Flexion, RDF: Right Dorsi Flexion, LPF: Left Plantar Flexion, LDF: Left Dorsi Flexion, *p<0.05

Table 6: Between-groups pre-post comparison of dynamic balance

Variables	ST (n = 10)	STPNF (n = 9)	P
	post-pre (M ± SD)	post- pre(M ± SD)	
forward	0.57 ± .78	0.31 ± 1.49	0.64
rearward	0.53 ± 1.12	0.20 ± 1.77	0.63
leftward	0.72 ± .85	0.82 ± 1.04	0.81
rightward	0.37 ± .99	1.50 ± 1.23	0.03*

ST: Stretching, STPNF: Stretching + Proprioceptive Neuromuscular Facilitation, RPF: Right Plantar Flexion, RDF: Right Dorsi Flexion, LPF: Left Plantar Flexion, LDF: Left Dorsi Flexion, *p<0.05

Conclusion

The present study applied elastic band exercise using PNF lower extremity pattern on adults with ankle instability to observe its effect on ankle muscle strength dynamic balance, based on which, the following conclusions were derived. In the within-group pre-post comparison, STPNF showed significant increase in muscle strength at RPF30°, LPF30°, and RPF90°. In the between-groups comparison, significant differences in muscle strength were found at RPF30°, LPF30°, LDF30°, RDF90°, LPF90°, and LDF90° (p<0.05). In the within-group pre-post comparison of dynamic balance, STPNF showed significant increase in leftward and rightward balance (p<0.05). In the between-groups comparison, significant difference in rightward balance was found (p<0.05). Based on the findings in the study, it is determined that elastic band exercise using PNF lower

extremity pattern can help improve muscle strength of adults with ankle instability. It is believed that in future studies, various types and patterns could be combined to use in other patients.

Ethical Clearance: Not required

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Conflict of Interest: The authors declare no conflict of interest.

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Smoking Behavior, Smoking Motivation, Stress, Physical Condition and Health Promotion Behavior of College Students with NO Smoking Intention

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ABSTRACT

This study attempted to identify the smoking behavior, smoking motivation, stress and health promoting behaviors of college students and to analyze basic physical condition and to provide basic data for smoking cessation program of college students. The subjects of this study were 135 college students who were willing to quit smoking. Data collection period was collected from February 1, 2018 to June 30, 2018. Statistical methods used were frequency, mean, standard deviation, t-test and ANOVA. Also Pearson's correlation analysis and regression analysis were used. Smoking motives are smoking behavior, key. Systolic blood pressure, hemoglobin, and smoking behavior were significantly correlated with CO₂ concentration. Body weight was significantly correlated with height, SBP, DBP, AST, ALT, Γ -GTP, and CO₂ concentration and stress. There was a statistically significant correlation between SBP, DBP, ALT, hemoglobin, and hematocrit. Leukocyte was significantly correlated with hematocrit, and stress and Γ -GTP were also significantly correlated. Health promotion activities showed a significant negative correlation with smoking motivation. Blood pressure, hemoglobin, platelet, and stress were found to have a significant effect on health promotion behaviors.

Therefore, in order to prevent smoking of college students and help smoking cessation, basic physical condition is checked to promote health promotion, smoking cessation program should be developed to reduce smoking motivation.

Keywords: *Smoking motivation, Smoking behavior, Stress, Physical status, Health promoting behaviors.*

Introduction

Although smoking is an important health problem and can be prevented, Korea's smoking rate is 40.7% for men and 6.4% for women in 2016, which is higher than OECD countries¹. Smoking and secondhand smoke are harmful to health, cause harmful diseases such as cancer, cause cardiopulmonary dysfunction and increase the chance of premature death². People who smoke for a long time have a high rate of COPD and are twice as likely as smokers to become chronic diseases. In addition, the prevalence of chronic obstructive pulmonary disease in smokers is known to increase to 20.7% in patients over 40 years of age³. Smoking is not only a cause of morbidity,

but also of socioeconomic loss due to exposure to various diseases⁴. On the other hand, during the transition from adolescence to adulthood, university life forms the basis of lifelong health⁵, so health promotion activities during college are among the most important tasks. It is easy for college students to recognize smoking and drinking as a part of the culture of college students, to easily forget about health problems⁶, and to have unhealthy lifestyle because health habits are not formed firmly⁷. In particular, smoking in female college students has a problem of increasing the risk of incidence of diseases such as menstrual irregularities, infertility and premature menopause⁸. Therefore, maintaining good health at this time can be influence health after college. However, college students are less interested in and need for health promotion, and the intention of quitting smoking is weak. Four out of 10 students in smoking cigarettes have no plans to quit, and 77.8% of male college students do not even recognize the need for smoking cessation. In

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addition to community smoking cessation programs, participation rate in no smoking education on campus is very low⁸. Therefore, in order to increase the effect of smoking cigarettes, it is very important to educate them through synchronization or no smoking programs to stop smoking themselves.

Theoretics

Employee Performance: Smoking behavior is a very broad and long-lasting habit, and college students smoking is different from adolescent smoking behavior. It is known that adolescents tend to smoke with simple curiosity or sympathy with colleagues, whereas college students are often selected because of smoking or psychological expectations of the individual⁹. Smoking initiation motives vary widely and are known to be multidimensional and have individual differences. Litvin and Brandon's study suggests that exposure to smokers to external cues (eg, smell of picture or tobacco) or internal cues (eg, inducing negative influences) may increase the impulse to smoke and other behavioral and physiological responses, Is known to be related to stress¹⁰. However, recent studies suggest that smoking in college students is more important than smoking in adolescents, as they are freer to choose without parental control. Sterling et al. (2009) reported that the motives for smoking were influenced and influenced by smoking behavior and smoking cessation. In other words, college students have a feeling of relaxation, feeling of tension, reduced hopelessness, concentration and problem solving, and have subjective perception and cognitive belief that smoking can relieve stress and anxiety¹¹.

Stress experienced by college students is manifested by physical and mental symptoms, including physiological symptoms (headache, stomach pain and cramps, back pain, neck and shoulder stiffness, fatigue), behavioral symptoms (crying, forgetfulness, (Eg, obsessive-eating), and emotional symptoms (worry, depression, excitement, impatience, anger, frustration, loneliness, and helplessness)¹². College students generally have a relatively low mortality or morbidity rate and are in the healthiest lifecycle, but at this time misplaced health habits or inadequate stress exposure can have a significant impact on college students' health status¹³. Therefore, health promotion behaviors of college students are very important in this period. Stress and smoking in college students may have a negative effect on the physical

condition. Therefore the purpose of this study was to investigate smoking motivation and behavior, stress, basic physical condition and health promoting behaviors, to improve the health of college students with the intention of quitting smoking, and to provide basic data for enhancing the effect of smoking cessation.

Method

Ethical-consideration: All data used was collected according to the approved guidelines and screening procedures of "N University" located in Cheonan.

Test Methods: General characteristics of college students were analyzed using mean, standard deviation, frequency, and percentage, and differences in general characteristics such as physical condition, smoking motivation, stress, and smoking behavior were analyzed by t-test and ANOVA, followed by Duncan's Were used. Pearson's correlation coefficient was used for the correlation between variables. Regression analysis was used to analyze the factors affecting health promoting behavior.

Instruments

Smoking Motivation: The smoking motivation questionnaire used tools reconstructed by Kim (2009)¹⁴ developed by Copeland, Brandan and Quinn (1995). There were 20 items with a 4-point. The possible scores ranged from a maximum of 80 points to a minimum of 20 points (higher scores indicated higher levels of smoking motivation). Cronbach's α was .87 in the present study.

Smoking Behaviors: The smoking motivation questionnaire used tools reconstructed by Mi Sook Kim (2009)¹⁴ developed by Copeland, Brandan and Quinn (1995). There were 8 items with a 4-point scale. The possible scores ranged from a maximum of 32 points to a minimum of 8 points (higher scores indicated higher levels of smoking behavior). Cronbach's α was .81 in the present study.

Physical Condition: Physical status consisted of height, weight, blood pressure, AST, ALT, Γ -GTP, WBC, hemoglobin, hematocrit, and platelet. The blood collection site was a disposable vacuum collection set in median cubital vein.

Stress: Stress was classified as 1 to 10 visual scale and very much, a lot, a little, and almost never. The larger the number, the more stressful the visual scale is.

Health Promoting Behavior: Walker and Hill-Polerecky¹⁵ have approved the Health Promotion Lifestyle Profile-II for the tool's original developers via personal e-mail (personal communication, 2008), And used Korean translation tools¹⁶. In total, 52 sub-domains consisted of physical activity, health responsibility, spiritual growth, nutrition, interpersonal relations and stress management. For each item, the total score ranged from 52 to 208, with a score of 4 on the 'not at all' 1 and 'always' rating. The higher the score, the higher the level of practice of health promotion activities. Cronbach's alpha was .95 at the time of development of the original tool and Cronbach's alpha of the sub-domain was .79-.95. In this study, Cronbach's alpha was a total of .937, and health subordination was .834, physical activity .885, spiritual growth .850, nutrition .732, interpersonal relationship .792, and stress management.

Result and Discussion

In this study, 135 subjects were studied, including 13 females (9.6%) and 122 males (90.4%). There were 30 students (22.2%) in the first year, 46 students (34.1%), 48 students (35.6%) in the second and third grade students, and 11 students (8.1%) in the fourth grade students., and the average age was 21.95 ± 2.02 . The students' majors were as follows: 53 engineering students (39.3%); 50 business and management (37.0%); and 32 health & social sciences students (23.7%). 23 (17.0%) students think that they are thin, 71 (52.6%) students think that they are normal, and 41 (30.4%) students think that they are obese. The mean height of the participants was 174.23 ± 6.74 cm and the mean weight was 72.32 ± 5.10 . Also, most of the participants were drinking (129, 95.6%).

In response to the question of how much stress they felt, the students answered as follows: very much (20 students, 14.8%), a lot of (60 students, 44.4%), a little (50, 37.0%), and almost never (5, 3.7%). The mean of smoking behaviors was $3.22 \pm .28$ and the mean of smoking motivation was $3.16 \pm .29$. The total average of the Health Promoting behaviors $1.90 \pm .50$ out of

the lowest 1 point to the highest 4 point. There are subcategories as follows; health responsibility $1.64 \pm .29$; physical activity 1.53 ± 0.26 ; nutrition $1.81 \pm .35$; growth of spirit $2.46 \pm .29$; human relationship $2.23 \pm .20$; and stress management $1.62 \pm .20$.

The average blood pressure was 134.44 ± 12.64 mmHg systolic and 76.17 ± 10.38 mmHg diastolic. Also, AST was 27.49 ± 10.38 IU/L, ALT was 20.40 ± 15.74 IU/L, and γ - GTP appeared as 31.24 ± 21.30 IU/L. WBC was $5.64 \pm 1.48 \times 10^3/\mu\text{L}$. Hemoglobin was 16.19 ± 1.42 , Hematocrit was 44.13 ± 3.68 %, and Platelet was $296.44 \pm 91.46 \times 10^3/\mu\text{L}$.

Differences in smoking behavior among students according to general characteristics and physical status factors are as follows. Smoking behavior showed statistically significant differences according to the following factors: Major ($F = -4.885$, $p = .012$); alcohol ($t = 3.874$, $p = .015$); stress ($F = 3.005$, $p = .036$). Smoking motivation showed statistically significant differences according to the following factors: Major ($F = 3.898$, $p = .011$); alcohol ($t = 3.718$, $p = .009$); stress ($F = 2.987$, $p = .041$).

The items that showed a significant relationship with smoking motivation are as follows. smoking behaviors ($r = .247$, $p < .01$), height ($r = -.197$, $p < .05$), systolic blood pressure ($r = .202$, $p < .05$), hemoglobin ($r = .172$, $p < .05$), health promoting behaviors ($r = -.190$, $p < .05$). Smoking behavior also showed a significant correlation with carbon dioxide concentration ($r = .192$, $p < .05$). Systolic blood pressure was positively correlated with hemoglobin ($r = .221$, $p < .01$) and hematocrit ($r = .238$, $p < .01$). The items that showed significant difference from diastolic blood pressure are as follows. AST ($r = .362$, $p < .01$); ALT ($r = .311$, $p < .01$); γ -GTP ($r = .378$, $p < .01$); hemoglobin ($r = .338$, $p < .01$); hematocrit ($r = .307$, $p < .01$); health promoting behaviors ($r = .197$, $p < .05$). Also stress was significantly correlated with γ -GTP ($r = .289$, $p < .01$), and Health promotion behavior ($r = .235$, $p < .01$). Smoking motivation was positively correlated with smoking behavior ($r = .247$, $p < .01$) (table 2).

Table 1: Correlation of smoking motivation, smoking behavior, physical status and health promoting behaviors

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1															
2	.247**	1														
3	-.077	.070	1													
4	-.197*	.025	.610**	1												
5	.202*	.106	.418**	.297**	1											
6	.082	.041	.363**	.106	.462**	1										
7	-.128	.061	.241**	-.017	.153	.362**	1									
8	-.128	.065	.445**	.083	.210*	.311**	.679**	1								
9	-.023	.085	.404**	.211*	.089	.378**	.379**	.402**	1							
10	.044	.101	.039	.006	.002	.090	.156	.144	.259**	1						
11	.172*	.017	.367**	.428**	.221**	.338**	.193**	.183*	.495**	.138	1					
12	.124	.084	.319**	.391**	.238**	.307**	.146	.188*	.484**	.212**	.859**	1				
13	.103	.085	-.093	-.144	.160	.158	.208**	.107	-.172*	.156	-.344**	-.199**	1			
14	.106	.192*	.169*	-.012	.035	.050	-.028	.138	.335**	.076	.087	.086	-.128	1		
15	.104	-.708	-.193*	-.101	.018	-.081	.065	.012	.289**	.017	-.081	-.074	.084	-.111	1	
16	-.190*	-.021	.064	.130	.129	.197*	.044	-.024	-.016	-.080	.130	.164	-.148	-.123	2.35**	1

1. Smoking motivation 2. Smoking behavior 3. Weight 4. Height 5. Systolic blood pressure 6. Diastolic blood pressure 7. AST 8. ALT 9. Γ -GTP 10. White blood cell 11. hemoglobin 12. hematocrit 13 platelet 14. Co2 15. stress 16. Health promoting behavior * $p < .05$, ** $p < .01$, *** $p < .001$

As shown in Table 2, independent variables that have a significant effect on health promoting behaviors were smoking motivation ($\beta = -.045$, $p = .042$), smoking behavior ($\beta = -.014$, $p = .036$), stress ($\beta = -.178$, $p = .006$), and hemoglobin ($p = .041$), and hematocrit ($\beta = .361$, $p = .040$).

Table 2: Regression analysis affecting factors on health promoting behaviors.

	B	SE	β	t	p
constant	.157	.077	-.045	2.055	.042
Smoking motivation	-.029	.014	-.045	-2.118	.036
Smoking behavior	.009	.014	-.014	.2.312	.008
Physical activity	.175	.015	.267	11.772	<.001
Nutrition	.225	.018	.396	12.470	<.001
Growth of spirit	.225	.018	.369	12.470	<.001
Personal relationship	.160	.015	.286	10.804	<.001
Stress management	.178	.016	.265	11.149	<.001
stress	.157	.003	.178	2.458	.006
Weight	-.001	.002	-.076	-.569	.570
Height	.005	.003	.158	1.321	.189
Systolic blood pressure	.015	.002	.033	1.354	.123
Diastolic blood pressure	.005	.002	.250	1.268	.125
AST	.004	.002	.202	1.597	.113
ALT	-.001	.002	-.113	-.879	.381
Γ -GTP	-.001	.001	-.163	-1.350	.180
WBC	-.007	.012	-.057	-.632	.528
HGB	-.045	.026	-.333	-2.775	.041
HCT	.019	.009	.361	2.078	.040
PLT	-.003	.004	-.078	-.842	.401

Discussion

There was a significant difference in smoking behavior and motivation by majors, but the average score of students in the health department was significantly lower than students in other department. This is the same as Kim's study¹⁷. Students in the health department are likely to be given continuous education about the harmful effects of tobacco on the human body, and the opportunity for such education is more frequent than the students in other departments. In this study, smoking behavior and smoking motivation were significantly different from alcohol drinking. This is similar to the previous study¹⁸ in which Smokers had a significantly higher frequency of drinking than non-smokers. There are a number of previous studies that reported a significant relationship between drinking and smoking. Also, stress, smoking motivation, and smoking behavior showed significant differences. Most smokers said they prefer to switch to smoking as the main reason for smoking^{18, 19}. Byrne et al. Found that stress was the motivation for adolescents to start smoking first.

In this study, the overall average of health promoting behaviors was $1.90 \pm .50$, and the highest score of health promoting behaviors was 2.46 ± 0.29 in spiritual growth and 1.53 ± 0.26 in physical activity. This result is the same as the previous study which examined the effect of nurses' job stress on health promotion²⁰. However, in the comparison of stress and health promoting behaviors, health promotion behaviors of nurses who were stressed were significantly lower²⁰, but in this study, the health promotion behaviors of students receiving stress were significantly higher. This is probably due to the fact that students spend more time than nurses who work at work and the influence of various environmental factors is higher than that of students. Gamma Glutamyl Transpeptidase is an index of liver function used in health screening and is involved in liver detoxification. In this study, stress was positively correlated with Γ -GTP. The results of this study were similar to those of the present study in that the Γ -GTP was significantly higher in the high occupational stress group than in the other studies²¹ that examined the relationship between job stress and male dysfunction in male office workers. Therefore, the necessity of further research on the relationship between physical condition, stress, and smoking is suggested for health promotion of smoking students.

In this study, smoking motivation, smoking behavior, stress, hemoglobin, and hematocrit were the factors influencing health promotion behaviors among college students. In previous studies, stress was significantly correlated with health promoting behaviors^{13,14, 17}. In Korea, university students are exposed to stresses such as academic, human relations, career and employment, and experience life habits that can negatively affect health such as lack of exercise, frequent drinking and smoking. Although the stress experienced in general can cause physical and emotional problems, the results may vary depending on how individuals perceive and cope with the stress situation²². Although the stress experienced in general can cause physical and emotional problems, the results may vary depending on how the stress situation is perceived and coped with. Therefore, in order to strengthen the individual's health promotion behavior, I think it should be done more research.

Conclusion

This study is a descriptive research study to investigate the relationship between smoking motivation, smoking behavior, physical condition and health promoting behaviors among college students. Although many studies have been carried out to help students quit smoking, this study has significance in that it confirms the physical condition and examines the relationship between smoking behavior, smoking motivation and health promoting behavior. In the future, it will be important to check the physical condition of more smoking students and to promote better health promotion activities.

Ethical Clearance: Not required

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Conflict of Interest: Nil

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The Validation of Intentions toward Assessments about Fitness of Disabled Students Scale in University Students Majoring in Adapted Physical Activity

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ABSTRACT

The aim of the study was to identify a validation of intentions toward assessments about fitness of disabled students scale in university students majoring in adapted physical activity (APA). 385 participants were selected to identify an intention toward assessment in university students majoring in APA. The use of series of exploratory factor analyses and confirmatory factor analyses were to determine structural validity and reliability of intentions toward assessments about fitness of disabled children scale in university students specializing in APA. The outcomes of the study were adequate to validate the model fit. Further, 24 questions in the questionnaire were considered as an acceptable scale and to determine the intentions toward assessments about fitness of students with disabilities in university students majoring in APA. Cronbach's Alpha coefficients were .88, .82, .89, .80, .89, .95, and .95. Based on the results, the Intentions toward assessments about Fitness of Disabled Students (ITAFDS) scale in university students specializing in APA had a good structural validity and reliability.

Keywords: Validation, intention, assessment about fitness, a student with disability, university students.

Introduction

Today many adapted physical activity (APA) instructors or teachers believe assessments about fitness of disabled children is significant^[1]. The data collected by assessments about current fitness assists children who have a disability to be placed in proper classrooms^[2]. Furthermore, the process of assessment about fitness is the first step to determine the current fitness levels and develop a program for children with disabilities in APA classes^[3]. However, many APA instructors or educators did not assess fitness of their children who are disabilities

in their classrooms before determining placement or programming for their students^[4].

After the passing of the Act of Education for All Handicapped Children in the United States^[5], all children including students with disabilities are assessed by district assessment programs and appropriate grade level^[6]. Students with and without disabilities are protected and guaranteed the rights for education by Acts in the United States. On the other hand, the public schools in South Korea were not required to assess disabled children to provide appropriate APA programs and placement in APA classrooms.

The intention of APA instructors or teachers is defined as an action or thing of intending are very important to lead individuals to real action or behavior even though not permanently lead to actual behavior^[7]. For instance, they may conduct assessments about fitness of students with disabilities if APA instructors or teachers have intentions that assessment needs for

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appropriate placement or programming for students with disabilities in APA classrooms. Thus, they have voluntary action or behavior to use assessments about fitness of disabled children in specific environments if APA instructors or teachers have positive intentions toward assessment. This was clarified in the special theory. Theory of planned behavior (TPB) was theorized beliefs (e.g., normative, behavioral, control belief), behavior, intention, subjective norm, attitude toward the behavior, and perceived behavioral control are significantly inter-correlated^[8,9].

According to the TPB, attitudes and beliefs in university students majoring in APA influence intentions and behaviors toward assessments about fitness of disabled children^[9]. That means the positive intentions of university students specializing in APA may not have assessments about fitness of children who are disabilities when university students have negative attitudes and beliefs toward assessment. These attitudes and beliefs refer to a phenomenon in which an individual's action or behavior appears as an action or behavior through an individual's experience, emotion, and learning^[10]. Hence, it is very important to identify attitudes and beliefs in university students majoring in APA toward assessments about fitness of students with disabilities and changing from negative to positive through education if they have negative attitudes and beliefs toward assessment.

The study was developed by a theoretically driven questionnaire, using the TPB, to determine validity evidence of intentions toward assessments about fitness of students who have disabilities in university students specializing in APA in South Korea. Most researchers related to this theory have studied in intentions or attitudes of general physical education (GPE) instructors or teachers toward teaching disabled children in their classrooms^[11,12,13,14]. The only elicitation study^[1] based on the TPB as a theoretical framework examined "the preservice APE teachers' intentions toward assessment of fundamental motor skills and patterns and physical and motor fitness of students with disabilities." Furthermore, it also provided verification of TPB in the intentions about assessment of university students specializing in APA.

However, no researcher developed the scale about the intentions of university students majoring in APA toward assessments about fitness of children who are disabilities. Although the previous research^[1] used the questionnaire to explore the intentions about assessment of university students majoring in APA, it

did not focus on assessing the structural validation of the survey. Accordingly, the current study was needed because of paucity of research in this issue, absence of questionnaire about the intentions of university students specializing in APA toward assessments of fitness that adheres to a theoretical background^[15,16]. Hence, the aim of the current research was to determine the validation of intentions toward assessments about fitness of disabled students scale in university students majoring in APA in South Korea.

Method

Participants

Table 1: Demographic Characteristics of Participants in Majoring in APA

Classification		Frequency (%)
Gender	Male	271 (70.4)
	Female	114 (29.6)
Grade	Freshman	103 (26.8)
	Sophomore	102 (26.5)
	Junior	125 (32.5)
	Senior	55 (14.3)
Teaching Experience in APA Environment	Under 6 Months	62 (16.1)
	Over 6 Months - 1 year	99 (25.7)
	Over 1 Months - 2 years	54 (14.0)
	Over 2 Years	13 (3.4)
	No	157 (40.8)

The purposeful sampling was conducted to collect data of 449 university students majoring in APA. The 64 participants were not selected because of incorrect replies (e.g., all participants must take only one response on each question in the given questionnaire). In case, some participants took two responses or no response on a question in the questionnaire. This data was removed from the final data. Therefore, the 385 participants were finally selected to determine the structural validity and reliability of intentions toward assessments about fitness of disabled children scale in university students specializing in APA. The following [Table 1] clarifies the demographic characteristics of university students majoring in APA in this study.

Instrument: The questionnaire was administered to the participants: (a) vignette, (b) a background questionnaire (e.g., gender, grade, teaching experience

in APA environment), and (c) the Intentions Toward Assessments about Fitness of Disabled Students in University (ITAFDS) questionnaire. First, it included an introduction letter including the overview that provided the aim of the current research, the general introduction about the investigators and confidentiality, and vignette about the fitness condition, physical skills, and demographic information of a student with disability. In the second part, the demographic characteristics were obtained by multiple choice. In the third part, the questions related to the TPB (e.g., seven variables) were used to identify the intentions toward assessments about fitness of disabled children in university students majoring in APA. The questionnaire was developed by the TPB questionnaire guidelines^[9] and Physical Educators' Intentions Toward Teaching the Individuals with Disabilities-II[PEITID-II;^{17]}. The PEITID-II questionnaire had the positive validity and reliability by results of confirmatory factor analysis (CFA), test-retest reliabilities, and Cronbach's alpha coefficients. Therefore, the PEITID-II questionnaire provided critical information for physical education and APE educators to educate disabled children in GPE.

The ITAFDS questionnaire developed by investigators in the current study was sent to three APA professionals who are a current APA teacher and two faculties in APA department at universities in South Korea. First, they had meetings to review and modify the construction of ITAFDS questionnaire for the content validity^[18]. Based on the feedback from the three APE professionals, it was revised. Further, the questionnaire reviewed by three APA professionals was lastly revised and reconstructed by feedback after data collection. A 5-point Likert scale was used in the ITAFDS survey, which can determine levels of opinions of participants for questions in the questionnaire^[19].

Data Analyses: Frequency analysis was used to classify the demographic characteristics of university students majoring in APA. In addition, the exploratory factor analysis (EFA) was used to identify validity of construction of questions in the questionnaire and a large set of variables by SPSS 24.0^[20]. Cronbach's Alpha coefficients were also used to measure reliability of questions in the questionnaire by SPSS 24.0^[21]. The EFAs were used to identify the measurement of sampling adequacy, identity of the association with matrix, and factor analyses' adequacy revealed by the Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity^[22]. The

CFA was conducted to identify model specification in the TPB and Normed X^2 , CFI, normed fit index (NFI), GFI, RMSEA, and Tucker-Lewis index (TLI) by AMOS 24.0^[23,24,25,26].

Results

In the first EFA, the sampling capability's KMO measure was .897. This result showed that the variables showed a high degree in common variance and provided good outcomes in the correlations. Bartlett's Test of Sphericity demonstrated significance in the results for the adequacy of the model (i.e., Bartlett's $\chi^2 = 10218.40$, $df = 666$, $p < .001$). The all factors showed 68.72% in the total variance. Further, the retained questions' communality (e.g., ranging from .27 to .85) and the loadings of questions which were retained (e.g., ranging from .32 to .90). Accordingly, the elimination of eight questions was conducted to improve the internal reliability and factor loading for each factor after meeting with APA professionals for the content validity. Eliminating eight questions had the communality or loading of less than .40 and high multicollinearity.

Table 2: Results of a Series of CFA

Classification		Goodness of Fit	
		First CFA	Number of Final Questions
Number of Questions Eliminated	Intention Toward Assessment	None	3
	Attitude Toward Behavior	1	3
	Behavioral Belief	1	3
	Subjective Norm	1	2
	Normative Belief	2	3
	Control Belief	None	5
	Perceived Behavioral Control	None	5
Normed X^2	2.81	→	2.72
NFI	.886	→	.917
CFI	.923	→	.946
TLI	.912	→	.935
RMSEA	.069	→	.067

In the second EFA, the sampling capability's KMO value was .894. Furthermore, Bartlett's Test of Sphericity showed positive adequacy of model ($p < .001$). The second EFA had total variance (76.76%) than the first EFA. The questions' communality (e.g., ranging from .56 to .87) and the loading of questions (e.g., ranging from .44 to .91). The internal reliability was intended by Cronbach's alpha, reached from .76 to .95. Thus, a total 29 questions were selected to identify the intentions toward assessments about fitness of students with disabilities in university students majoring in APA.

A series of CFA was used to identify a relationship between the related theory (e.g., TPB) and variables to indicate the specification of model founded on questions designated after EFAs. In addition, the CFA was conducted to identify the adequacy of fitting a model. An acceptable model fitting is quantified as an index of 3.0 or lower in normed X^2 . The positive fitting a model is quantified as an index of .90 in NFI, TLI, and CFI. A close fit is quantified as an index of .05 and .08 shows an acceptable fit in RMSEA [24,25,26]. These indexes were calculated to determine the adequacy of validation in scale.

Table 3: Final Questions in the Questionnaire

Classification	Contents of Questions	Number of Questions
Intention	Intention toward assessment about fitness of a student with disability	3
Normative Beliefs	Families, friends	2
Behavioral Beliefs	Effort, teaching experience, theory	3
Control Beliefs	Locomotor skills, objective control skills, cardiorespiratory endurance, muscular strength, flexibility	5
Subjective Norm	Friends, educational system, surrounding people	3
Attitude Toward the Behavior	Help, meaning, interest	3
Perceived Behavioral Control	Locomotor skills, objective control skills, cardiorespiratory endurance, muscular strength, flexibility	5

In the first CFA, five fitting indexes were Normed X^2 (2.81), RMSEA (.069), NFI (.886), TLI (.912), and CFI (.923). NFI showed a low value of .90. Five questions had high multicollinearity or lower squared multiple correlation (SMC) than .40 when conducting a factor analysis to identify the validation of scale. The SMC was conducted to enhance fitting a model. As a result, five questions were eliminated when conducting the first CFA [Table 2]. In the second CFA, all fit indexes, such as Normed X^2 (2.72), RMSEA (.067), NFI (.917), TLI (.935), and CFI (.946) were improved [Figure 1]. Furthermore, there were significant relationships between each factor even though there was not a significant relationship in the perceived behavioral control (e.g., $CR = .908$, $p = .345$). Therefore, the outcomes of this study showed an acceptable adequacy of fitting a model. In addition, 24 questions in the questionnaire were considered as an acceptable scale to determine the intentions toward assessments about fitness of disabled children in university students majoring in APA [Table 3].

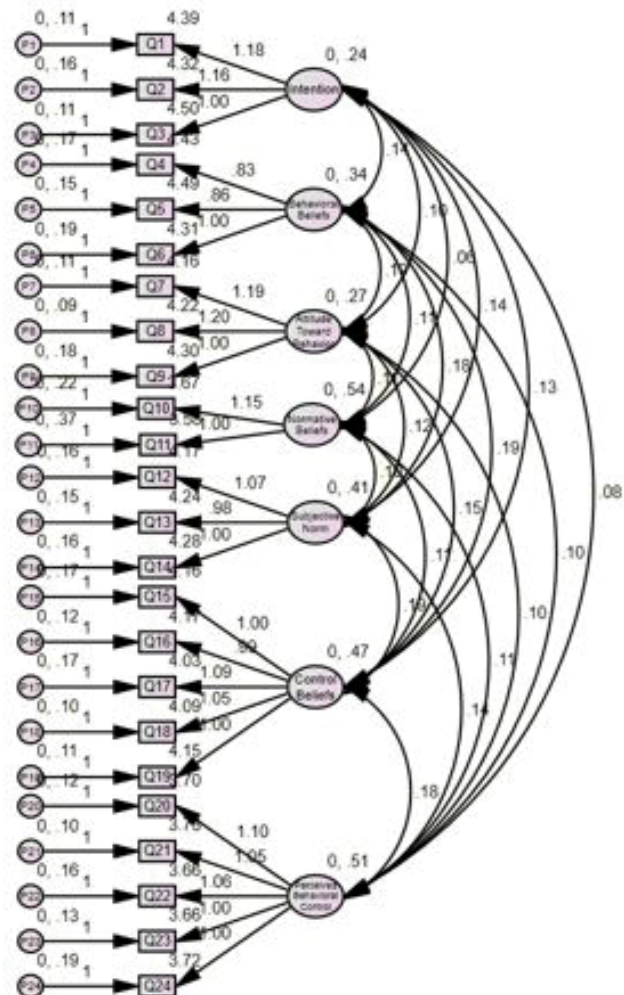


Figure 1: Results of the Second CFA

Discussion and Conclusion

The aim of the current research was to classify the validation of intentions toward assessments about fitness of disabled children scale in university students majoring in APA. The series of EFA and CFA was used to find the validity of the questionnaire. Furthermore, the Cronbach's Alpha coefficient was also calculated to identify consistency of questionnaire.

In consistent with previous study^[1], the hypothesis that subjective norm and attitude toward behavior is positively related to intentions toward assessments about fitness of students with disabilities in university students specializing in APA even though perceived behavioral control did not significantly influence for intentions toward assessments about fitness of disabled children in university students specializing in APA. It does not show a clear reason why perceived behavioral control is not significantly associated with intentions. There is a potential reason that Ajzen^[8] suggested the perceived behavioral control is connected with volition of an individual. In addition, lacking teaching experience in APA environment and education might be another reason because they do not have appropriate information or experience about assessment. According to a research^[27], the perceived behavioral control was an important factor to determine the intentions of aquatic coaches toward training children with disabilities for swimming. In the study, aquatic instructors had a lot of experience and information to teach disabled children. These issues may impact on a factor of university students majoring in APA.

However, the subjective norm and attitude toward behavior are significantly connected with intentions toward assessments about fitness of disabled children in university students specializing in APA. First, positive attitude toward assessment may make intentions toward assessment positive. In other words, the university students majoring in APA may have positive intentions toward assessment when they have positive attitudes toward assessment^[1,28]. Second, the university students majoring in APA might be prejudiced by the social pressures from family, friends, or parents who have children with disabilities to develop the intentions toward assessments about fitness of students with disabilities^[29]. It is very significant for university students specializing in APA to have their beliefs toward assessment and how they assess their students with disabilities when they become an APA instructor or teacher. Hence, they

significantly impact on the intentions toward assessments about fitness of disabled children in university students.

In addition, the indirect factor (e.g., normative belief, behavioral belief, control belief) are significantly associated with direct factor (e.g., subjective norm, attitude toward the behavior, perceived behavioral control). In other words, indirect factor had the strong relationship with the direct factor. This strong relationship provides positive results between the direct factor and intention toward assessment. However, no known researcher in APA determines the assessments about fitness of children with disabilities founded on TPB before the elicitation study^[1]. The most researchers who used the TPB provided information about the GPE educators' intentions or attitudes toward educating disabled children in classrooms^[11,12,13,14]. Thus, the current study provides significant information about intentions toward assessments about fitness of disabled children in university students majoring in APA.

In conclusion, based on the results the intentions toward assessments about fitness of disabled students scale in university students majoring in APA is appropriate to identify the intentions toward assessments of fitness for students with disabilities in university students majoring in APA in South Korea. Therefore, the ITAFDS scale had a good structural validity and reliability.

Ethical Clearance: Not required

Source of Funding: Not required

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Effects of 8-week Rehabilitation Exercise on Vascular Health

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ABSTRACT

The purpose of this study was to investigate the effect of 8-week rehabilitation exercise on active vascular health and ultimately propose an effective rehabilitation program applying various stretching methods. The research targets were females who visited hospital due to chronic diseases or metabolic syndrome; and were divided into two groups, participants of rehabilitation exercises, and non-participants of rehabilitation exercises. 10 people were included in each group. The subjects were restricted to participate in other exercise programs during the exercise period. The 8-week exercise program was designed to measure the ankle brachial index (ABI) and the cardio-ankle vascular index (CAVI) using active stretching and passive stretching. In the data processing, descriptive statistics were presented for each measurement item and a 2-way RGRM ANOVA was conducted to examine the interaction effects between groups. The results have shown significant interaction effects in ankle brachial index (ABI) and the cardio-ankle vascular index (CAVI). Therefore, the eight-week rehabilitation campaign has shown to have a positive effect on vascular health and is believed to be an effective preventive measure to reduce the incidence and risk of cardiovascular disease. Also, this rehabilitation program is thought to help prevent cardiovascular disease if it is provided to more elderly people since which does not require special places or specialized equipment.

Keywords: Rehabilitation Exercise, Cardio-Ankle Vascular Index (CAVI), Ankle Brachial Index (ABI), Stretching Exercise, Vascular Health

Introduction

According to the report published by National Statistical Office (NSO) in 2014, the main cause of death in elderly women (over 65) was circulatory system diseases¹. When compared to the fact that the main cause of death of men is cancer, it seems obvious that the women in their 60s or 70s have more relation with circulatory diseases than men. Cardiovascular disease is the most frequent manifestation of cardiovascular disease, and 80% of the causes are thought to be arterial dysfunction. It is considered as an element which brings high risk of death².

This change in cardiovascular aging is due to the loss of elasticity and stiffness of the pulsatile arteries, resulting in a loss of blood vessel expansion and a burden on the heart. It therefore causes cardiac hypertrophy and cardiac function, resulting in reduced cardiac output – which ultimately skyrockets the probability of heart function failure³.

The decrease of the arterial compliance- which is - The increase of arterial stiffness interferes with blood pressure or blood flow - can increase blood pressure, bring left ventricular hypertrophy, cause ischemic disease in the coronary artery, and decrease arterial baroreflex sensitivity⁴.

Various methods such as medication therapy, diet control, and exercise are being explored to alleviate arteriosclerosis and maintain proper arterial rigidity(Cardio Ankle Vascular Index, CAVI) and angle brachial index (ABI).

Since exercise (body activity) is considered as a means of minimizing physiological disorders caused

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by aging and preventing chronic diseases or disorders, it is also thought as a method which efforts to increase expectations of positive life to achieve successful aging⁵. Exercise for the treatment and prevention of diseases is called therapeutic exercise or rehabilitative exercise⁶, and is constantly emerging as a countermeasure against diseases and injuries in the elder. Plus, the rehabilitative exercise which was conducted in conjunction with medical teams for injury or disease treatment has also proved and demonstrated its efficiency as well⁷. In this context, exercise rehabilitation programs for the elderly can reduce stress by improving physical health, giving confidence in physical strength and providing an opportunity to enjoy life by enhancing social activities and cooperation. Research in developed countries has shown that sports activities can effectively prevent problems and reduce diseases among older people, and aerobics, swimming, jogging and other sports activities can effectively relieve stress in the general public⁸.

Stretching, which is part of the dual rehabilitation exercise program, is a temple exercise that expands muscles, tendons, ligaments, and around joints. It not only improves the range of operation of joints and posture imbalance, but also prevents musculoskeletal damage, and is also effective in balancing the pelvis by relaxing the tense muscles around the pelvis and spine⁹. Stretching exercises are also simple to perform, by expanding and contracting muscles, and can be performed anywhere,

reducing muscle and musculoskeletal adhesion as well as increasing joint flexibility and blood circulation¹⁰. Stretching exercise is one of the therapeutic interventions to improve the operability of connective tissue, such as muscles, and to increase the range of joint operation. Depending on how the exercise is performed, there are passive or active methods, but regardless of the method of stretching exercise performed, the most important thing is to relax the contracted muscles and increase the connective tissues' flexibility as much as possible¹¹.

The purpose of this study was to investigate the effect of 8-week rehabilitation exercise on the vascular health of active elderly women with active stretching and passive stretching, and to propose an effective rehabilitation exercise program for stretching.

Materials and Method

Subject of Study: This study was conducted with the consent of participating in rehabilitation exercise for women who visited the hospital due to metabolic syndrome and chronic diseases. The subjects were 10 rehabilitation exercise group(RG) and 10 non - participation group(CG) and they were restricted to participate in other exercise programs during the exercise period. Other daily activities were instructed to live the same as before the experiment, and explained that if you feel any abnormality during the experiment, you can withdraw from this experiment immediately<Table 1>.

Table 1: Physical Characteristic of Subjects (M ± SD)

Group	N	Age (yr)	Height (cm)	Weight (kg)	Fat (%)
RG	10	69.33 ± 2.54	153.42 ± 3.51	62.13 ± 4.29	29.12 ± 4.03
CG	10	70.20 ± 2.06	154.17 ± 2.76	62.97 ± 4.23	29.30 ± 3.70

Exercise Program: The exercise program of this study was applied in parallel with active stretching and passive stretching. Stretching can help relieve pain in the long term through orthodontic correction and extension, and can improve physical activity by improving the range of motion of the joints. First, active stretching was performed in a way that the subject could proceed alone while watching the leader, and passive stretching was performed by artificially stretching the range of motion of the subject's joint by the assistant. The exercise program consisted of 30 minutes of active stretching for 30 minutes and passive stretching for 60 minutes, three times a week for 8 weeks. Specific exercise programs are shown in <Table 2>.

Table 2: Exercise Program

Division	Intensity	Main Stretching
Periods (8week)	RPE (Borg scale) ≤11	Cervical rolling, cervical joint release, cervical trapezius stretching, cervical side bending stretching, cervical rotation, erector spinae stretching, mobilization, traction modify, scapula medial STR, scapula dislocation, shoulder full extension, trunk rotation stretching, thoracic mobilization, hamstring stretching, hip joint traction stretching, quadriceps stretching, psoas stretching

Measurement Method and Equipment: The vascular health according to the rehabilitation exercise was measured before and 8 weeks after exercise program using Vascular Screening Device (VeSera VS-2000, Japan). The measurement items were 4 diastolic blood pressure (both arms and legs), atherosclerosis (CABI), and arterial stenosis (ABI).

Data Analysis: The data analysis of this study presented descriptive statistics for each measurement item and 2-way RGRM ANOVA was performed to examine the interaction effect between groups. The significance level was analyzed based on $\alpha = .05$.

Result

Cardio Ankle Vascular Index (CAVI): After an 8-week rehabilitation exercise with RG and CG, ANOVA showed that R-CAVI had an interaction effect ($p=.035$) between the two groups. Also, L-CAVI was also found to have interactive effects ($p=.04$) <Table 3>.

Ankle Brachial Index (ABI): After an 8-week rehabilitation exercise with RG and CG, ANOVA showed that R-ABI had an interaction effect ($p=.045$) between the two groups. Also, L-ABI was also found to have interactive effects ($p=.049$) <Table 4>.

Table 3: CAVI ANOVA

Factor	Group	Pre	Post	P
R-CAVI	RG	10.10 $\pm$ 1.01	9.20 $\pm$ 1.03	Group*period: .035 Group: .547, Period: .02
	CG	9.89 $\pm$.98	9.99 $\pm$ 1.10	
L-CAVI	RG	9.28 $\pm$.89	8.92 $\pm$ 1.02	Group*period: .04 Group: .486, Period: .035
	CG	9.45 $\pm$.94	9.55 $\pm$.88	

Table 4: ABI ANOVA

Factor	Group	Pre	Post	P
R-ABI	RG	1.75 $\pm$.13	1.25 $\pm$.11	Group*period: .045 Group: .423, Period: .024
	CG	1.98 $\pm$.50	1.99 $\pm$.64	
L-ABI	RG	1.48 $\pm$.15	1.02 $\pm$.13	Group*period: .049 Group: .436, Period: .027
	CG	1.42 $\pm$.21	1.52 $\pm$.32	

Discussion

The purpose of this study was to compare and analyze the differences of vascular health changes through the 8 - week rehabilitation exercise program which included active stretching and passive stretching in the elderly women who visited the hospital due to metabolic syndrome and chronic diseases. The results of this study are as follows.

The Cardio ankle vascular index(CAVI) is an index that reflects the loss of elasticity of the arterial blood vessels and is an independent predictor of the incidence and mortality of cardiovascular disease¹². The central aorta is more easily stiffened by aging, menopause, smoking, metabolic syndrome, and lack of exercise due to lower percentage of muscles and a high proportion of elastic fibers¹³. Increased CAVI can lead to elevated central blood pressure, and can result in increased cardiovascular risk by overloading the left ventricle¹⁴.

ABI is an indicator of atherosclerotic change and is used to diagnose peripheral arterial diseases¹⁵. It also can be used to assess blood flow to the ankles and play a role as a marker for vascular diseases¹⁶.

In a previous study on vascular health changes through exercise in the elderly, Madden et al¹⁷ conducted a three-month median-high-intensity aerobic exercise on hypertensive elderly people. The results showed that it decreased the pulse wave velocity of radius and aorta femoralis. Miura et al¹⁸ reported that at least two times of exercise can give positive effect on improving arterial stiffness. A study by Jung et al¹⁹ found that 12 weeks of physical dance movements for senior citizens had a positive effect on improving arterial hardness and vascular function. According to study of Thetiwuthikiat et al²⁰, there was no change in ABI after eight-week of arm-swinging exercise were conducted on men and women over the age of 50, while there was a significant decrease in cardio-ankle vascular index(CAVI).

However, it is necessary to conduct further studies about long-term results of arm-swings exercise to improve arteriosclerosis.

Regarding the previous studies about the change in vascular health through stretching exercises, Logan et al²¹ reported that a 30-minute video demo of full-body stretching exercises in healthy women resulted in a decrease in carotid-femoral pulse wave velocity(cf-PWV). Also, Hota et al²² suggested that stretching exercises in patients with acute myocardial infarction could significantly increase the reactive hyperemia peripheral arterial tonometry(RH-PAT) and improve intravascular function and peripheral circulation. The study by Nishiwaki et al²³ showed that the four-week of stretching exercises in middle-aged men resulted in a decrease in both brachial-ankle pulse wave velocity(ba-PWV) and CAVI. However, according to Wong & Figueroa²⁴, eight-weeks of stretching exercises in obese women after menopause did not show changes of arteriosclerosis. These contrasting studies could have excuse for the fact that vascular adaptation by stretching can vary depending on the characteristics of participants such as age, gender, history, type of exercise program, intensity, duration, frequency, and momentum²⁵.

In this study, eight-week of rehabilitation program using active –passive stretching exercise resulted in reduction of the degree of arterial rigidity and arterial stenosis, with statistically significant differences. It would be attributed to the improvement in the functional ability of vasodilation and also vascular epithelial cell itself by supporting endothelial progenitor cells involved in the hormone secretion and inflammatory response, owing to the stretching exercises²⁵.

Therefore, it is supposed that rehabilitation program using active –passive stretching exercise is the way to not only reduce but also prevent the incidence of aging-induced cardiovascular diseases by improving vascular function. However, further additional studies with larger subjects, various physiological factors, and various stretching exercise programs should be performed to establish a clear effectiveness.

Conclusion

The purpose of this study was to investigate the effect of rehabilitation exercise on vascular health for 8 weeks. The rehabilitation exercise group and the control group were divided into two groups.

After the rehabilitation exercise group and the control group applied the rehabilitation exercise for 8 weeks, the R-CAVI showed an interaction effect between the two groups. Also, L-CAVI was also found to have interactive effects.

After the rehabilitation exercise, R-ABI showed an interaction effect between the two groups. In addition, L-ABI also has an interaction effect.

And a statistically significant decrease in arterial stiffness and stenosis after the rehabilitation exercise. In addition, aerobic exercise is recommended as a method of reducing arteriosclerosis, but stretching based on rehabilitation exercise in this study also showed a significant effect on decrease of atherosclerosis.

In the follow-up study, it is necessary to increase the number of subjects to be interested in the validity of the study. In addition, it is thought that various approaches are needed to further refine the program, intensity, time, and frequency of rehabilitation exercise.

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Nutrition Management and Support Effect of Food Service at Home Childcare Center

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ABSTRACT

The goal of this study was to investigate current nutritional management status of meals served at home childcare center and the degree of improvement and the change of salt salinity after the support by the Center for Children's Foodservice Management (CCFM). The result showed that the mean compliance rate of all 14 items was 76.1% among which the items that were rated lower than the average was. Among the items that were rated lower than the average, 0.7% answered yes to "Does the center check the soup's salinity at cooking?", 28.0% for "Does the center cook by reading the standard recipe?", 32.7% for "Does the center provide alternative food to infants with food allergy?" 363.3% for Does the center natural seasoning during cooking', 73.3% replied yes to 'Does the center utilize special diet such as low-salt diet, low-end diet?', etc. The improvement in providing alternative foods to infants and children with allergies after one nutritional support did not show significant change. However, the mean scores of all four domains increased significantly ($p < 0.05$, $p < 0.001$), and the overall mean score increased significantly from 70.43 to 75.79 ($p < 0.001$). 58 (50.4%) of 0.3 ~ 0.5% of the nursery schools were the most with the change in salinity after the nutritional support for lunch, while 59 childcare center (49.5% reduced to 38(33.1%) which were more than 0.5%. The mean salinity of the nursing homes in the study was significantly reduced from 0.53% to 0.45% ($p < 0.01$) measured in the childcare center. The results of this study made sure that the nutritional management of the home childcare center was improved after the service of the child care center. However, there were some items that could not be improved only with one nutritional support, and there were many nurseries that did not improve with the salinity of the soup. Therefore, the Children's Food Service Support Center will continue to provide nutritional support for home childcare centers, and more home childcare centers will need to increase resources and opportunities to benefit from the Center for Children's Foodservice Management.

Keywords: Home childcare center, Foodservice, Nutrition management, Salinity, CCFM.

Introduction

Children under age five who spend some time in a childcare center would spend more than 33 hours per week at childcare center^{1,2}. While eating at the childcare center, they take meals and snacks more than once and begin to form eating habit by interacting with the director of the center and teachers other than their peer groups.

Such eating habits formed while young could influence the eating habits of adolescents and adulthood³⁻⁵. Therefore, other than providing the nutritional support necessary for the growth of children through the meals they provide, the childcare center has become an important institution that influences the eating habits that are formed throughout one's life and the resulting health⁶. However, analysis of the menu of the lunch provided by the real childcare center found that there were many problems such as the lack of vegetables, fruits, and whole grain, and excessive sugar and salt meals^{7,8}. Experts say that to address these problems and ensure proper nutritional management of the childcare center, the meal should be done as planned on the right menu and share the nutritional policy of the childcare center

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with the parents⁹. In addition, the teacher should eat with the children, provide nutrition guidance with proper interaction and be a role model by themselves⁸. More than anything, more nutrition education and information to the director of the center are to be provided, and continuous improvement of nutritional management of nursery schools is necessary^{7,8,10}.

Australia is applying a Start Right - Eat Right system for nutrition management of full-time childcare centers. In the study of the efficacy of this system, 80% of the nurseries participating in the study fully complied with the standards and the overall compliance rate reached to 98% from 56%¹¹. The program provided nine hours of nutrition training to the directors and cooking employees, and the children's meal intake has also been significantly improved after that. However, a study of nutrient management by Martyniuk *et al.*⁶ found that home-based child-care facilities had a significantly lower nutritional value than center-based child; yet, both types of childcare centers indicated that improvements in nutritional management and nutrition education and training were needed for both kinds of childcare centers.

In Korea, the Center for Children's Foodservice Management (CCFM) has been established and operated by the Food and Drug Administration to systematically manage the hygiene and nutrition of childcare meals since 2011¹². The Center for Children's Foodservice Support Center provides services such as nutrition education and education of cook and chief of care center, supervision of diary and cookery, check of foodservice management, and preparation of diets for childcare centers, kindergarten and children's welfare facilities without nutritionist. However, small-sized children's homes with younger-aged children are far less than those of large-scale childcare centers¹³. To this, the study is to evaluate the effect of center support for home childcare centers to benefit from more support centers. First, this study will investigate the nutritional management status of home childcare meals, and the degree of improvement after the support of the CCFM and the salinity change of soup provided for each lunch. The results of this study can be helpful in predicting the effectiveness of nutritional support in the CCFM

Method

Research Subjects and Duration: In this study, 150 childcare centers in Cheongju, Korea were visited by dietitians and examined the foodservice and food

distribution of center. Two visits were made in total of which first visit was from February to July, and the second visit was from August to December.

Survey Method and Contents: In this study, the home childcare center was visited twice every 5 ~ 6 months. After the field visit at the first visit, the director and the center were provided with necessary nutrition education. The salinity of the soup served at lunch during the first and second visits was measured using the 'HM digital salinity meter (Model: SB-2000 PRO, Seoul, Korea)'. The nutritional management status of children's meals was measured using a checklist used by the support center¹².

The checklist used in the field visit was the one provided in the Guidelines for the CCFM¹², which divides the total 14 items into four domains. In the 'diet management' domain, there are three items. The second domain of 'food provision' provides 6 items. Third, there are four items in the 'cooking domain'. In the final 'distribution' domain, there is one item. After reviewing the nutritional management status of the meals, things that were not complied with well were mainly educated including the confirmation of diet and dietary changes, the description of special diets, allergies and substitutes, standard recipes, natural seasonings, appropriate salinity of the soup, the adequate amount of distribution.

Data Analysis: The statistical analysis of this study was SPSS ver. 18.0 for windows (Statistical Package for Social Science, SPSS Inc. Chicago, IL, USA). Frequency analysis was conducted to figure out the compliance rate of the generalities and the first check result. After the nutritional check-up and feedback on it, the study conducted a p-paired t-test on the first and second nutritional management scores and the salinity the soup served at lunch menu to grasp the efficacy of the check.

Results

Generalities of the Surveyed Childcare Center:

Table 1 shows the generalities of 150 childcare centers surveyed. The number of preschool children was 16 ~ 20 persons in 45.4%, 67.8% in case of designated cook, and 31.3% in case of direct cooking by directors without designated cook. 49.3% of the cooks or directors had less than 1 year of cooking experience, and 72.0% of them used water purifiers for drinking water and 24.0% of them used boiled tap water. 87.3% of the childcare centers were certified by the Ministry of Health and Welfare in Korea and 97.3% were childcare centers using the diet provided by the CCFM.

Table 1: General characteristics of the childcare centers

Category		Frequency (N)	Percentage (%)
Number of child	1 - 5	6	4.0
	6 - 10	26	17.3
	11 - 15	50	33.3
	16 - 20	68	45.4
Number of foodservice employee	0*	47	31.3
	1	103	68.7
Working period of foodservice employee (or directors' cooking periods) (years)	< 1	74	49.3
	1 ≤ - < 3	30	20.0
	3 ≤ - < 5	25	16.7
	5 ≤ - < 7	18	12.0
	7 ≤ - < 10	3	2.0
Drinking water	Using purifier water	108	72.0
	Boiling tap water	36	24.0
	Others	6	4.0
National accredited facilities	Yes	131	87.3
	No	19	12.7
Use of center's menu	Yes	146	97.3
	No	4	2.7
Total		150	100

*Director cooks instead of foodservice employee.

Nutritional Management Status before the Foodservice Management Support of Home Childcare Centers:

Table 2 shows the nutritional management status of home childcare centers before the support by the CCFM. The average compliance rate of all 14 items was 76.1%. The items with lower scores than the average were 'Does the center check the salinity of soup at cooking' 0.7%, 'Does the center cook with standard recipe', 28.0%, 'Does the center use alternative foods for the allergies' 32.7% 'Does the center use natural seasoning at cooking' 63.3%, 'Does the center use special diet such as low-salt diet and low-sugar diet' 73.3%. The domain with the lowest compliance rate was 'cooking management', with the average of 47.6%.

Table 2: Nutritional management status before the meals management support of home childcare centers
(N = 150)

	Obeying no. (N)	Obeying rate (%)
<Diet management>		
Does the center use a dietitian's diet?	149	99.3
Does the center use a special diet such as a low salt diet and a low sugar diet?	110	73.3
Whether to place a monthly diet available and show them to their parents?	148	98.7
Subtotal mean		90.4
< Food provision management>		
Does the center provide substitute food for infants and children with food allergies?	49	32.7
Whether they are provided with meals and snacks in compliance with the menu?	140	93.3
Whether they provided fried food less than twice a week?	149	99.3
Is instant food is used less than twice a week?	150	100.0

Conted...

Do fresh vegetables or fruits are given more than three times a week?	141	94.0
Are snacks provided twice a week each in the morning and afternoon?	150	100.0
Subtotal mean		86.6
<Cooking management>		
Does the center use standard recipe?	42	28.0
Does the center not reuse frying oil as much as possible?	147	98.0
Does the center use natural seasoning at cooking?	95	63.3
Does the center check the salinity of soup during the cooking?	1	0.7
Subtotal mean		47.6
<Distribution management>		
Does the center distribute appropriate amount (nutritional intake standard) to infants?	127	84.7
Total mean		76.1

Comparisons of the nutritional management before and after the foodservice management support of home childcare centers: The nutritional management scores of primary and secondary inspections were compared to determine the difference in nutritional management before and after the foodservice management support to home childcare centers. Among 14 items, 6 items showed significant increase after receiving support from the CCFM ($p<0.05$, $p<0.01$, $p<0.001$). The mean scores of all four domains were significantly increased ($p<0.05$, $p<0.001$), and the overall mean score was significantly increased from 70.43 to 75.79 ($p<0.001$). (Table omitted.)

Comparison of the salinity measured result before and after the nutritional education of home childcare centers: During the first visit of the home childcare center, the salinity of the soup served at lunch was measured and nutritional education was conducted on the necessity of low salt diet. After 5 to 6 months, the salinity of the soup was measured again at the second visit and the results were compared (Table 3). 57 (49.5%) of the centers were more 0.5% in the first visit, which was the most, while 58(50.4%) of the centers that had the salinity of the soup as 0.3 ~ 0.5% were the most in the second visit. And the childcare centers having more 0.5% of salinity decreased from the first visit's 49.5% to 33.1%. The mean salinity of the centers in this study was significantly decreased from 0.53% in the first to 0.45% in the second ($p<0.01$).

Table 3: Comparison of the salinity measured result before and after the nutritional education of home childcare centers

		Before education	After education	χ^2/t -value
Salinity (%)	≤ 0.3	11(9.6) ¹⁾	19(16.5)	6.299
	$0.3 < \sim \leq 0.5$	47(40.9)	58(50.4)	
	> 0.5	57(49.5)	38(33.1)	
Total ³⁾		115(100.0)	115(100.0)	
Mean salinity (%)		0.53 ± 0.22 ²⁾	0.45 ± 0.15	3.242**

¹⁾N(%), ²⁾Mean $\pm$ S.D., ** $p<0.01$, ³⁾There were cases when salinity was not measured in before and after both.

Discussion

The purpose of this study was to investigate the current status of nutritional management of meals provided at home childcare center and figure out the changes of salinity of the soup provided at lunch and the extent of the

improvement after support of the Center for Children's Foodservice Management. First, as a result of inspecting the status of nutritional management of children's meals before children's foodservice management support of home childcare center, the item that showed the lowest compliance rate was 'confirmation of saltiness of cooked

soup. Also, the actual salinity was measured to be 49.5% of the total number of childcare center over 0.5%, and the average salinity was 0.53 higher than 0.5, which is the recommended soup salinity of infant feeding school in Korea¹⁴. The intake of excess salt during childhood is highly correlated with later hypertension¹⁵ and may negatively affect the function of the heart or kidney when grown up¹⁶. In addition, the eating habits at younger age would have a lasting effect even when they became adults^{4,17}. The results of this study showed that there was a significant improvement in the salinity measurement practice after one nutritional support and the mean salinity of the country was also significantly decreased. Therefore, continuous education and management of low-salt food should be provided for children.

In this study, the second lowest level of nutritional compliance rate among childcare centers was cooked using standard recipes. In Lee's study¹³, home nursery chiefs tend to refer only to the ingredients and recipes from the standard recipe and do not link them with the amount of material purchased, the amount of food they have been cooked, or the amount of food they eat. Therefore, the Center for Children's Foodservice Support Center should notify the importance and usefulness of the standard recipe for nursery homes and directors. Although the compliance rate for providing alternative food to infants with food allergies in the home childcare center of this study was low, this item was not significantly improved after nutritional support. Many children's foodservice workers know for sure that food allergy is a disease threatening health, but are not aware that the consequences can be fatal¹⁸. Although the understanding and knowledge of food allergy have been improved after education about food allergy¹⁹, as shown in the results of this study, it is difficult to improve practically with one education, so various methods of support and continuous education are needed.

Conclusion

The goal of this study was to investigate the current status of nutritional management of meals provided at childcare centers. The results indicated that some items and overall average scores were improved after nutritional management support for feeding of home childcare centers, and the salinity of the soup also showed favorable change. However, there were some items that were not improved only with one nutritional

support, and the salinity of the soup was not improved sufficiently. Therefore, the Children's Food Service Support Center would need to continue its efforts to provide nutritional support for home childcare centers, and more home childcare centers will benefit from the Children's Food Service Support Center.

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Differences in Attention Levels between Preliminary Nurses and Pre-Service Early Childhood Teachers Using ANT (Attentional Network Test) Computer Test

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ABSTRACT

The purpose of this study was to analyze attentional network test (ANT) and to examine the difference of attention level according to the types of brain dominance between nursing college students and preservice early childhood teachers. The subjects of this study were 79 students in 3rd and 4th grades attending nursing department and early childhood education department of U university. Herrmann's BDI was used to measure the type of brain dominance and Ant (attentional network test) computer test was performed to measure the level of attention. The data were analyzed by independent t-test to determine differences in brain dominance and attentional level between preliminary nurse and pre-service early childhood teacher and to analyze differences in attention level according to types of brain dominance. The results of this study were as follows: First, there was no significant difference between the two groups in A, B, and C quadrants. In quadrant D, the pre - early childhood teacher's quadratic thinking score was significantly higher than preliminary nurse quadrant, respectively. Second, there was no significant difference between preliminary nurses and pre - service early childhood teachers in the level of alerting and executive control. At the level of orienting, the preliminary nurse's orienting score was significantly higher than the pre-service early childhood teacher's orienting score. Third, alerting effect attention was not significantly different according to the type of brain dominance, but orienting was highest in students in the quadrant A, and executive control was highest in students in quadrant D quadrant burnt.

Keywords: *ANT computer test, brain dominance thinking, attention level, preliminary nurse, preservice early childhood teacher*

Introduction

According to the model of Herrmann (1996), the left cerebral hemisphere (A quadrant) is associated with logic analysis and quantitative thinking, while the left limbic hemisphere (B quadrant) is associated with sequential, The right limbic hemisphere (C quadrant) is associated with emotional and sensory person-to-person interactions, while the right cerebral hemisphere (D quadrant) is associated with visual, intuitive, and innovative thinking¹. In other words, the left cerebral hemisphere (A quadrant) dominant person tends to think

logically, analytically, and factually, to find an efficient problem-solving method for complicated problems, it does not shake my feelings. The left limbic hemisphere (B quadrant) the dominant person is systematic, sequential, planned and detailed thinking, similar to the sedentary brain, but somewhat structured and focused on the theoretical framework and likes to work according to time and schedule. Right limbic hemisphere (C quadrant) the dominant person tends to be influenced by mood, is sensitive, talks to talk, is accustomed to persuade others, and is interested in thinking about how others will feel. The right cerebral hemisphere (D quadrant) the dominant person is global, intuitive, imaginative, and does not follow sequential procedures for making decisions.

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Herrmann's brain dominance was related to the tendency of middle school students to solve technical problems. According to this study³, students in the

quadrant have a quadrant of a tendency to solve technical problems. This means that a student with a quadrant D quadrant is more likely to perform a job that requires technical problem resolution than a student who has a quadrant A, B, or C. It is important to consider whether the thinking itself is dominant in A, B, C, or D quadrants, but if such dominance is revealed, it correlates with any psychological, learning, This characteristic must be considered when performing or learning a job depending on the correlation.

Research related to these brains has been an important research topic not only in medicine and physiology but also in pedagogy. In fact, results from brain research provide educational implications. Attention is a basic information processing process of the brain that has different characteristics depending on its range, type, functional process, purpose, and neural network. ⁴divided into alertness, arousal, sustained attention, selective attention, and resource. It has been subdivided into alerting, orienting, and executive control⁵. In particular, Eriksen and Eriksen used the adult ANT (Attentional Network Test) to measure three attentions using a computer, including the Flanker task⁵⁻⁶.

First of all, 'alertness' is focused on attention and maintaining the condition continuously. This system refers to letting the task continue to be carried out because it is related to the front part of the right hemisphere and the crown of the right hemisphere. Second, 'orienting' selects information from input stimulus, which is related to parietal lobe and frontal lobe. Orienting is operated by presenting a cue that points to a space in which a person must pay attention, and even though it may be ambiguous enough to move the eye or notice the motion of the eye. Third, 'executive control' means resolving conflicts among various reactions, which activates the frontal lobe⁷⁻⁸.

Executive control is the ability, through behavioral control and oversight, to ensure that plans are executed in order, that errors are identified, and that goals are achieved. These three levels of attentiveness (alertness, orienting, and executive control) are the basic cognitive abilities that underlie learning and information processing that affect learners differently in performing tasks. Selective attention is dependent on cognitive suppression, which involves the control of internal and external stimuli and the suppression of information that interferes with attention. In addition, sustained attention

to keep attention on a single source of information is also a function to better cope with the situation of task resolution⁹. Therefore, selective attention and continuous attention are essential elements in the learning process.

Previous studies have shown that the right limbic hemispheres tend to be influenced by mood, and they prefer to talk with others, preferring to work as nurses and teachers. However, it has been found that the type of brain dominance has changed during college years, and that this variation is very large ¹⁰. It is meaningful to examine the type of brain dominance at this point. In addition, it is considered that it is necessary to grasp the types of brain dominance, considering that the personal dominance and suitability of job fit an important role in raising job satisfaction¹¹. The purpose of this study was to investigate the level of brain power and attentiveness of students who majored in different departments and to identify the level of attention according to the type of brain dominance, and to provide basic data for the development of interventions that can increase the level of attention.

The following are the specific research questions for carrying out these research objectives.

1. Is there a difference in brain dominance between the preliminary nurses and the pre-service early childhood teachers?
2. Are there differences in attentiveness between the preliminary nurses and the pre-service early childhood teachers?
3. Does the level of attention differ according to the types of brain dominance of the preliminary nurses and pre-service early childhood teachers?

Materials and Method

Designs: This study is to investigate the knowledge, attitude and performance ability for CPR of pre-service early childhood teachers.

Participants and Data Collection: The type of brain dominance was conducted by the researcher in the form of questionnaires for all students at the same time. Brain dominance type test paper was collected. Of the collected data, 79 of them were included in the analysis except for 3 items with no or no answers. The time required for testing the brain dominance is about 20 to 30 minutes. An attentional network test computer test was conducted by the researcher from May to June 2018. Students took

a 5-minute pilot test in a separate room in the computer room of U-University, and then took a total of 35 minutes for three sessions, about 10 minutes each. A total of 79 results were applied to the final analysis, except for one abnormal student who showed symptoms of attention deficit hyperactivity disorder at the first test, and one student who was absent from the test day.

Research Instruments

Brain Dominance Type Test: The research tool for measuring the type of brain dominance was based on the research tool of Yu¹², which applied the preference scores to the items based on Kim et al¹³. The total number of questions was 17, ranging from 1 to 13 in the order of preference of 4 (A, B, C, D). From the 14th to the 17th, the total score was calculated by multiplying the score by the number of items checked in the item and multiplied by 4 in each quadrant. The highest score among the four quadrants was classified as the learner's dominance type. In order to measure the reliability of the research instrument, the internal consistency of items 1 to 13 was analyzed. Cronbach's α was found to be .85 in A quadrant, .87 in B quadrant, .85 in C quadrant, and .92 in D quadrant respectively.

ANT (Attentional network test) Computer Test: ANT is a computerized test that measures three attentions to alertness, clench, and attention-to-action by measuring response time⁵. In this study, we used the adult arrow version to show the computer screen to the learner and to react appropriately with the direction key of the keyboard. The learner presses the directional key that matches the direction of the middle arrow among the five directional arrows. One of the four cases * appears when (1) * does not appear, (2) it appears overlaid on the + sign, (3) it appears simultaneously at the top and bottom of the screen, (4) appears on the top or bottom of the screen. The learner should press the direction key as soon as possible. If the answer is correct, the loudspeaker sounds 'uhu', and if it is not correct or does not react in time, 'ppi' sounds. At the end of the test, three points are shown on the screen: border alerting effect, orientation effect, and conflict effect. The 'alerting effect' is the average reaction time without the + sign, minus the average reaction time when the + sign is below and above the screen, the 'orienting effect' is the average response time when the + sign is in the middle, minus the average response time when the + sign is at the same position as the target. And the 'conflict effect' is

measured as the mean response time when the directions of the middle arrow and the remaining four arrows do not match, minus the mean response time when the directions of the five arrows are the same⁵.

Data Analysis: The data collected in this study were used to calculate the Cronbach alpha coefficient for the reliability of the brain dominance type test using the SPSS 18.0 program. The independent sample t-test was conducted to examine the differences between the preliminary and the pre-service early childhood teacher in the level of brain dominance and attentiveness. In addition, we conducted one - way ANOVA in order to clarify the difference of attention level according to types of brain dominance of the preliminary nurses and the pre-service early childhood teacher.

Results

1. Differences in brain dominance between preliminary nurses and the pre-service early childhood teacher.

Table 1. Differences in brain dominance between preliminary and the pre-service early childhood teacher (N =79)

	Pre-liminary nurses (n = 36)		Pre-service early childhood teacher (n = 43)		t
	M	SD	M	SD	
A	54.92	7.80	52.00	11.78	1.27
B	51.83	9.70	47.37	15.88	1.47
C	58.39	10.57	63.79	15.60	-1.77
D	50.69	10.38	64.42	17.80	-4.08***

*p<.05, **p<.01, *** p<.001

As shown in Table 1, the results of the study were as follows: first, there was a significant difference between the preliminary nurses and the pre-service early childhood teacher in the A quadratic dominant thinking ability ($t = 1.27$, $p > .05$) and the B quadrant dominant thinking ability ($t = 1.47$, $p > .05$) and C quadratic dominant thinking power ($t = -1.77$, $p > .05$) were not significantly different between the two groups. On the other hand, there was a significant difference between the two groups in the quadrant of D quadrant ($t = -4.08$, $p < .001$). The pre-service early childhood teacher's D quadratic thinking power score was significantly higher than preliminary nurse D quadrant dominant thinking ability respectively.

2. Differences in attention level between preliminary nurses and the pre-service early childhood teacher.

Table 2: Differences in attention level between preliminary and the pre-service early childhood teacher (N = 79)

Division	Pre-liminary nurses (n = 36)	Pre-service early childhood teacher (n = 43)	t
	Mean $\pm$ SD	Mean $\pm$ SD	
Alerting effect	47.03 $\pm$ 22.89	57.77 $\pm$ 105.32	-.60
Orienting effect	74.44 $\pm$ 59.65	133.67 $\pm$ 46.96	-4.94***
Conflict effect	93.53 $\pm$ 78.76	92.09 $\pm$ 101.27	.07

*p<.05, **p<.01, *** p<.001

As shown in Table 2, there was no significant difference between the two groups in the alertness ($t = -.60$, $p > .05$) between the preliminary nurses and the pre-nursery teachers. Orienting effect was found to be significantly different between the two groups ($t = -4.94$, $p < .001$). The preliminary nurses' orienting effect scores were higher than those of pre-service early childhood teachers. There was no significant difference between the two groups in the conflict effect ($t = .07$, $p > .05$).

3. Differences in attention level according to type of brain dominance between preliminary nurses and the pre-service early childhood teacher.

Table 3: Differences in differences in attention level according to type of brain dominance (N = 79)

Sub-factor		N	M $\pm$ SD	F
Alerting effect	A	9	64.39 $\pm$ 22.46	.56
	B	12	68.63 $\pm$ 19.81	
	C	25	36.24 $\pm$ 37.35	
	D	33	58.21 $\pm$ 105.21	
Orienting effect	A	9	71.22 $\pm$ 44.58	3.37*
	B	12	81.33 $\pm$ 59.70	
	C	25	103.72 $\pm$ 61.43	
	D	33	127.82 $\pm$ 57.61	
Conflict effect	A	9	124.48 $\pm$ 75.48	2.85*
	B	12	147.08 $\pm$ 124.17	
	C	25	88.88 $\pm$ 68.46	
	D	33	67.24 $\pm$ 89.06	

*p<.05, **p<.01, *** p<.001

As shown in Table 3, as a result of examining the difference of attention level according to types of brain dominance among preliminary nurses and the pre-service early childhood teacher, there was no significant difference in alerting effect attention according to types of brain dominance ($F = .56$, $p > .05$). Orienting effect attention was significantly different according to brain dominance type ($F = 3.37$, $p < .05$). And orienting effect attention was highest in learners of A quadrant type, B quadrant, C quadrant, and D quadrant dominant type. Conflict effect attention was significantly different according to brain dominance type ($F = 2.85$, $p < .05$), and conflict effect attention level was highest in students in quadrant D quadrant, followed by students in C quadrant, A quadrant, and B quadrant.

Discussion and Conclusion

The purpose of this study was to analyze the differences between the types of brain dominance and attention level, and to analyze the difference of attention level according to the type of brain dominance. The results of this study are as follows. First, there was no significant difference between the two groups in the A, B, and C quadrants in the difference of the brain dominant between the preliminary nurses and the pre-service early childhood teacher. On the other hand, in quadrant D, the pre - service early childhood teacher's quadratic thinking score was significantly higher than the pre-service nurse's quadratic thinking score. The difference in the type of brain dominance among the subjects of this study seems to be different according to the learning contents and method of the major subject which is currently being studied in the university. This result is similar to the results of this study in the results of ¹³, which examined the types of brain dominance in current pre-service early childhood teacher, in the C and D quadrants. The quadrant D is mainly judged holistically, subjective, and intuitively, and the more dominant the imaginative brain is, the more creative it is to be able to generate many ideas within a limited time, to think creatively, and to think openly. The curriculum of the department of nursing mainly focuses on comprehension and memorization such as pathophysiology, pharmacology, and physiology. Most of the lessons require analytical and critical thinking such as predicting the cause of a patient's disease and finding a treatment method. Therefore, the problem solving ability of the situation is high, but it is judged

that originality or creativity is lower than that of the pre-kindergarten teacher.¹⁴ suggested that students who are creative thinkers can perform well in clinical practice. Therefore, a new educational plan should be sought to activate the right brain for the preliminary nurses.

Second, the difference of attention level between preliminary nurses and the pre-service early childhood teacher showed that there was no significant difference between the two groups in the level of alerting effect and conflict effect. In the conflict effect level, the preliminary nurse' the higher the score was, the more significant difference than the orienting score. Direct comparison is difficult because there are no studies on the prevalence of brain dominance among prospective nurses. Orienting effect attention quickly selects information from input stimuli, which is related to the parietal and frontal lobes. This can be interpreted as the need to solve the problem of accurately calculating the dose of the drug according to the patient's weight, and to improve the functions and skills such as blood pressure measurement, injection, and accuracy. Third, the difference of attention level according to the type of brain dominance of preliminary nurses and the pre-service early childhood teacher showed that there was no significant difference in alerting effect attention according to type of brain dominance, and students in the quadrant of the quadrillion type were the highest. In other words, the tendency of analytical thinking is high when executive control is high, and the higher the executive control, the higher the tendency of creative thinking. Given the study that the brain is specialized according to the way the brain works, the instructors must try to make the learner a master of the integrated mindset that is dominant in all quadrants A, B, C, D. Although not statistically benign, the subjects in this study preferred C-quadrant accidents. A person with a dominance in the quadrant C can participate in group activities rather than working alone, and it can be seen as having an importance to the relationship. Nurses work with patients, caregivers, other medical staff, and teachers are important examples of human relationships, such as working with students, students' parents, and other teachers. In previous research, it was confirmed that academic achievement varies according to individuals' brain dominance type, and job preference and job satisfaction can be changed. In Korea, researches on the relationship between brain dominance type and creativity have been conducted for infants and pre-service early childhood teacher. The results of this study

are expected to be applicable to education and research programs of nursing department and early childhood education department. Especially, if you perform this test before going on to college, you will be able to guide the appropriate course for each type considering the type of brain dominance of the learner, and then you will be able to increase your major satisfaction and educational effect. It is important to note that this study was the first attempt to identify the types of brain dominance and attentiveness of learners majoring in nursing and early childhood education.

Limitations of this study and suggestions for future research are as follows. This study was aimed at a specific department of a university, but it is necessary to use more samples in subsequent studies to compare grade, major, and gender.

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The Effect of Kinder Therapy on Improvement of Teachers' Interaction of Toddlers' Problem Behavior

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ABSTRACT

The purpose of this study was to develop kinder teacher treatment play therapy for kindergarten children. SPSS version 22.0 for Windows was used for data analysis to develop kinder teacher treatment play therapy for kindergarten children. Among nonparametric statistical methods, the Mann-Whitney U Test and the Wilcoxon Signed-Rank Test were conducted. The results of this study are summarized as follows. Kinder therapy had a positive effect on the improvement of teachers' interaction. The difference between the pretest and the posttest showed that their positive and permissive interactions improved and that their punitive and detached interactions decreased. This study shows that it is difficult to generalize the result by participation by a small number of people, but it is proved that kinder therapy is effective in improving teacher interaction ability and reducing kinder's problem behavior in a childcare center.

Keywords: Kindergarten Teacher, Therapy Play, Interaction, Teacher Treatment, child-centered therapy

Introduction

The crucial importance of the role of child-care teachers has been recognized, as their roles do not simply include taking care of infants but also clearly influence their secure attachment as well as development. The infancy of one's first year in life is absolutely the most important period for him or her. Still, many nursery teachers spending much time with infants in daycare centers might not be knowledgeable enough of the infancy, perhaps because most of them are mainly trained for taking care of toddlers^[1,2].

As for child-care facilities, the number one reason for leaving child-care centers is not any environmental issue such as inconvenience of transportation or moving of the household but children's maladjustment. Such maladjustment might be attributable to a variety of factors, but the most important one would be teachers' teaching method dealing with the initial stage of infants' maladjustment behavior^[3,4]. Their maladjustment

would involve maladjustment behavior such as crying, whining, pestering, refusing to eat and having difficulty in going to sleep, and problem behavior such as biting and beating^[5,6]. It is thus necessary that effective and practical programs be developed in order to train teacher play therapy.

Play therapy has been used as a psychological treatment for children having difficulty in getting adjusted to child-care facilities. The agent of the therapists has recently expanded to include childcare teachers as well as licensed play therapists thanks to Kinder Therapy, which is performed, on the basis of child-oriented play therapy, by teachers at childcare institutions^[7]. To meet the current needs of society, it is required that the educational program of Kinder Therapy be designed to prevent problems rather than provide treatments for various problems that would happen at childcare centers.

Since Kinder Therapy was first introduced in 1999, the therapy has been investigated as an educational method, not as a professional therapeutic one, that would help those children having difficulty in getting adjusted to childcare facilities. However, this type of therapy has been recently recognized as an effective program that can generalize teachers' attitude and, as a consequence, can be generally applied to any child as well as those with problem behavior to prevent him or her from having social and emotional problems.

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Kinder Therapy is one of the techniques to solve problems that teachers face in classroom settings. Using this method, teachers are expected to take the role of therapists^[8].

Kinder Therapy performed for maladjusted children aimed to build up generalization in teachers' emphatic and receptive attitude as well as change in the children's emotional stability and problem behavior^[8,9].^[10]'s view that teachers' therapeutic role can be an effective remedy to children's social and emotional problem behavior, and claimed that therapeutic approaches can apply to any child at any level of educational institutions for pre-schoolers. Kinder Therapy helped solve maladjusted children's emotional problems and increase their sociality, and produced a positive change in their relationship with teachers and improved quality of life at kindergarten^[11]. It might be concluded that Kinder Therapy can be effectively used as a preventive program for emotional problem behavior.

The current research aims to show that Kinder Therapy is expected to help improve the quality of childcare, reduce toddlers' problem behavior by securing their emotional stability and trust. We also expect for the therapy to help children get well adjusted, reduce their problem behavior and have balanced social relationship with others. For that purpose, a set of 10 sessions of teacher-children play therapy was developed in order to identify how the therapy would improve teachers' interaction and teacher-children problem behavior, and what their interaction between teachers and children are like through Kinder Therapy.

Method

Research Participants: The current research proceeded with an experimental group of 8 teachers and 8 toddlers and a control group of the same number of subjects attending at 10 childcare institutions located in Seoul, Korea. The purpose of the research was well explained to the children's parents and we received agreement to participate in the project from the teachers and parents. All the teachers had at least 3 years of teaching experience. The ages of the children ranged from 19 months to 29 months and each group consisted of 4 male and 4 female.

Research Tools: To measure caregivers' interaction, Arnett's(1989) Caregiver Interaction Scale(CIS), which was translated and slightly modified in ^[4], was adopted for the current research. The scale consists of a set of

26 measurement items, which can be grouped into four categories of positive interaction, punitive interaction, detached interaction and permissive interaction. Cronbach's α for the scale was obtained at .70-.80.

^[7]slightly revised version of Toddler Behavior Checklist(TBC) was adopted to measure toddlers' problem behavior. The scale consisted of a set of 51 measurement items. The scale consists of 51 measurement items, which were grouped into five categories of aggressive behavior, defiant behavior, emotional instability, immature behavior and withdrawn behavior. Each item was measured on a four-point Likert scale. Cronbach's α for each of the five categories was obtained at .80-.95.

Data Analysis: Based on preliminary results, a set of 10 sessions of teacher-children play therapy program. Since the number of cases in this study—8 in the experimental group and 8 in the control group—is hard to meet the assumption of regular distribution for measurements, a non-parametric statistical method, which requires no basic assumption of regular distribution, was used. SPSS version 22.0 for Windows was used for data analysis to verify the effects of the training program. Among nonparametric statistical methods, the Mann-Whitney U Test and the Wilcoxon Signed-Rank Test were conducted. The results of this study are summarized as follows.

Results

Test of Homogeneity: Wilcoxon signed rank test is more powerful than sign test when paired two group's difference verification.

$$Z = \frac{T - \frac{N(N+1)}{4}}{\sqrt{\frac{N(N+1)(2N+1)}{N-1}}} \quad \dots(\text{equation 1})$$

Mann-Whitney U test is used because of simplification of test.

$$U_1 + U_2 = n_1 n_2 + n_1 n_2 + \frac{n_1(n_1+1)}{2} + \frac{n_2(n_2+1)}{2} - (\Sigma R_1 + \Sigma R_2) \quad \dots(\text{equation 2})$$

$$n_1 n_2 + \frac{n_1(n_1+1)}{2} + \frac{n_2(n_2+1)}{2} = \Sigma R_1 + \Sigma R_2 = T \quad \dots(\text{equation 3})$$

so,

$$U_1 + U_2 = n_1 n_2 \quad \dots(\text{equation 4})$$

Table 1: Homogeneity of the two groups in teachers' interaction

	Group	N	Mean rank	Rank sum	Mann-Whitney U	Z	p
Positive Interaction	Experimental	8	8.75	70.00	30.000	-.212	.832
	Control	8	8.25	66.00			
Punitive Interaction	Experimental	8	9.63	77.00	23.000	-.953	.341
	Control	8	7.38	59.00			
Detached Interaction	Experimental	8	9.56	76.50	23.500	-.939	.348
	Control	8	7.44	59.50			
Permissive Interaction	Experimental	8	6.75	54.00	18.000	-1.526	.127
	Control	8	10.25	82.00			

The data shows that the mean ranks of positive interaction of the experimental group and the control group were obtained at 8.75 and 8.25, respectively, which were not significantly different [Table 1]. Thus, it might be assumed that their positive interaction level of the teachers of the two groups was approximately the same. Also, as shown in [Table 2], their punitive interaction, detached interaction and permissive interaction as well as positive interaction were not significantly different.

Table 2: Homogeneity of the two groups in problem behavior

	Group	N	Mean rank	Rank sum	Mann-Whitney U	Z	p
Total problem behavior	Experimental	8	10.13	81.00	19.000	-1.367	.172
	Control	8	6.88	55.00			

As illustrated the mean rank of the experimental group and the control group was obtained at 10.13 and 6.88, respectively, which shows that there was no significant difference. This indicates that the homogeneity of the two groups was secured before the therapy was implemented [Table 2].

Effect of Kinder Therapy on Teachers' Interactions:

An analysis was made of the effect of Kinder Therapy on the teachers' reciprocal interaction by identifying the difference between the pre-test and post-test of the experimental and the control groups. It was found, as illustrated that positive and permissive interaction improved in the post-test than in the pre-test, whereas punitive interaction and detached interaction decreased after therapy [Table 2]. Thus, it might

be safely concluded that Kinder Therapy exerted a positive influence on teachers' interaction.

Discussion and Conclusion

First of all, it was found that teacher-children Kinder therapy had a positive effect on the improvement of teachers' interaction. The difference between the pretest and the posttest showed that their positive and permissive interactions improved and that their punitive and detached interactions decreased. Such a result clearly indicates that Kinder Therapy could help enhance teachers' sensitivity and competence and eventually had a positive influence on their interaction.

Table 3: Difference between the pretest and the posttest of the Experimental Group

Experimental (N = 8)		N	Mean rank	Rank sum	Z	p
Positive Interaction Post test- pre test	Negative rank ^a	0	.00	.00	-2.536*	.011
	Positive rank ^b	8	4.50	36.00		
	Equal ^c	0				
	Total	8				
Punitive Interaction Post test-Pre test	Negative rank ^a	8	4.50	36.00	-2.585*	.010
	Positive rank ^b	0	.00	.00		
	Equal ^c	0				
	Total	8				

Conted...

Detached interaction Post test-Pre test	Negative rank ^a	8	4.50	36.00	-2.565*	.010
	Positive rank ^b	0	.00	.00		
	Equal ^c	0				
	Total	8				
Permissive Interaction Post test-Pre test	Negative rank ^a	1	1.50	1.50	-2.345*	.019
	Positive rank ^b	7	4.93	34.50		
	Equal ^c	0				
	Total	8				

* $p < .05$ a. posttest < pretest, b. posttest > pretest, c. posttest = pretest

Second, it was also found that Kinder Therapy was effective in improving toddlers' problem behavior. The analysis of the data obtained in the pretest and the posttest revealed that there existed a statistically significant difference in the toddlers' problem behavior. However, no difference was found in the control group's maladjustment behavior between their pretest and posttest. Thus, it might be concluded that Kinder Therapy was effective in reducing toddlers' problem behavior, since the experimental group exhibited a significant difference after therapy, whereas the control group did not show any significant difference between the pretest and the posttest.

It might be assumed that Kinder Therapy could have a positive influence on overall development of infants and toddlers. During play sessions, teachers would concentrate on children's play, consider the meaning of play, better understand children's development, and adequately respond to children's behavior, which all would help children grow and develop.

The limitation of the current is that the results of research are hard to generalize, since it was conducted with a set of 10 sessions to a small group of 8 subjects.

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The Effects of Dynamic Neuromuscular Stabilization Exercise on Forward Head Posture and Spine Posture

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ABSTRACT

Background/Objectives: The purpose of this study was to investigate the effect of dynamic neuromuscular stabilization exercise on the forward head posture.

Method/Statistical Analysis: After the end of the intervention, an experimental group, control group A, and control group B were compared in terms of changes with time within each group and among the groups. A repeated-measures ANOVA was performed to compare the three groups in terms of their spinal structures with time.

Findings: There was no significant difference between the three groups in relation to the general characteristics of the study subjects and the three groups were found to be homogeneous. Each group showed a statistically significant decline in the degree of forward head posture and improvements with time in thoracic kyphosis and lumbar lordosis after 6-week intervention ($p < 0.05$) and no statistically significant difference was found among the groups.

Improvements/Applications: In conclusion, dynamic neuromuscular stabilization exercise is an effective training method to improve forward head posture, and this exercise will be useful for improving the forward head posture of subjects who cannot perform neck exercises directly.

Keywords: Forward head posture, Dynamic neuromuscular stabilization exercises, McKenzie exercise, Neck stabilization exercise, Spinal structure

Introduction

Habitual forward head posture leads to weakening of the deep neck flexor muscle, shortening of the muscles under the back of the head, increased lordosis of the craniocervical region connecting the head and neck, and continuous muscular contractions in the lower neck and shoulder muscles as relative compensatory actions, ultimately causing changes in the craniocervical region connecting the cranial bone and neck¹. In some studies that aimed to improve forward head posture, neck

stretching and neck extensor strengthening exercises were applied to subjects with forward head posture²⁻³. A small tool-assisted neck stabilization exercise⁴⁻⁶ was one of the most popular intervention methods used among these studies.

Dynamic neuromuscular stabilization (DNS), which was proposed by a Czech physical therapist, is a rehabilitation approach that optimizes the movement system based on the principles of developmental kinesiology⁷. DNS exercises regulate optimal intraperitoneal pressure to provide stiffness and dynamic stabilization of the vertebrae. They also constitute the deep core and operate under the automatic and potential feed-forward regulation mechanisms⁸.

The diaphragm functions primarily as a respiratory muscle, but also as a posture-controlling muscle by increasing intraperitoneal pressure before limbs begin

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to move⁹. This increased intraperitoneal pressure simultaneously activates the deep pelvic floor muscles, thereby providing stability in the lower part of the pelvis, and contracts the abdominal muscles eccentrically, thereby providing stability in the front and lateral surfaces and to the posterior direction, ultimately enhancing overall postural stability¹⁰.

Vertebral curvature promotes a balance between flexibility and muscle strength and acts as a lever against the vertebral muscles so as to transmit force through the body and reduce damage in local areas¹¹. However, abnormal vertebral curvature changes the mutual relations between the gravitational line and each vertebral area, thereby increasing stress on the muscles, ligaments, bones, and dendritic joints and changing the volume of the thoracic cage.

Kyphoscoliosis is associated with neck dysfunction¹², and vertebral mobility plays an important role in patients with neck injuries¹³. However, the mechanism required to mediate kyphoscoliosis and neck dysfunction is not well known. Proper vertebral curvature promotes the further extension of the bottom of the neck bone, enabling a more desirable chin-in posture. As the bottom of the neck bone is further extended, the upper craniocervical region takes a more neutral position¹¹.

Although DNS exercises are increasingly being studied through comparisons with existing lumbar stabilization methods¹⁴ such as the abdominal pulling technique¹⁵ and the abdominal bracing technique, there is little research comparing the effects of DNS exercises on forward head posture. This study therefore aimed to investigate the effects of DNS exercises on the vertebral structures and forward head postures of subjects with forward head posture.

Method

The subjects of this study were randomized by lot drawing and divided into three groups, each comprising 15 people. The experimental group performed a DNS exercise, control group A performed a neck stabilization exercise, and control group B performed stretching and extensor strengthening exercises for six weeks. Separate therapists were assigned to each group for the exercises. The principle investigator explained each method to each therapist and conducted sufficient training.

Volunteers in their 20s who were willing to participate in the experiment and gave their consent before the start of the experiment were included in the

study, and the subjects with forward head posture were screened through a preliminary examination.

In the analyses of the vertebral structure, the alignment of the neck bone was assessed using a GPS 400 (Chinesport, Udine, Italy), and all lumbar measurements were conducted using a vertebral structure analyzer by the experienced principle investigator. After the interventions were completed, changes over time and the differences in change between the three different intervention groups were analysed.

A whole-body posture measurement system (GPS 400) was used to diagnose forward head posture. Subjects with a distance of 1 cm or more between the perpendicular induction lines of the shoulder upper arm bones and the outer ear line of the ear were selected as the study subjects² [Figure 1].



Figure 1: Measurement of the forward head posture using GPS400

A vertebral structural analyzer (Formetric 4D, DIERS International GmbH, Schlangenbad, Germany) was used to evaluate the structure of the backbone. This is a non-invasive diagnostic instrument for evaluating the alignment of the vertebrae. It is a safe product commonly used in clinics to measure halogen irradiated on the body using a computer. In this study, the light irradiated on the body by a halogen lamp was measured for five seconds, and the structures of the pelvis, back bone, and vertebrae were analyzed [Figure 2].



Figure 2: Measurement of the spine alignment using Formetric 4D

The DNS exercise was performed while the subject's hip joints were maintained at 90° of flexion in the supine position. A pressure biofeedback device (Stabilizer, Chattanooga Group, Inc., Hixson, TN) was placed on the waist of the subject, and while the pressure was maintained at 60 mmHg according to the pressure gauge, the anterior, lateral, and posterior parts of the abdomen were extended to increase the pressure further by 10 mmHg at the time of inhalation. This was achieved while inhaling through the nose and exhaling through the mouth¹⁶ [Figure 3].



Figure 3: Dynamic neuromuscular stabilization exercise

The neck stabilization exercise was performed by increasing pressure by 2 mmHg up to 20–30 mmHg, as measured by the pressure biofeedback device. The exercise was carried out for 10 seconds by holding muscle strength in the static position for each reference value, followed by a three-second rest period. This process was repeated 10 times. Then, the pressure was increased by 2 mmHg and the same process was repeated, which was continued until the pressure reached 30 mmHg¹⁷[Table 1], [Figure 4].



Figure 4: Neck stabilization exercise

Table 1: Neck stabilization exercise protocol

Exercise Intensity	Time	
20~22 mmHg	10 second*10 repetition	3 set repetition
20~24 mmHg	10 second*10 repetition	
20~26 mmHg	10 second*10 repetition	
20~28 mmHg	10 second*10 repetition	
20~30 mmHg	10 second*10 repetition	

The McKenzie neck stretching exercise consists of seven movements, but in this study, only five movements were performed. The head pull-back in the sitting position and chin-in in the supine position were excluded¹⁸.

The neck extensor strengthening exercise was performed while the subject was displaced from the treatment bed up to the mammillary line in the prone position with his/her legs and pelvis fixed. While both hands grasped the shoulder on the opposite side, both the head and the upper body were lifted to the same level as the treatment bed and held for 10 seconds, followed by a three-second rest. This process, which was defined as one set, was repeated 10 times¹⁹.

The collected data in this study were analyzed using SPSS 21.0 for Windows, and the statistical significance level (α) was set to 0.05. The general characteristics of the subjects were calculated using descriptive statistics, and a one-way ANOVA was conducted to determine the level of homogeneity among the groups. A repeated ANOVA was performed to compare the changes in forward head posture and vertebral structure between the three groups over time, while a one-way ANOVA was performed to compare the inter-group differences in forward head posture and vertebral structure between three weeks and six weeks after the interventions. The least significant difference method was used for the post hoc test.

Result and Discussion

- 1. General characteristics of the subjects:** There was no significant difference between the three groups in terms of the general characteristics of the subjects, and the three groups were determined to be homogeneous.
- 2. Change in forward head posture:** Table 2 shows the changes in the subjects' forward head postures after the six-week exercise program. The extent of the forward head posture was significantly reduced ($p<0.05$) after the exercise program, and no interaction effect was found between the training period and the group ($p>0.05$). Furthermore, there was no significant difference in the mean values between the three groups ($p>0.05$).

Table 2: Changes of distance in forward head posture at before, after 3-week and 6-week of three groups

	Before	3-week	6-week	Time (F)	Group (F)	Time* Group (F)
EG	2.91 ± 1.19	2.20 ± 0.74	1.65 ± 0.73	55.784*	0.088	1.503
CoA	2.84 ± 0.93	2.46 ± 0.77	1.68 ± 0.50			
CoB	3.03 ± 1.03	2.27 ± 0.68	1.36 ± 0.68			
F	0.121	0.508	1.145			
p	0.887	0.605	0.328			

unit: cm, *: $p < 0.05$, EG: Experimental group, CoA: Control A group, CoB: Control B group

3.1 Comparison of the changes in kyphoscoliosis: Table 3 shows the changes in kyphoscoliosis in each group after the six-week exercise program. The extent of the kyphoscoliosis improved significantly ($p < 0.05$) after the exercise program, and no interaction effect was found between the training period and the group ($p > 0.05$). There was also no significant difference in the mean values between the three groups ($p > 0.05$).

Table 3: Changes of thoracic kyphosis at before, after 3-week and 6-week of three groups

	Before	3-week	6-week	Time (F)	Group (F)	Time*Group (F)
EG	40.93 ± 11.35	41.87 ± 10.01	42.53 ± 7.80	6.130*	0.236	0.023
CoA	40.46 ± 8.64	42.23 ± 7.29	43.31 ± 6.07			
CoB	40.77 ± 7.52	42.54 ± 6.57	43.92 ± 5.87			
F	0.009	0.024	0.151			
p	0.991	0.977	0.860			

unit: °(angle), *: $p < 0.05$

3.2 Comparison of the changes in lumbar lordosis: Table 4 shows the changes in lumbar lordosis in each group after the six-week exercise program. The extent of the lumbar lordosis was significantly improved ($p < 0.05$) after the exercise program, and no interaction effect was found between the training period and the group ($p > 0.05$). There was also no significant difference in the mean values between the three groups ($p > 0.05$).

Table 4: Changes of lumbar lordosis at before, after 3-week and 6-week of three groups

	Before	3-week	6-week	Time (F)	Group (F)	Time*Group (F)
EG	31.33 ± 12.15	33.47 ± 9.72	35.27 ± 8.22	5.493*	0.154	0.084
CoA	30.77 ± 9.50	32.38 ± 7.50	34.62 ± 7.50			
CoB	32.29 ± 7.08	34.86 ± 9.17	35.57 ± 6.31			
F	0.082	0.262	0.058			
p	0.921	0.771	0.943			

unit: °(angle), *: $p < 0.05$

Discussion

In this study, 45 subjects with forward head posture were divided into three groups: the DNS group, the neck stabilization group, and the neck stretching and extensor strengthening group. The subjects in each group performed the respective exercises for six weeks. The effects of these exercises on vertebral posture and forward head posture were subsequently investigated.

Previous study²⁰ reported that the application of a stretching exercise induced postural changes in patients with moderate-to-mild forward head posture. Previous study²¹ described improvements in forward head posture and the range of motion of the neck joints after applying a neck extensor strengthening exercise to forward head subjects for four weeks. Consistent with these findings, this study also found that, after a

six-week exercise program, the subjects with forward head posture experienced postural changes. Moreover, a significant improvement in posture was observed in all three groups without a significant inter-group difference. In other words, although the DNS exercise did not directly mediate the movement of the neck or shoulder area, it seemed to be able to influence the structure of the neck bone by increasing intraperitoneal pressure through diaphragm-assisted breathing, thus stabilizing the trunk. Eventually, the stability of the vertebrae was enhanced through the integrated spinal stabilizing system, which activates not only the deep neck flexor muscles, the erector spinae, the upper and lower backbones, and the lumbar erector, but also the diaphragm, pelvic floor muscles, and abdominal muscles⁸⁻⁹. The experimental group performed a DNS exercise, which is an important component of the integrated spinal stabilization system. For this group, the rate of core muscle activity increased and endurance also improved.

Previous studies have reported that kyphoscoliosis is associated with forward head posture^{12,22}, and forward head posture is improved by the application of manual therapy. According to a previous study²³, flat lumbar posture is related to forward head posture, while other study²⁴ reported that neuromuscular retraining effectively improved forward head posture and kyphoscoliosis. In this study, kyphoscoliosis and lumbar lordosis were also improved after six weeks of exercise.

The results of this study indicated that forward head posture and vertebral structure are related to each other, and diaphragm-mediated breathing exercises applied to subjects with forward head posture who are unable to perform direct neck exercises can produce results similar to those obtained from direct neck exercises. Follow-up studies are recommended to examine whether DNS exercises have lasting effects.

Conclusion

In this study, three groups of people were classified to show the forward head posture to see the effect of DNS exercise on the forward head posture. The DNS exercise, neck stabilization exercise, neck stretching and extensor reinforcement exercise were carried out for six weeks, respectively, to measure a change in the forward head posture and spine structure, and the following conclusions were obtained. Forward head posture and vertebral structure were improved in the DNS exercise group. This finding demonstrated that this intervention

method can be used in subjects who find it difficult to perform exercises relating directly to the neck and shoulder areas. This exercise affects the structure of the neck bone by increasing intraperitoneal pressure through diaphragm-mediated breathing and thus stabilizing the trunk. Therefore, it is expected that DNS exercise will be used as a exercise to improve the forward head posture, along with neck stabilization and neck stretching and extensor reinforcement exercise, which are commonly used in clinicians.

Ethical Clearance: Not required

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Conflict of Interest: Nil

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Study of Knowledge and Attitude about Brain Death and Donation of Cornea

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ABSTRACT

We investigated the knowledge and attitude of brain death thought by students in the department of optometry, and investigated the knowledge and attitude of donating cornea to see the relationship. The survey was conducted from September 1 to December 20, 2015 in the subjects of the students who were informed of the study goals and contents, and agreed. We examined gender, grade, religion, etc. And they looked into whether there were any chronic patients in the family, people who wanted to receive organ donation, and whether they wanted to donate their organs or why. Emotional attitudes about donating cornea and key knowledge of brain death are related, it has been shown. Behavioral attitudes toward donating cornea are linked to key levels of brain death and legal knowledge of brain death. Emotional attitude and cognitive attitude scores for donating cornea are related to behavioral attitude scores. The knowledge of donating corneas has been shown to affect the attitude of donating cornea. Therefore, a variety of promotions and educations are needed to promote the donation of cornea.

Keywords: *Attitude about donation of cornea, College student, Knowledge about donation of cornea, Knowledge of brain death, Optometry*

Introduction

With the rapid development of high-tech medicine, the average human life expectancy continues to rise and man is trying to maintain and promote a healthy life, not just an extension of life. However, Lee & Kim, (2008: 120-129) suggest that the health promotion of terminally ill patients cannot be beyond the limits, and offers organ transplants as the most effective and only solution¹. Brain death is very important in terms of organ transplantation, and the definition of brain death is when the brain, the center responsible for breathing and circulation of the human body, is destroyed by damage, and the patient is unable to regenerate again, and the patient has an artificial respiration system attached, which stops beating soon due to loss of circulation central function by Kwak, (1999)².

Chronic organ failure patients are gradually increasing, and organ transplantation is activated by the development of immunosuppressant, anesthesia, and surgical procedures as their treatment methods. For transplants, donor organs must be actively carried out, which inevitably requires brain death organs. Kwak,

(207: 1-3) suggests that in Korea, as organ transplants have been activated from brain death, it has become a new life-giving treatment for terminally-ill organ failure patients³. The development of immunosuppressant and surgical techniques, the development of effective long-term preservatives, the improvement of the ability of transplant patients to follow-up care, and the increase in the number of adaptive patients with organ transplants, and the decrease in concerns and rejection of organ transplants, have led to a rapid increase in patients and organ transplants in patients requiring organ transplants. In February 2000, Korea enacted the 'Long Term Transplantation Act' to recognize brain death on the premise of organ donation and to provide an institutional basis for organ donation to be made fairly and efficiently. To this end, the National Center for Organizational Management was also set up in the National Medical Center by Kim & Kim, (2013: 225-251)⁴. According to Ha, Hong, Kim, Lee, Song, & Han, (2001: 51-57), despite these efforts, however, demand for organ transplants has increased since the law was enforced, but the number of brain death organ donations and transplants has decreased⁵. Because of the decreased number of organ

donation, procedural problems such as brain death judgment and complex organ distribution processes and the negative attitude toward organ donation due to the influence of Confucianism have emerged as an urgent issue to promote brain death organ donation by Kang & Kim, (2004: 81-86) and Lee, Moon & Kwak, (2001: 217-224)^{6,7}. According to Korean Network for Organ Sharing, (2014), lack of brain death organ donors is a worldwide problem, especially in Korea, with eight Koreans, 36 Spaniards, 27 U.S., 23 Italians and 20 British nationals, compared with the number of brain death organ donors per million populations⁸. A study of non-medicine patients by Kim & Lee, (2016: 3313-3327) showed a relatively positive attitude toward organ transplants, but lacked brain death's medical knowledge of organ transplants, law and organ transplantation management systems, and that most of the information about brain death transplants was obtained through imaging media, showing a lack of professional educational opportunities compared to clinicians⁹.

Meanwhile, According to Korean Network for Organ Sharing eyes during organs are one of the most important organs for modern people to acquire all information and visual information is very important to raise the quality of life. According to statistics from the National Organ Transplantation Center, the total number of corneal transplants was 5,909 in 2000, 368 in 2005, 311 in 2010, 319 in 2015 and 212 in 2017¹⁰. According to a 2011 survey by the Korea Institute for Health and Social Affairs suggested by Chu (2016), the number of people who are blind is estimated to be 256,841, and about 20,000 people who are blind who can regain their eyesight through corneal surgery is estimated to be less than 1 percent a year due to a lack of cornea symptoms¹¹. According to Kim, (2016), to activate brain death organ transplants, both caregivers who participate in the brain death organ transplantation process and nonmedical persons who can affect brain death organ donation are important subjects¹².

Therefore, this research is intended to provide students with optometric and students who will be responsible for the health and safety of the public by identifying the degree of medical knowledge and legal knowledge of corneal and brain death, emotional attitudes, cognitive attitudes, and behavioral attitudes, and to analyze the correlation and provide them as basic data for activating corneal diseases in the future.

Method

Research Subjects: A survey was conducted to investigate the relationship among knowledge and attitude about brain death and donation of cornea in the optometry college student in Choongchung Provinces in this study. Eighty-one male students (46.3 percent) and 94 female students (57.7 percent) surveyed a total of 175 students.

Research Period: The survey was conducted from September 1 to October 5, 2015 in the subjects of the students who were informed of the study goals and contents, and agreed.

Measurement Tools: General information on organ donation asked if you have heard about brain death organ donation and transplants. And if you've ever heard of it, how did you perceive it? I asked if you have any experience in learning about brain death organ donation and transplants. He asked if he would like to donate organs from his family and himself. It is composed of questions such as whether the family has given organ donation or organ transplants.

Knowledge of brain death organ donation was used by Yoo, (2004) and Kim, (2010) in previous studies, but modified and supplemented to the purpose of our study^{13,14}. The list consisted of a total of 23 questions, including six key knowledge on the definition of brain death organ donation, four medical knowledge questions, 10 questions on legal and management systems, and three questions on current and actual conditions. The total knowledge score was treated as 1 point for each question and 0 point for the wrong answer, and the scores for the 23 questions were added. Therefore, the total score of knowledge is zero from a maximum of 23 points, and the higher the score, the higher the knowledge of brain death organ donation.

Attitudes to corneal dysfunction were used by modifying and supplementing the attitude scales of Yoo, (2004) and Kim, (2010). The content is divided into emotional aspects (emotional aspects), cognitive aspects (knowledge, belief), and behavioral aspects (behaviorally). The measurement tool gave the response to a five-point scale of 'very yes' 5 points, 'yes' 4 points, 'normal' 3 points, 'no' 2 points and 'very no' 1 point, and the higher the score, the more positive the attitude.

Result and Discussion

Sociodemographic Characteristics of Subjects:

Sociodemographic characteristics of subjects are sex, grade, religion, presence of chronic and incurable patients in the family, presence of an acquaintance who wishes to receive organ donation, presence of an acquaintance who has received organ donation, your wish to donate organs, reasons to wish for organ donation, why don't you hope to donate an organ, is it recommended that family donate their organs?, presence of information about organ donation organizations, do you wish to participate in training on organ donation?, information on organ donation registration procedure is available, thinking about the cost of organ transplants, whether or not to wish for organ transplant surgery, the one i want to receive when i donate my organs, period of hope for organ donation, opinion on the absence of a price for an organ donor, do you want to pay for organ donation?

Gender was 53.7 percent for women and 46.3 percent for men, and 22.3 percent for first, 28.6 percent for second, 25.7 percent for third and 23.4 percent for fourth graders.

Some 44.6 percent were Christians in religion, 7.4 percent were Catholics, 1.7 percent was Buddhists and 46.3 percent had no religion.

"Presence of chronic and insurable patients in the family" was 14.3 percent with yes and 85.7 percent with no.

"Presence of an order who wants to receive organ donation" was 2.9 percent for yes and 97.1 percent for no.

"Presence of an explanation who has received organ donation" was 4.0 percent for yes and 96.0 percent for no.

Your wish to date organizations was 40.6 percent for yes and 59.4 percent for no.

"Reasons to wish for organ donation" was 1.1%, "Promotion details controlled by organ donor" by 2.3%, "Drama or Movie" 1.7%, "Encouragement of 5.7%" "Why don't you hope to give an organ" is 17.1% of Religion, the fur that the medical staff Will not do their best to prolong my life

There were 22.3% in, 22.9% in 'I Hope my body is intact', 34.9% in 'Family opposition' and 34.9% in 'Scary and unhappy'. "Is it recommended that family donate their organizations?" was 18.9 percent and 81.1 percent.

"Presence of information about organization organizations" had 10.3 percent "yes" and 89.7 percent "no."

"Do you want to travel on organ donation?" 32.6 percent said yes, and 67.4 percent said no.

Information on organ donation registration processing is available was 1.7 percent for know effectively, 18.9 percent for know a little, 79.4 percent for I don't know.

"Thinking about the cost of the organ transfers" was 57.7 percent for "Too aggressive," 37.7 percent for "Suitable" and 4.6 percent for "Not probable."

"Whether or not to wish for organ transplant Surgery" had 70.9 percent "No" of 29.1 percent.

"The one I Want to receive when I don't care" was 34.3 percent for "Family and Relatives," 1.1 percent for "Acquaintance," and 38.9 percent for "Doesn't matter who you are."

"Period of Hope for organ failure" was 0.6 percent for "While Alive," 5.7 percent for In the event of Brain Death and 67.4 percent for "Post-mortem donation."

"Open on the issue of a price for an organ donor" yes 64.6 percent and 35.4 percent no.

"Do you want to pay for organ donation?" was 38.3 percent for yes and 61.7 percent for no.

Mean value on knowledge and attitude about brain death and donation of cornea: Mean value on knowledge and attitude about brain death and donation of cornea is Table 1. Medical knowledge of donating cornea is 0.69 ± 0.16 . Legal knowledge of donating cornea is 0.61 ± 0.30 . Key knowledge of defining brain death is 0.8 ± 0.22 . Medical knowledge related to brain death is 0.83 ± 0.22 . Knowledge of the status of brain death is 0.84 ± 0.21 . Legal knowledge related to brain death is 0.76 ± 0.15 . Emotional attitude is 2.89 ± 0.56 . Cognitive attitude is 3.75 ± 0.59 . Behavioral attitude is 2.84 ± 0.59 .

Table 1: Mean value on knowledge and attitude about brain death and donation of cornea

	M	SD
Medical knowledge of donating cornea	0.69	0.16
Legal knowledge of donating cornea	0.61	0.30
Key knowledge of defining brain death	0.31	0.22
Medical knowledge related to brain death	0.83	0.22
Knowledge of the status of brain death	0.84	0.21
Legal knowledge related to brain death	0.76	0.15
Emotional attitude	2.89	0.56
Cognitive attitude	3.75	0.59
Behavioral attitude	2.84	0.59

Differences in emotional attitude according to sociodemographic characteristics: Differences in emotional attitude according to sociodemographic characteristics are Table 2. The emotional attitude was higher for men than for women, and the first grade was the highest for women those who were Christian were higher, and those who wished to donate their organs were higher. People with information about organ donation centers were higher, and those with accurate information about organ donation procedures were higher. When I donated my organs, there were higher numbers of people who didn't care who the donor was, and those who thought I shouldn't have to pay for the donation.

Table 2: Differences in emotional attitude according to sociodemographic characteristics

Characteristics	Category	M	SD	t/F
Gender	Male	3.03	0.63	3.172*
	Female	2.77	0.46	
Grade	1st	3.03	0.58	3.251*
	2nd	3.01	0.54	
	3rd	2.75	0.39	
	4th	2.77	0.67	
Religion	Christianity	3.00	0.56	3.368*
	Catholicism	2.98	0.40	
	Buddhism	2.27	1.55	
	No religion	2.79	0.52	
Presence of chronic and incurable patients in the family	Yes	2.98	0.72	0.726
	No	2.87	0.53	
presence of an acquaintance who wishes to receive organ donation	Yes	2.56	0.59	-1.134
	No	2.90	0.56	
presence of an acquaintance who has received organ donation	Yes	3.43	0.58	2.625
	No	2.87	0.55	
Your wish to donate organs	Yes	3.06	0.62	3.345**
	No	2.77	0.49	
Is it recommended that family donate their organs?	Yes	3.10	0.58	2.444
	No	2.84	0.55	
Presence of information about organ donation organizations	Yes	3.33	0.72	2.816**
	No	2.84	0.52	
Do you wish to participate in training on organ donation?	Yes	2.89	0.47	-0.042
	No	2.89	0.60	

Conted...

Information on organ donation registration procedure is available	Know exactly	3.93	0.92	6.116** (a>b, a>c)
	Know a little	2.96	0.58	
	I don't know	2.85	0.53	
Thinking about the cost of organ transplants	Too expensive	2.90	0.63	1.463
	Suitable	2.84	0.46	
	Not expensive	3.20	0.37	
Whether or not to wish for organ transplant surgery	Yes	2.90	0.62	0.417
	No	2.87	0.41	
The one I want to receive when I donate my organs	Family and Relatives	2.74	0.46	6.087** (a<c)
	Acquaintance	3.40	0.57	
	Doesn't matter who you are	3.09	0.64	
Opinion on the absence of a price for an organ donor.	Yes	3.02	0.57	4.168**
	No	2.66	0.47	
Do you want to pay for organ donation?	Yes	2.67	0.51	-4.302**
	No	3.03	0.56	

*p<0.05, **p<0.01

Differences in cognitive attitude according to sociodemographic characteristics: Differences in cognitive attitude according to sociodemographic characteristics are as follow.

Cognitive attitude was higher for men than for women, and for those who answered that there was no disease in the family. Those who wanted organ donation were higher, while those who wanted family organ donation were higher. There were higher numbers of people who wanted to participate in organ donation programs, and those who knew the procedure well. There were higher numbers of people who said I'd rather not know the donor if I donated my organs. The price for organ donation was higher for those who opposed the payment.

Differences in behavioral attitude according to sociodemographic characteristics: Differences in behavioral attitude according to sociodemographic characteristics are as follow.

The behavioral attitude was higher among those who wanted organ donation, and those who wanted to recommend organ donation to their families as well. People with information about organ donation and those who wanted to be educated about organ donation were higher. There were higher numbers of people who knew how to register for organ donation and those who received it when I gave it to them. There were more people who did not think about the economic cost of organ donation.

Relation between knowledge and attitude about brain death and donation of cornea: The relationship between knowledge and attitude about brain death and donation of cornea are as follow.

The results of examining the correlation between the medical knowledge of donating cornea and the legal knowledge of donating cornea, the key knowledge of defining brain death, the medical knowledge, the status quo, the brain death law knowledge, etc. were as follows. Emotional attitudes were correlated with the key knowledge of defining brain death. Behavioral attitudes are correlated with key knowledge of defining brain death and legal knowledge about brain death, as well as emotional and cognitive attitudes.

Conclusion

The development of modern medicine and the growth of technology not only sustain human life but also help to live life extension. Organ transplantation is the most cutting-edge technology in modern medicine. Organ transplantation is the removal of one or all of the tissues or organs of the body and implant them into the surface or body of oneself or other objects. The degree of medical and legal knowledge of cornea and brain death, emotional attitudes, cognitive attitudes, and behavioral attitudes were identified among students in optics.

The understanding and knowledge of cornea and brain death were rather low, but in this regard they showed a correlation with attitudes. It is important to develop education and programs to promote correct knowledge of cornea donation and brain death, and it is believed that, among other things, social consensus building will lead to change of perception and more active education and promotion, leading to voluntary participation by attracting more people's attention.

The overall knowledge of donating corneas has been shown to be related to emotional attitudes, behavioural attitudes. And emotional and cognitive attitudes were correlated. The results suggest that disseminating knowledge related to brain death and organ donation may change attitudes and perceptions about donating organs. In addition, at a time when the legal scope for brain and euthanasia is gradually expanding, it is expected that education programs using various media will be able to give hope to more patients.

Ethical Clearance: Not required

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Comparison of Balance and Muscle Activity of Normal Male and Female in Squats Exercise According to Knee Joint Angle

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ABSTRACT

The purpose of this study was to analysis the balance and muscle activity with squats exercise according to the knee joint knee between male and female. Before experiment, MVIC values were measured, and balance and muscle activity were measured during the squat exercise using MATLAB and EMG. Shapiro-Wilk test was used for normality test and Independent T test was used for independence test. All statistical significance levels were $p < .05$. The results showed that both male and female showed no significant difference between Maximum and 140° ($p > .05$), but 90° showed significant difference ($p < .05$). There was a significant difference in BF, VL, RA, and ES values at 90° between male and female ($p < .05$), and VL, ES, and RA were significantly different at 140° ($p < .05$). In order to enhance balance in various dynamic movements such as squat exercise that uses AR, the movement of the thigh muscles is required. In addition, statistics on muscle activity and balance can be used to apply a squat movement according to the knee angle. Therefore, future research suggests that research is proceeding from a more diverse angle.

Keywords: *squat exercise, balance, muscle activity, Knee joint angle, Normal Male and Female*

Introduction

The squat exercise is popular because of its similarity and applicability to both activities of daily living and many athletic movements, and it is a multi-joint movement that requires many large muscle groups to function together¹. Squat exercise is relatively powerful because it is more stable than other lower body exercises such as run or plank, and both legs are equally stressed. Squat exercise produces functional muscle mobilization patterns, promotes a sense of proprioception, includes the exercise of joints and muscles in closed kinetic chains, and requires many joint exercise². Muscle activity refers to the activity of the muscle in any particular motion. Usually, muscle activity is measured in an electrocardiogram. While the muscles contract and relax, there is a tiny potential difference around them. Among the squats, there are a lot of influences on the vastus medialis, vastus lateralis, biceps femoris, and the

gastrocnemius³. At this time, the Knee extensor muscle becomes the main muscle, and the hip extensor muscle acts as an assistant to the other muscles.

Marchetti et al.(2016) reported that there was a difference in muscle activation of the vastus lateral, vastus medialis, and rectus femoris depending on the position of the knee. The isometric back squat, which produces the highest muscle activation, has an angle of 90° , but the vastus lateralis total muscle activation of the lateral broad muscle is said to be produced in an isometric back squat at 140° , and muscle activation of the hamstring were not associated with knee angle⁴. And Saito et al.(2013) reported the neuromuscular activation of four synergistic agents of quadratus femoris at three different knee joint angles during isometric knee extension. The activation of each of the four synergists of rectus femoris at 150° knee angle joint was lower than at 90° . vastus intermedius, vastus lateralis, vastus medialis, and Rectus femoris muscles were compared with each other. As a result, muscular activation of vastus intermedius was observed at 150° of knee joint angle It is said to have decreased greatly⁵. Park et al.(2013) also reported that the rectus femoris muscles showed an increase in activity through repetitive squat exercises only below 100° of the knee joint⁶.

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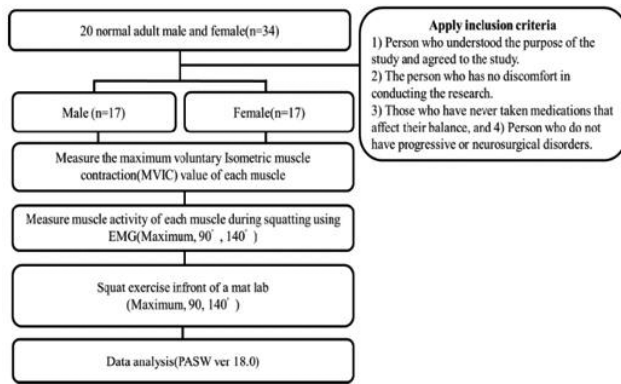


Figure 1: Flow diagram of subject experimental protocol

In contrast, Caterisano et al.(2002) found that while performing squatting at three depths, the experience of ten experienced reporters, gluteus maximus, biceps femoris, vastus medialis, vastus lateralis muscles⁷. The results suggest that there were no significant difference in biceps femoris, vastus medialis or vastus lateralis during concentric contraction at different squatting depths.

As we have seen there have been controversial studies on the muscle activity of rectus femoris and hamstring in squat exercise according to knee angle. To conclude the controversy, there is a difference in the pelvis between male and female, so it is necessary to compare the differences because the average Q angle is different. In addition, studies to date have shown that there is a balance between the squat exercise according to the angle of the knee, and the muscle activity of the gastrocnemius, tibialis anterior, erector spine, and rectus abdominis there was little. Therefore, the purpose of this study was to compare the balance and muscle activity of normal adult male and female with squat exercise according to knee angle.

Method

Participants: This study was conducted on healthy male and female students attending S University in Asan, Chungnam. Before participating in the study, all subjects were given sufficient explanations about the purpose and method of the study to conduct the research smoothly, and the researchers conducted voluntary consent. Participants selected 17 males and 17 females. The selection criteria were: 1) Person who understood the purpose of the study and agreed to the study. 2) The person who has no discomfort in conducting the research. 3) Those who have never taken medications

that affect their balance, and 4) Person who do not have progressive or neurosurgical disorders. The exclusion criteria are those uncomfortable with the study, and that are taking supplements. This study was approved by Institutional Review Board (SM-201804-021-2) Institutional Physiological Ethics Committee.



Figure 2: 140°, 90°, Maximum

Experimental Procedures: The overall research process is shown in [Figure 1]. This study is cross sectional study and non-equivalent two group comparison test and Single blinded test. Prior to starting the study, the subjects were briefed on the purpose of the experiment and the method of study and then conducted on those who agreed to it. Before the experiment, short sleeves and shorts were worn to reduce the skin resistance of EMG attachment site. Measurements were performed on the muscles of the vastus lateralis, biceps femoris, gastrocnemius, tibialis anterior, erector spine, and rectus abdominis using an electromyography device during each squat exercise at 140°, 90°, Maximum and The muscles that were activated during the squat exercise at the angle were analyzed [Figure 2].

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We used digital goniometer for measuring angle and EMG for measuring muscle activity. To assess the balance capability, we used the Matlab program. In order to reduce the skin resistance on the legs of the subject, the hair on the attachment site was removed using a razor or the like and disinfection was carried out by inserting the area to

be examined and the EMG pad with alcohol. According to the existing study, in the case of the vastus lateralis, it was attached about 10cm above the upper corner of the knee bone and about 6~8cm toward the side⁸. The biceps femoris was attached at 1/2 point between the ischial tubercle and the fibular head, and the gastrocnemius was attached 1/2 between the calcaneus and the fibular head. three 3, tibialis anterior was attached at 1/3 point between fibular and medial malleolus, rectus abdominis at 5cm above the umbilicus, and erector spine was attached 2cm away from the spinous process of the 2nd lumbar. The overall attachment point is shown in [Table 1].

Table 1: The attached location of EMG electrodes

Muscle	Location
Vastus lateralis	About 10 cm above the upper edge of the knee bone, about 6 to 8 cm toward the edge`
Biceps femoris	1/2 point between ischial tubercle and fibular head
Gastrocnemius	1/3 point between calcaneus and fibular head
Tibialis anterior	1/3 point between fibular and medial malleolus
Rectus abdominis	About 5cm above the belly button
Erector spine	Approximately 2 cm away from the spinous process of the second lumbar

Goniometer: Using a Digital goniometer (Digital Absolute + Axis, 12-1027, USA, 2012), the knee joint angles were adjusted to 140°, 90°, Maximum and, respectively, and then squatting was performed [Figure 3].

EMG (Electromyography): The digitized signal of the EMG was subjected to 20-500 Hz bandpass filtering, full wave rectification and smoothing using root mean square (RMS). The obtained muscle activity value were calculated as the effective mean value and then mean and compared with the ratio (MVIC) of the Maximum number of muscle contractions of each muscle on the basis of the muscle strength evaluation posture⁹. In order to determine muscle quantization, the mean value of the root muscle, vastus lateralis, gastrocnemius, and tibialis instrument were divided by the RMS mean value of each muscle [Figure 4].

$$\text{MVIC (\%)} = \frac{\text{Mean amplitude}}{\text{MVIC}} \times 100$$



Figure 3: Goniometer



Figure 4: EMG(Electromyography) Matlab

We measured the balance during squat operation using Matlab program in UINCARE (UINCARE - 82B, Korea, 2016.) MATLAB is a mathematical engineering program that allows you to measure the motion of the center of gravity(COG) in the direction of the Ant-Post, Vertical, and Medial-Lateral while the subject is moving. The method of use automatically measures the COG when the object or object is in front of the device after executing the program and shows the axis movement for the set amount of time.

Result

Physical Characteristic: The physical characteristics of the researchers are as follows [Table 2].

Table 2: General characteristics of subjects (n = 34)

	Male (n = 17)	Female (n = 17)	Mean
Age (year)	23.12 ± 2.28	20.94 ± 0.55	22.03 ± 1.97
Weight (kg)	73.82 ± 9.02	53.53 ± 7.62	63.68 ± 13.18
Height (cm)	173.76 ± 7.76	163.18 ± 4.47	168.47 ± 8.23
mean ± standard deviation			

Comparison of the balance of the squat exercise: According to the angle of the knee joint the difference in the balance when squatting according to the angle of the knee joint is as follows [Table 3].

There was no significant difference in Maximum and 140° when squatting at 140°, 90°, and Maximum, respectively ($p>0.05$), but there was a significant difference between anterior-posterior and medial-lateral at 90° ($p<0.05$). For male, there was no significant difference between 58.14 ± 15.99 in the maximal Medial-Lateral ($p>0.05$) and 95.31 ± 23.26 in the Anterior-Posterior. For 90° case, Medial-Lateral showed a significant difference of 27.99 ± 8.64 ($p<0.05$) and also a significant difference of 89.02 ± 67.93 Anterior-Posterior. There was no significant difference in

140° medial-Lateral ($p>0.05$), with a difference of 101.92 ± 83.60 at Anterior-Posterior. The maximum medial-lateral of the female was 60.85 ± 27.72 , indicating no significant difference ($p>0.05$). Anterior-posterior was not significantly different from 97.91 ± 22.42 ($p>0.05$). There was a significant difference between 90° mediolateral 50.04 ± 14.59 and anterior-posterior 141.02 ± 74.66 ($p<0.05$). There was no significant difference between 140° Medial-Lateral and 28.29 ± 11.58 and anterior-posterior was also 106.84 ± 73.23 ($p>0.05$).

Table 3: Comparison of the balance of the squat exercise according to the angle of the knee joint (Unit: mm)

		Male	Female	t
Max	overall	342.66 ± 32.86	358.43 ± 55.49	-1.008
	Ant-Post	95.31 ± 23.26	97.91 ± 22.42	-0.331
	Medio-Lateral	58.14 ± 15.99	60.85 ± 27.72	-0.35
90°	overall	243.27 ± 57.81	258.87 ± 47.57	-0.859
	Ant-Post	89.02 ± 67.93	141.02 ± 74.66	-2.214*
	Medio-Lateral	27.99 ± 8.64	50.04 ± 14.59	-5.359*
140°	overall	159.57 ± 43.00	194.77 ± 80.10	-1.585
	Ant-Post	101.92 ± 83.60	106.84 ± 73.23	-0.183
	Medio-Lateral	24.56 ± 12.25	28.29 ± 11.58	-0.912

mean $\pm$ standard deviation, Max: Maximum, Ant-Post: Anterior-Posterior, Medio-Lateral: Medial-Lateral, * $p<0.05$

Comparison of muscle activity of the squat exercise: For muscle activity, there was not significant difference between male and female when the knee joint angle was Maximum, and at 90° the difference was significant at the biceps femoris at 83.25 ± 7.16 , 62.26 ± 4.99 , respectively ($p<0.05$). In the vastus lateralis, there was a significant difference between males and females at 91.94 ± 7.26 , 98.17 ± 7.86 ($p<0.05$). Erector spine showed a significant difference of 86.34 ± 7.35 , 38.51 ± 7.64 respectively ($p<0.05$). For the rectus abdominis, there was a significant difference ($p<0.05$) with 84.88 ± 7.92 , 34.74 ± 8.40 ($p<0.05$). At 140°, male and female showed a difference of 85.61 ± 7.55 , 95.69 ± 11.44 , 37.76 ± 5.14 , 27.45 ± 4.87 , 69.91 ± 7.2 respectively.

Table 4: Comparison of the muscle activity of the squat exercise according to the angle of the knee joint

	140°			90°			Maximum		
	Male	Female	F	Male	Female	F	Male	Female	F
GCM	34.08 ± 6.11	33.26 ± 5.16	0.18	65.85 ± 6.67	63.18 ± 5.47	1.63	77.26 ± 8.31	73.21 ± 5.59	2.29
TA	95.17 ± 8.01	93.71 ± 7.39	0.31	84.43 ± 7.68	86.20 ± 7.63	0.45	97.44 ± 6.34	96.57 ± 10.40	0.09
BF	44.35 ± 5.40	93.71 ± 7.39	1.42	83.25 ± 7.16	62.26 ± 4.99	8.16*	56.47 ± 4.16	54.20 ± 5.31	1.92
VL	85.61 ± 7.55	95.69 ± 11.44	5.97*	91.94 ± 7.26	98.17 ± 7.86	5.76*	72.54 ± 8.23	74.89 ± 7.42	0.77
ES	37.76 ± 5.14	27.45 ± 4.87	6.64*	86.34 ± 7.35	38.51 ± 7.64	15.52*	56.74 ± 5.19	54.39 ± 3.26	2.5
RA	69.91 ± 7.22	31.21 ± 4.61	9.19*	84.88 ± 7.92	34.74 ± 8.40	19.96*	30.03 ± 5.20	28.85 ± 5.63	0.4

mean $\pm$ standard deviation, GCM: Gastrocnemius, TA : Tibialis anterior, BF : Biceps femoris, VL : Vastus lateralis, ES : Erector spine, RA : Rectus abdominis, * $p<0.05$

Discussion

This study compared the balance and biceps femoris, vastus lateralis, tibialis anterior, gastrocnemius, erector spine, and rectus abdominis muscle activities when normal adults were squatted according to the knee joint angle (140°, 90°, maximum). There was no significant difference between the maximum and 140° of knee joint angle ($p>0.05$), but there was a significant difference at 90° ($p<0.05$). Balance is the ability to maintain the center of the body on the supporting surface and base, and essential for body stability and independence¹⁰. The ability to maintain center of gravity on the base during static and dynamic movements is called balance. Sensory posture control requires visual, physical, and sensory information from the vestibular system^{9,11}.

Balasubramanian et al.(2007) reported that balance plays a very important role in maintaining posture, maintaining posture when performing any other movement, and everyday life¹². Yunwon et al.(2015) suggested that genu valgum may affect the medial-lateral balance index because the medial collateral ligament and joint capsule are elongated, the inner muscles such as semitendinosus are elongated, and the lateral joint space is lost¹³. Timothy et al.(2018) measured the dynamic stability index for the standard deviation of the ground reaction force and dynamic posture stability during static posture stability according to gender. As a result, female had better static postural stability than male, but no difference in dynamic postural stability¹⁴. On the other hand, Wikstrom et al.(2006) quantified dynamic postural stability during jump landing of a single leg. The results showed that female had dynamic postural stability compared to male in vertical planes¹⁵. Hollman et al.(2009) found that muscle strength of mid-ball famine suggests increased knee flexion¹⁶. Ryan et al.(2006) reported that female had a larger Q angle than male. The results showed that a cruciate ligament injury in female could be an anatomical risk factor¹⁷. In conclusion, the present study showed that the female genu valgum was increased by squatting at 90° and there was no significant difference between maximum and 140°. In the case of muscle activity, Valentina et al.(2012) Suggested that female may be exposed to the risk of anterior cruciate ligament injury by activating the quadriceps muscle because the female lacks the trunk muscle force that controls the forward displacement of the center of mass during the squatting

phase respectively¹⁸. In addition Willson et al.(2006) Using instruments suitable for a clinical setting, females were found to have greater frontal plane projection angle (FPPA) and generally decreased trunk, hip, and knee isometric torque. Hip external rotation strength was most closely associated with the frontal plane projection angle¹⁹. In this study, there was a significant difference in vastus lateralis, erector spine, and rectus abdominis at the knee joint angle of 140° between male and female.

Ebben (2009) evaluated the activity of hamstring and quadriceps muscle according to gender. As a result, female are more active in the quadriceps muscle and less active in the hamstring muscle than male. Female may require disproportionately greater training for the hamstrings compared with the quadriceps²⁰. Therefore, in this study, the muscle activity of vastus lateralis was higher in female than in male at 90°, but it was lower in biceps femoris.

The results of this study showed that at 90° and 140° in the squat, males contributed stability to balance by activating erector spine and rectus abdominis more than females. Thus, female were more unstable than male. Also, squats at 90° can increase knee valgus stress and cause damage to knee structures. Therefore, for female who are at risk of falling, it is recommended that the knee joint angle is 140° in order to perform a stable squat.

Conclusion

This study was intended to compare balance and muscle activity when normal male and female their squat exercise according to their knee joint angle. The study found that balance was not significantly different for both male and female at 140° and for 90°, when they had squat exercise according to the knee joint angle. Consequently, the difference in balance in knee joint angles was found to be the most unstable for female at 90° above male and relatively stable at Maximum and 140°. vastus lateralis was higher in female than in male at 90°, while biceps femoris, erector spine and rectus abdominis were lower. At 140°, females were higher in vastus lateralis than males and lower in erector spine and rectus abdominis. In the case of Maximum, there was no difference between male and female. Therefore, in the future studies will provide a comparative study of male and female according to various angles and movements.

Ethical Clearance: Take from Sunmoon University committee Institutional Review Board (SM-201804-021-2).

Source of Funding: Self

Conflict of Interest: Nil

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The Emergency Medical Services System of South Korea: The Present and Future of Emergency Medical Technicians

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ABSTRACT

Objectives: This study aimed to analyze the present and future of the work scope for emergency medical technicians (EMTs) in the South Korean emergency medical services system (EMSS). This is qualitative research with secondary data analysis based on literature review.

Method: This is qualitative research aimed at interpreting and understanding the meanings of social and cultural phenomena. It aimed to investigate the social phenomena—current situations—of the work scope for EMTs in EMSS and make suggestions for increasing the scope in a future-oriented way.

Result: As for the work scope for EMTs in South Korea, EMTs-Level 1 are in charge of airway intubation, laryngeal mask intubation, securing of an intravenous route, and medication (glucose injection against hypoglycemic coma, sublingual nitroglycerin against chest pain, a fixed amount of fluid infusion against shock, and bronchodilator inhalation against asthma exacerbation) in addition to those tasks of EMTs-Level 2. US EMTs-Paramedic are in charge of a wider range of tasks, including cardioversion and medication permitted in emergency, in addition to those tasks of EMTs-Basic and EMTs-Intermediate.

Conclusion: EMTs actually play insignificant roles in South Korean EMSS. While the number of new good-quality EMTs increases on an annual basis, the scope of their work has insignificantly been changed for the past 20 years. South Korea needs to reinforce systems and legislation that can give good-quality EMS appropriate for advanced EMSS.

Keywords: EMS, EMSS, EMT, In-hospital, Pre-hospital, Scope of work

Introduction

EMSS is divided into two stages: the pre-hospital stage at which medical service is provided outside hospital ^[1] and the in-hospital stage at which emergency medical service is provided in an emergency room ^[2]. Gomes et al^[3] suggested that EMSS provide efficient EMS

through on-site work, transportation, communication, and arrival at hospital. Sayed ^[4] suggested the need for manpower, facilities, and equipment so that EMSS could give medical service efficiently.

NHTSA ^[5] indicated that diagnosis and treatment in pre-hospital EMS was mostly performed by EMTs. Al-Shaqsi ^[6] suggested that paramedics play crucial roles as treatment providers in EMSS. It is EMTs who play central roles among human resources in EMSS ^[4,5,6].

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EMTs need to give efficient first-aid in pursuit of a higher survival rate for first-aid patients in emergency. MOLEG ^[7] suggested that EMTs in South Korea be divided into EMTs-Level 1 and EMTs-Level 2. The United States has them divided into EMT-Basic, EMT-Intermediate, and EMT-Paramedic, which varies among states ^[8].

MOLEG ^[7] notes that EMTs-Level 1 in South Korea are in charge of airway opening for cardiopulmonary resuscitation (CPR), securing of an intravenous route, breathing maintenance using a respirator, and medication (glucose injection against hypoglycemic coma, sublingual nitroglycerin against chest pain, fluid infusion against shock, and bronchodilator inhalation against asthma exacerbation) in addition to those tasks of EMTs-Level 2. EMTs-Paramedic in the United States are in charge of electrocardiogram (ECG), permissible drugs in emergency, esophageal intubation, airway intubation, and medication (hypoglycemic glucagon/50% glucose, sublingual nitroglycerin against chest pain, intravenous injection, intramuscular epinephrine against anaphylaxis, antagonist in case of drug overuse, nitrous oxide in case of pain, etc.), which varies among states ^[8,9].

The work scope for EMTs differs between the United States and South Korea, which is still at the elementary level. That is, EMTs in South Korea have difficulty in accessing professional first-aid on emergency sites or in medical institutions due to their limited tasks. Sun ^[10] contend that although EMTs play major roles in EMSS and remove the risk of death from people faced with the risk, they can shrink psychologically due to possible legal sanction caused by a narrow scope of tasks ^[10]. It is necessary to reflect on the realities of pre-hospital EMS and develop a plan for improving the tasks of EMTs to protect the people's life in South Korea. This study aimed to investigate the tasks of EMTs in South Korean EMSS and help widen the scope of their tasks in a future-oriented way and improve EMS. It intended to provide basic data that could help widen the scope of EMTs' work and revise EMSS-related legislation.

Method

1. Study desi: This study aimed to analyze the present and future of the work scope for EMTs in South Korean EMSS. It was based on the data from the National Fire Agency (NFA) ^[11] and the National Emergency Medical Center (NEMC) ^[12] and on literature review. This is qualitative research with secondary data analysis based on the data from NFA and NEMC and on literature review.

2. Actual state of EMTs: The actual state of new EMTs is as presented in Table 1. There were an average of 2,953 new EMTs on an annual basis: 1,319 EMTs-Level 1 (44.7%) and 1,634 EMTs-Level 2 (55.3%).

The gender ratio of new male and female EMTs-Level 1 was 54:46. That of new male and female EMTs-Level 2 was 89:11. The high gender ratio of EMTs-Level 2 is probably due to EMT qualification by firefighters working at fire stations^[11,12].

NFA^[11] reported that a total of 7,623 persons worked at NFA. EMTs-Level 1 (4,034; 52.9%) were slightly more likely to work at NFA than EMTs-Level 2 (3,589; 47.0%).

Table 1: Number of new EMTs in each year*

	EMT-Level 1			EMT- Level 2		
	Total	Male	Female	Total	Male	Female
2013	1,147	599	548	1,343	1,208	135
2014	1,210	666	544	1,598	1,425	173
2015	1,327	746	581	1,271	1,124	147
2016	1,371	739	632	1,625	1,432	193
2017	1,544	816	728	2,336	2,096	240
Mean	1,319	713	606	1,634	1,457	177
[12]NEMC, Emergency Medical Statistical Year Book, 2018						

3. Procedure of research: This study covers new EMT status, EMT education programs, and the scope of EMTs' tasks to investigate the whole scope of tasks for EMTs, who belong to the human resources in South Korean EMSS. Theme selection was followed by literature review, data collection, and result-obtaining.

This is qualitative research aimed at interpreting and understanding the meanings of social and cultural phenomena. It aimed to investigate the social phenomena—current situations—of the work scope for EMTs in EMSS and make suggestions for widening the scope in a future-oriented way.

In other words, this is qualitative research with secondary data analysis based on literature review. This study was approved by Institutional Review Board(IRB)(Human_006_20181130_2nd).

Result and Discussion

1. Work status for EMTs: The actual work status for EMTs is as presented in Table 2. NEMC ^[12] reported that there were a total of 10,541 EMTs: 6,177 EMTs-Level 1 and 4,364 EMTs-Level 2.

8,587 EMTs worked for 119 EMS and private EMS at the pre-hospital stage: 4,622 EMTs-Level 1 (53.8%) and 3,965 EMTs-Level 2 (46.2%). The differences in the number of EMTs between NFA^[11] and NEMC^[12] are due to the inclusion of those qualified both as a private transporter and as an EMT.

1,894 EMTs worked at emergency departments in emergency medical centers, hospitals, and others at the in-hospital stage: 1,495 EMTs-Level 1 (79.5%) and 399 EMTs-Level 2 (20.4%)

Table 2: Work status for EMTs

	Working Department	EMT-Level 1	EMT-Level 2	Total
Prehospital EMS	119 EMS	4,072 (47.4)	3,606 (42.0)	7,678 (89.4)
	Private EMS	550 (6.4)	359 (4.2)	909 (10.5)
	Subtotal	4,622 (53.8)	3,965 (46.2)	8,587 (100.0)
Hospital EMS	Emergency Department	925 (47.3)	38 (1.9)	963 (49.3)
	Hospital	498 (25.5)	147 (7.5)	645 (33.0)
	Others	132 (6.8)	214 (10.9)	346 (17.7)
	Subtotal	1,555 (79.5)	398 (20.4)	1,954 (100.0)
Total		6,177 (58.6)	4,364 (41.4)	10,541 (100.0)
[12] NEMC, Emergency Medical Statistical Year Book, 2018				

2. Scope of EMTs' work(South Korea): The scope of EMTs' work is as follows (South Korea). EMTs-Level 2 in South Korea are in charge of airway opening using an airway, removal of foreign body in oral cavity, basic life support(bls), oxygen administration, limb and spine fixation, external hemostasis and first aid for wounds, wearing of trauma air pants, automated external defibrillator, vital sign check, sublingual nitroglycerin against chest pain, and bronchodilator inhalation against asthma exacerbation^[7].

EMTs-Level 1 are in charge of airway intubation, laryngeal mask intubation, Scope of EMT-Level 2, securing of an intravenous route, and medication (glucose injection against hypoglycemic coma,

sublingual nitroglycerin against chest pain, a fixed amount of fluid infusion against shock, and bronchodilator inhalation against asthma exacerbation) in addition to those tasks of EMTs-Level 2^[7].

3. Scope of EMTs' work(US): The scope of EMTs' work is as follows (US). US EMTs-Basic are in charge of basic life support, cervical & spinal fixation, splint application, airway & breathing management, pulsation and oxygen measurement, medication (oral glucose against hypoglycemia, aspirin against chest pain etc) and automated external defibrillator. EMTs-Intermediate are in charge of basic life support, intravenous injection, application of trauma air pants, esophagobronchial intubation, multi-Lumen airways, endotracheal intubation, medication (50% glucose, antagonist in case of drug overuse, sublingual nitroglycerin against chest pain, intravenous injection, intramuscular epinephrine against anaphylaxis, nitrous oxide in case of pain etc) and automated external defibrillator in addition to those tasks of EMTs-Basic. EMTs-Paramedic are in charge of a wider range of tasks, including cardioversion and medication(inhaled – beta agonist & bronchodilator, Anticholinergic for dyspnea and wheezing, permissible drugs in emergency etc) permitted in emergency, in addition to those tasks of EMTs-Basic and EMTs-Intermediate^[8,9,13,14].

In the United States, the scope of work varies among states^[8,9,13,14]. EMT categorization also varies among states. ASTHO^[8] reported that Florida divided them into EMTs and paramedics; Georgia divided them into cardiac technicians, EMTs, and paramedics; Idaho divided them into emergency medical responders, EMTs, advanced EMTs, and paramedics; and Mississippi divided them into EMS drivers, EMTs-Basic, EMTs-Intermediate, EMTs-Paramedic, and EMTs-Paramedic Critical Care.

This division differs from the South Korean EMT division—EMTs-Level 1 and EMTs-Level 2—which was suggested by MOLEG^[7] along with the institutional differences in the scope of work.

4. Elements of performance for EMTs at pre-hospital stage in EMSS: The elements of performance for EMTs at the pre-hospital

stage in EMSS are as follows. The elements of performance for EMTs at the pre-hospital stage in EMSS include the number of EMTs-Level 1 and EMTs-Level 2 per the whole population and the EMT occupancy rate. The four stages—system introduction, quantitative growth, qualitative growth, and advanced system operation—which were suggested by MOHW and KOFIH ^[15] cover no first-aid based on the increase in the scope of work for EMTs. Since these tasks are related to emergency medical service requiring a doctor's medical guidance, it seems to imply an aspect of medical guidance at the stage of advanced system operation rather than an increase of EMTs' tasks.

- 5. Present and future of EMTs:** MOLEG ^[7] reports that EMTs in South Korea are divided into EMTs-Level 1 and EMTs-Level 2. ASTHO ^[8] reports that US EMTs are divided into two (EMTs and paramedics) to five (EMS drivers, EMTs-Basic, EMTs-Intermediate, EMTs-Paramedic, and EMTs-Paramedic Critical Care) categories, which varies among states.

NHTSA ^[5] notes that the scope of EMS management in the United States varies among provinces and states. However, the tasks of EMTs who play key roles in EMS are improved through revision. To do this, efforts are made to improve EMS and widen the scope of EMTs' tasks through various types of research on agenda for the future of EMS ^[5], reinforcement of the roles of EMS ^[8], standardization of EMS education ^[9], and EMS models ^[13, 14].

In South Korea, four stages—system introduction, quantitative growth, qualitative growth, and advanced system operation—were presented through the process of EMSS establishment suggested by MOHW and KOFIH ^[15]. Another attempt was made to improve EMS by dividing EMSS into pre- and in-hospital stages. However, while EMS generally had constructive contents, EMTs were under legally poor conditions. In other words, there was a poor device for institutional improvement. While the South Korean EMSS has been improved significantly since the establishment of the Emergency Medical Services Act in 1995, EMTs have failed to perform their duties well.

According to the legal interpretation by MOLEG ^[7], EMTs have never been qualified for advanced life support (ALS) due to legally limited tasks in emergency. Since the establishment of the Emergency Medical Services Act in 1995, they have failed to provide ALS.

Poor legislation can cause EMTs to avoid positive first-aid in emergency due to possible legal problems. Such avoidance is also expected to be found in relation to medication. Limited tasks can possibly cause some risks, not giving full consideration to the characteristics of EMS. The current EMS system fails to widen the scope of tasks for EMTs and the limited scope of their tasks can be fatal to people's life. It is therefore necessary to determine if the current limited scope of tasks for EMTs is reasonable in pursuit of the better future of EMSS. It is hoped that better legislation will be made in pursuit of improvement in EMSS and first-aid patients' survival. The improvement in the scope of tasks for EMTs is expected to realize first-aid at the level of advanced EMSS in case of emergency. Under the current emergency medical services act, it is necessary to adjust the scope of work not requiring doctors' medical guidance in emergency or to reinforce doctors' medical guidance.

Conclusion

EMTs actually play insignificant roles in South Korean EMSS. While the number of new good-quality EMTs increases on an annual basis, the scope of their work has insignificantly been changed for the past 20 years. South Korea needs to reinforce systems and legislation that can give good-quality EMS appropriate for advanced EMSS. It is necessary to widen the legitimate scope of work and reinforce on-site medical guidance. Under the current emergency medical services act, it is necessary to adjust the scope of work not requiring doctors' medical guidance in emergency or to reinforce doctors' medical guidance. It is hoped that efficient settlement of EMSS will give a chance to raise the level of EMS centered on EMTs for the people in South Korea

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Effects of Intensity and Set Method on iEMG of Flexor Carpi Ulnaris and Performance Speed Decrease Point during Barbell Curl Exercise

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ABSTRACT

The purpose of this study was to investigate the effects of repetition time changes during barbell curl exercise on EMG responses. In this study, the subjects were selected from twelve men in their twenties who had more than 3 years of resistance exercise experience. In this case, the subjects were randomly assigned to three conditions at intervals of one week with different rest interval and intensity (50%1RM/1min, 70%1RM/2min, 90%1RM/3min). When each condition was performed, each one repetition time and iEMG of the agonist were measured and reviewed. In each instance, a statistical analysis was performed by repeated measures of two-way ANOVA, with a p value=.05. In the review of the results of this study, iEMG of flexor carpi ulnaris during the performance of the barbell curl movement increased significantly with the occurrence of performance speed decrease point in all intensity, and was significantly noted with the progression of the set only at 50%1RM and 70%1RM. The point of occurrence of repetition speed decrease point was significantly different according to exercise intensity. Generally speaking, the heavier the weight, the closer was the point of performance speed decrease point and the end of exercise. To that end, the point of occurrence of performance speed decrease point according to the set also showed a significant difference. In this case, as the set progressed, there was a tendency that the point of performance speed decrease point was close to the point of stopping motion. There In conclusion, it is important to consider the fatigue factor associated with decreased performance during resistance exercise, and the important role of a supporter should be considered and utilized when exercise speed is decreased as an exercise set progresses during a regimen.

Keywords: Resistance exercise, Barbell curl, integral EMG, Repetition time, Maximum repetition exercise

Introduction

Resistance training is effective in improving muscular strength and muscle strength^[1]. This conditioning also has a positive effect on exercise performance and health by using coordination, balance, increase of nervous system reaction and decrease of body fat^[2]. The intensity of the resistance exercise is set differently according to the purpose of the exercise regimen and proposed training routine^[3].

When the maximum repetitive resistance exercise is performed, fatigue occurs in the agonist and the

exercise velocity is decreased^[4]. In most cases, the decreased speed of exercise means that the function of the agonist has decreased^[5]. The decrease in the exercise performance rate is attributed to the decrease in exercise intensity at the onset of concentric movement^[6]. In this condition, fatigue is generally caused by repetition of motion, which reduces energy until the repetition of motion fails^[7]. At this time, the repeated maximum muscle contraction uses additional motor units to maintain exercise performance^[8]. For instance, at a single iteration, the point at which the velocity of motion is reduced occurs at the upward motion of the resistor^[9,10]. As we have seen, this decrease in muscle strength increases the level of effort required until exercise fails^[11]. The force velocity power is reduced^[12], and a marked increased curvature in the force-velocity relationship is the main cause of muscle strength loss^[13]. In this case,^[14] concluded that there is a high correlation

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between the speed and height reduction of exercise and the occurrence of lactic acid and ammonia, as well it is noted that there is a reasonable possibility to predict muscle fatigue.

When muscle contraction begins, EMG provides information on bioelectrical activity related to muscle regulation, such as force generation and muscle fatigue levels^[15]. This is important to note, based on the muscle electrical characteristics and changes in exercise unit activity during maximal contraction, and in the case where non-contraction of muscles are similar to changes in iEMG^[16]. The lack of increase in iEMG at low exercise intensity means that muscle strength is low because of the condition of muscle mobilization^[17]. When performing a motion requiring constant force, a new exercise unit is mobilized in place of the motion-depleted motion unit as the initial mobilized motion unit becomes fatigued^[18]. As momentum and muscle contraction increase, iEMG increases due to increased muscle activity due to increased workload^[17]. To this end, the iEMG slope increases during the same intensity exercise. This is due to the accumulation of lactic acid and the decrease in pH due to muscle fatigue, and the binding force between calcium and troponin. In this case, these conditions can affect the affinity of the sarcoplasmic reticulum for calcium, and has effects on the recruitment of additional motor units^[19], which can be used to determine when muscle fatigue begins^[20].

In this case, the Babel Curl is known as the biceps Brachii which was used as the main muscle^[21]. The force output of the flexor carpi ulnaris, which contributes to the stabilization of the wrist, appears to influence the maintenance of movement. In this study at three loads During the maximum repetitive barbell curl of 5 sets, iEMG of flexor carpi ulnaris, and the relationship between the stability of the wrist muscle and change of repetition time to provide basic data, for the performance of safe and effective resistance training.

Materials and Method

Subjects: The subjects were enrolled as 20s healthy men, people with at least three years of resistance training experience. All experiments have explained the significance and specific research methods of the study, and were selected whereby twelve person agreed to participate. Characteristics of the subject is shown in Table1.

Table 1: Characteristics of the subject

	Age (yr)	Weight (kg)	Height (cm)	Experience (yr)
N = 12	26.08 ± 2.94	81.08 ± 8.56	174.50 ± 3.50	3.33 ± 1.55

RM Measurement: It is emphasized that the 1RM measurement was made by referring to the method of^[22], and the maximum weight can be measured within 4 sets. Based on the measured maximum weight, 90% 1RM, 70% 1RM, 50% 1RM weight was calculated.

Electromyography Measurement: In this case, the EMG measurements were performed using a wire EMG (LXM 5308, Korea) and surface electrodes. During the exercise, the area of the surface electrode was shaved and cleaned before the experiment. Next, the electrode attachment portion was attached to a distance of as much as two finger widths from the ulnar surface of 1/3 of the^[23] fore arm was presented. After the measurement, the electromyogram raw data was filtered using a band pass filter of 10-400 Hz, full wave rectification was performed, and iEMG was calculated by integrating the signal section. Electromyography measurement is shown in Figure1.



Figure 1: Electromyography Measurement

Repetition Time Measurement: In the study, a digital camera (Nikon D750, Japan) was used to measure exercise time by repetition frequency during exercise. The moment the bar returns to the thigh from the moment it fell off the thigh to the maximum bending point, was recorded using a video editing program (Kinovea, France). This exercise is performed with slower time, and was calculated as a percentage of the total number of repetitions, which is selected as the time (reps) slower than the first repetition times for the average per person.

Data Analysis: Raw data in this study was calculated for the mean and standard deviation by using the SPSS 22.0 program. The iEMG of Flexor carpi ulnaris between before and after Performance speed decrease point occurrence (2) and set (5) of 50% 1RM, 70% 1RM, 90% 1RM was analyzed using a Repeated measures two-way ANOVA

method. Performance speed decrease point according to exercise intensity (3) and set (5) were analyzed using the Repeated measures two-way ANOVA method. In this study, the statistical significance was set at $\alpha = .05$.

Results

50% 1RM Change of iEMG according to Performance speed decrease point during barbell curl exercise: As has been seen and reviewed, in this case a 50% 1RM,

iEMG showed significant difference according to the exercise time ($p<.01$), and it tended to increase with Performance speed decrease point. There was also a significant difference between the sets ($p<.001$) and increased as the set progressed. There was no interaction effect between exercise time and set. Two-way ANOVA analysis for the iEMG Flexor carpi ulnaris difference of during the 50%1RM barbell curl exercise according to repetition time and set is shown in Table 2.

Table 2: Two-way ANOVA analysis for the iEMG Flexor carpi ulnaris difference of during the 50%1RM barbell curl exercise according to repetition time and set (μV)

	1set	2set	3set	4set	5set		F	P
Pre Speed decrease point	21.39 ± 15.40	68.82 ± 41.91	115.43 ± 57.31	121.94 ± 112.49	191.88 ± 170.19	Repetition time(R)	11.473	.006
Post Speed decrease point	56.92 ± 41.99	110.34 ± 68.36	169.60 ± 122.28	259.82 ± 161.58	324.31 ± 227.40	Set(S)	21.945	.000
						(R)x(S)	2.467	.059
M ± SD								

70% 1RM Change of iEMG according to Performance speed decrease point during barbell curl exercise:

The prevailing discipline notes that the iEMG at 70% 1RM showed a significant difference ($p<.001$), indicating a tendency to increase at the Performance speed decrease point. In this context, there was also a significant difference between the sets ($p<.001$) and increased as the set progressed. It is noted also that there was no interaction effect between exercise time and set. Two-way ANOVA analysis for the iEMG Flexor carpi ulnaris difference of during the 70%1RM barbell curl exercise according to repetition time and set is shown in Table 3.

Table 3: Two-way ANOVA analysis for the iEMG of Flexor carpi ulnaris difference during the 70%1RM barbell curl exercise according to repetition time and set (μV)

[illegible]

90% 1RM Change of iEMG according to Performance speed decrease point during barbell curl exercise:

The iEMG at 90% 1RM showed a significant difference according to the repetition time ($p < .05$), and it tended to increase at the performance speed decrease point. In this respect, There was no significant difference between the sets, which was seen to have. And increased as the set progressed. In this relation, There was no interaction effect between exercise time and set. Two-way ANOVA analysis for the iEMG Flexor carpi ulnaris difference of during the 90%1RM barbell curl exercise according to repetition time and set is shown in Table 4.

Table 4: Two-way ANOVA analysis for the iEMG of Flexor carpi ulnaris difference during the 90%1RM barbell curl exercise according to repetition time and set (μV)

[illegible]

Change of Performance speed decrease point according to intensity and set during barbell curl exercise: The performance speed decrease point was significantly different according to exercise intensity ($p < .001$). In its most positive context, as the exercise intensity increased, performance speed decrease point and exercise stop were close. There was also a significant difference between the sets ($p < .001$). Furthermore, as the set increased, the performance speed decrease point and exercise stop were close to each other. Finally, there was no interaction effect between exercise time and the exercise set. Two-way ANOVA analysis for the Performance speed decrease point difference during the barbell curl exercise according to intensity time and set is shown in Table 5.

Table 5: Two-way ANOVA analysis for the Performance speed decrease point difference during the barbell curl exercise according to intensity time and set (%)

	1set	2set	3set	4set	5set		F	P
50%1RM	72.89 ± 11.13	68.95 ± 10.43	78.96 ± 6.24	89.41 ± 11.85	93.98 ± 13.29	Intensity (I)	17.420	.000
70%1RM	75.79 ± 11.76	75.02 ± 7.64	85.56 ± 13.64	88.20 ± 14.85	97.22 ± 9.62	Set(S)	22.881	.000
90%1RM	83.75 ± 14.89	94.45 ± 12.97	94.45 ± 12.97	97.22 ± 9.62	100.00 ± 0.00	(I)x(S)	1.729	.136
M ± SD								

Discussion

In the present study, iEMG of the flexor carpi ulnaris at 50% 1RM, 70% 1RM, and 90% 1RM intensity showed a significant difference ($p < .01$) ($p < .001$). As the performance speed decrease point occurred, it is recorded that all of the iEMG increased. During the same intensity exercise, accumulation and pH decrease of lactic acid by muscle fatigue the affinity of calcium and troponin and affinity to calcium and sarcoplasmic reticulum, and iEMG slope increases were due to and the result of additional motor unit recruitment^[17,19]. It is thought that the mobilization of additional exercise units was carried out to keep the muscle contraction with the decrease of the muscular force as the exercise progresses slower and the closer to the end of the exercise, the slower the muscular contraction^[8,10,12]. It is considered that muscle activity is maximized as the work load ratio increases as the exercise is stopped^[23].

Upon review, it is seen that the 50% 1RM and 70% 1RM intensity condition showed significant difference in the iEMG between sets ($p < .001$) and the tendency to increase as the set continued. The question then is noted that the increase in iEMG as the set increases seems to be due to the lack of time to recover from the rest interval, as the fatigue caused by the repetition of the slow exercise interval is repeated^[26]. On the other hand, iEMG at 90% 1RM showed no significant difference

between sets, and iEMG changes at performance speed decrease point was less than 70% 1RM and 50% 1RM intensity. To this end, when strength is exerted, the Type I muscle fiber with low mobilization threshold is mobilized first, then Type II fiber is mobilized in order, but in exercise requiring large force, the motor unit is large according to size principle. Most types of exercise units are mobilized up to Type II fiber, and the firing rate of the motor unit is accelerated^[4]. In the present study, there was a significant difference between the exercise intensity and the exercise intensity in all repetitions ($p < .001$). The light load showed a tendency to continue the exercise after the performance speed decrease point. At this time, as the weight increased, the performance speed decrease point appeared and the exercise performance tended to stop. The lighter weight is thought that the incident would occur with less mobilization of the motor unit^[23]. This subsequently created a loss of speed of exercise performance. For this reason, it is considered that the number of repetitions can be maintained even after the performance speed decrease point^[15]. At 90% 1RM weight, the movement failure occurred rapidly after performance speed decrease point. This factor is noted as an increase of the delayed neural responses that appeared to lift the load from the heavy weight^[9], whereby the rate of lifting of the resistance is reduced, resulting in muscle strength loss^[15]. Therefore the exercise is considered to this point stop occurred rapidly^[8,12]. As the

set progressed, the performance speed decrease point tended to appear just before the failure ($p < .001$). Lactic acid produced by continuous exercise appears to be due to more fatigued^[29,30]. The time required to remove lactic acid from continuous exercise is 4-10 min^[31], with ATP and CP recovering to 85% within the timeframe of 3 min^[32]. It is thought that low repetition frequency and fast movement discontinuity appeared because the exercise was performed in the condition that the energy supplement was insufficient due to a short rest time. Also fatigue by-products that were not removed during the rest period seemed to have an effect on the premature termination^[31].

Conclusion

In formulating a summation of the results of this study, as the set progressed, there was a tendency that the point of performance speed decrease point was close to the point of a stopping motion. In conclusion, it is important to consider the muscle fatigue associated with decreased exercise performance during resistance exercise, and the role of an attending exercise assistant should be important when the exercise speed is decreased as the set progresses.

Ethical Clearance: Not required

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Conflict of Interest: Nil

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Study on the Knowledge, Optimistic bias and Engagement with AIDS in Nursing Students

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ABSTRACT

Our country is the only country with an increasing number of AIDS infections. To combat this reality, the knowledge and thought related to AIDS was to find out how it relates to the practice of preventing AIDS. The knowledge and optimistic bias and involvement of AIDS related to university students majoring in nursing were investigated to find out how the three variables were related. Statistical results were calculated using SPSS 18.0. Looking at the relationship between AIDS-related knowledge, optimistic bias, AIDS involvement, self-respect and self-control, the higher AIDS-related knowledge, the higher the self-esteem and self-control. The higher the optimistic bias, the higher the level of AIDS involvement, and the lower the self-respect and self-control. The higher the level of AIDS involvement, the higher the sense of self-respect, and the higher the self-esteem, the higher the sense of self-control. A high level of knowledge and involvement in AIDS is likely to be implemented as a positive health act on AIDS prevention. Therefore, we hope to reduce the growth rate of AIDS infections by providing accurate knowledge and information about AIDS, especially for teenagers and college students who are seeing an increase in AIDS infection.

Keywords: *AIDS-related knowledge, College student, Involvement of AIDS, Optimistic bias, Self-control, Self-respect*

Introduction

According to study by Korea Centers for Disease Control & Prevention, (2017), while the number of new infections and AIDS-related deaths worldwide is decreasing, the number of new infections in Eastern Europe and Central Asia, including Korea, is still on the rise¹. Considering that people in their 20s, which account for the largest percentage of AIDS, must manage their illnesses for the rest of their lives, one cannot overemphasize thorough prevention before obtaining them. The period of college students is when heterosexual intercourse is free, adult consciousness is open, and sexual activity is increased, overall knowledge level is not low, but relatively low level of knowledge about infection pathways and treatment by Korea Centers for Disease Control & Prevention, (2015)².

Korea Centers for Disease Control & Prevention, (2013) suggest that AIDS knowledge refers to the facts and information that an individual has gained through training or experience in HIV/AIDS in many situations involving AIDS³. Ndugwa & Berg-Beckhoff, (2015:299-308) suggest that this is an important precondition

for disease prevention and, in most national policy programs; a great deal of effort is being made to raise the level of knowledge⁴. Assume that people will be aware of a disease-causing crisis and will change their behavior accordingly by Weinstein, (1984:55-59)⁵. However, people's inability to perceive a crisis despite their knowledge of AIDS suggests that psychological factors such as optimism bias can influence judgment.

According to Clarke, (2000: 367-376) optimistic bias refers to the tendency to believe that you are less likely to experience negative events, such as illness or physical risk, than others⁶. Weinstein, Marcus & Moser, (2005: 55-59) suggest that this means a low perception of a crisis, so it has been understood as a negative variable to health behaviors, such as failing to perform preventive actions or medical prescriptions, but is likely to be perceived independently of it⁷. Prevention is the best way to avoid HIV, when there is no full cure for AIDS yet and only a chronic disease that can be managed by symptom management by Kim, Choe & Choe, (2006: 43-58)⁸. In other words, safe sexual behavior is the most effective way to prevent AIDS.

Without knowing correctly about AIDS, it is known to be difficult to establish effective AIDS prevention measures as this increases the likelihood of being obsessed with excessive fear or hatred. Therefore, according to Linda, (1983: 41-61) the dissemination of correct knowledge is not only a sure way to correct one's own safe sexual behavior, but also a key to achieving effective preventive measures⁹.

On the other hand, involvement by Kwon & Lee, (2018: 251-262) is recognized as a variable related to an individual's motives and a concept that is distinct from knowledge¹⁰. It is defined as the degree to which individuals view things, individuals, situations, or organizations as being personally related or of personal importance. If so, it is necessary to recognize the degree of knowledge of the AIDS disease and the seriousness of the disease and to see how optimistic bias in this regard affects the effects of behavioral changes depending on the degree of involvement.

According to Hallahan, (2000: 499-515) Self-respect is a concept that shows how valuable an individual is to his or her own self-worth, ability, value, satisfaction and so on, so that he or she has positive or negative self-worth and evaluates and judges himself¹¹. The greater self-respect, the more positive your health will be.

Health & Douglas, (1990: 193-204) suggest that Self-control refers to the extent to which individuals believe they can control what is happening to them, and the greater they think they can control what is happening to them, the greater the optimism bias and the associated variables of health-boosting behavior.

Therefore, this study was conducted to find out the correlation between AIDS-related knowledge and optimism bias and involvement among nursing college students and to establish a basis for how self-esteem and self-control affect the guidelines for preventive action.

Method

Research Subjects: The study was conducted on university students attending the nursing department of B University located in Area C. First, the purpose of the study and the methods of the study were explained and the students who agreed to it were surveyed.

Research Period: The survey was conducted from March 4 to March 15, 2018.

Measurement Tools: AIDS-related knowledge was used by Son's tool, (2009: 57-78)¹³. AIDS knowledge tools were measured by questions about the causes, symptoms, infection paths, testing methods, prevention methods and treatment methods of AIDS. AIDS knowledge consists of 13 questions (a three-point scale) and the scoring method gives one point to the correct answer, resulting in a total of at least 0 points from a maximum of 13 points, and the higher the score, the higher the AIDS knowledge.

Optimistic biases suggest that individuals are self-centered when evaluating risks in comparison, and that they tend to believe that they are less vulnerable to risks than others when assessing their risks relative to them. That means believing that you are less likely to have a negative experience than others. Many people perceive their own chances of experiencing a crisis differently, such as illness like cancer or disaster or death like natural disasters that happen to others, which are far from them. If optimistic prejudice works with AIDS, I think I will not get AIDS even though other people may have it. An optimistic bias is likely to cause many negative consequences in society, as he believes he is not HIV-positive and therefore is more likely to neglect his health care and take risky actions. This study used tools developed by Weinstein, (1984: 431-457)⁵.

First of all, his own perceptual measurement of infection compared to others said, "How much do you think you're likely to be infected with AIDS compared to someone else (a normal person)?" and his own perceptual measurement of the possibility of infection compared to his or her close friend used the phrase "What do you think your chances of getting AIDS are compared to your best friend?" If respondents' response averages in each question using a seven-point scale represent the median score (4 points) of the scale, then there is no optimism bias, and if there is a higher score than the median, it can be interpreted as having an optimistic bias, and the greater the score, the greater the optimism bias.

A degree of involvement refers to the degree of perceptual relevance or importance of an individual to a subject. That is, the higher the level of involvement in a problem, the more likely it will be to find data or discuss with others, the more knowledge and attitudes will eventually change. Therefore, the increase in level of involvement in AIDS prevention education. A domestic study also found that people with a higher level

of involvement are more likely to take into account the personal seriousness and future impact of AIDS, and thus form a belief in the possibility of AIDS infection. In this study, we measured it with a tool developed by a deferred acquisition. A score measured through two questions asked about the severity of an individual's feelings about AIDS and how much impact his or her future will have by Sherif & Cantril, (1947)¹⁴.

Self-respect refers to the degree of self-respect and the degree to which an individual considers him a worthy person, as it relates to a negative or positive assessment of him. With subjective assessments of how valuable an individual is, people generally tend to think that they are better than others to maintain a positive self-image, which also affects perceptual bias. In this study, the AIDS-related self-esteem tool developed by Lee, (2011) refers to the score measured through three questions about whether she is reasonable, responsible or ethical compared to her peers¹⁵.

Self-control refers to the extent to which an individual believes he or she can control what is happening to him. If there is a sense of self-control, it affects optimism bias because it thinks it is possible to exercise control in a health crisis or crisis event. This applies to the perception of AIDS infection, which can be assumed that the greater self-respect and self-control the less likely you are to be infected with AIDS. In this study, the scores measured through two questions asked about whether the tools developed by the company could prevent AIDS and control the unhealthy sex life.

Data Analysis: Data collected for the purpose of the study was analyzed using SPSS 18.0 statistical program using the following analysis methods.

First, average and percentage were calculated on sociodemographic characteristics of the subjects.

Second, average and standard deviation were calculated to analyze the AIDS-related knowledge, Optimistic bias, involvement of AIDS, Self-respect and Self-control of the subject.

Third, t-test and ANOVA were conducted to explore the differences in AIDS-related knowledge, Optimistic bias, involvement of AIDS, Self-respect and Self-control according to sociodemographic characteristics of the subject.

Fourth, correlation analysis was conducted to explore the relation between AIDS-related knowledge, Optimistic bias, involvement of AIDS, Self-respect and Self-control.

Result and Discussion

Sociodemographic Characteristics of Subjects:

The demographic characteristics of the subjects were investigated, including sex, grade, religion, participation in religious activities, residence status, family economic power they thought they were living in, level of study they thought they were studying. Gender was 83 percent for women and 17 percent for men. The number of first graders was 31.3 percent, second graders 32.1 percent, third graders 16.4 percent and fourth graders 20.2 percent. Religion was 45.1 percent for Christianity, 4.8 percent for Buddhism, 2.7 percent for Catholicism and 47.5 percent for non-religiousness. According to a survey of religious people, 14.6 percent said they are working very hard, 48.0 percent said they are working hard, 19.7 percent said they are doing it in a perfunctory manner, and 17.7 percent said they are doing little. Asked about the type of residence, 361 percent said they live with their parents, 34.5 percent said they live in dormitories and 29.4 percent said they live alone. About 6.4 percent said they have good economic power, while 13.5 percent said they are poor. As for the level of study you think you are good at, 13.5 percent said you are good at, 44.3 percent said you are good at, 32.6 percent said you are not good at, 8 percent said you are bad at it, and 1.6 percent said you are not good at it.

Result of AIDS-related knowledge, optimism bias, involvement in AIDS, self-respect, and self-control:

The average standard deviation values of AIDS-related knowledge, optimism bias, AIDS involvement, self-respect, self-control, AIDS-related knowledge of the subject, optimism bias, AIDS involvement, self-respecting and self-control of the subject are as follows.

AIDS-related knowledge is 9.60 ± 2.49 , optimism bias is 2.76 ± 1.37 , involvement in AIDS is 5.12 ± 1.28 , self-respect is 5.55 ± 1.20 , self-control is 1.15.

Differences in AIDS-related knowledge according to sociodemographic characteristics:

Comparing AIDS-related knowledge according to the demographic and sociological characteristics of the subjects, it was found that differences vary with the grade. First graders were the lowest and second graders were the highest.

Second grade's AIDS-related knowledge is 11.08 ± 1.66 . There were also differences depending on the level of study they were aware of, compared to students who answered that their level of study was higher than those who answered that they were doing well. The value was 10.23 ± 2.34 .

Other than that, it was found that there was no difference between sex, grade, religion, participation in religious activities, residence status, family economic power they thought they were living in.

Differences in optimism bias according to sociodemographic characteristics: Comparing the optimism bias with respect to the demographic characteristics of the subject, it was found that there were no differences in all demographic characteristics.

Differences in involvement in AIDS according to sociodemographic characteristics: Comparing the level of AIDS participation according to the demographic and social characteristics of the subjects, there are differences in gender and religion. Female were higher than male, and Christian students were higher than non-religious students. Female's value was 5.20 ± 1.27 . Other than that, it was found that there was no difference between grade, participation in religious activities, residence status, family economic power they thought they were living in, level of study they thought they were studying.

Differences in self-respect according to sociodemographic characteristics: Comparing the self-respect of the subject's demographic characteristics, the results showed that there are differences between grades. The first grade was the lowest, and the second grade students were the highest. The value was 5.94 ± 1.27 . Other than that, it was found that there was no difference between sex, religion, participation in religious activities, residence status, family economic power they thought they were living in, level of study they thought they were studying.

Differences in self-control according to sociodemographic characteristics: Comparing the sense of self-control according to the demographic characteristics of the subject, there is difference between grades. The first grade was the lowest in grade, and the second grade was the highest. The value was 6.25 ± 1.00 . Other than that, it was found that there was no difference between sex, religion, participation in

religious activities, residence status, family economic power they thought they were living in, level of study they thought they were studying.

Relation between AIDS-related knowledge, optimism bias, involvement in AIDS, self-respect and self-control:

The results of looking at the relationship between AIDS-related knowledge, optimism bias, involvement in AIDS, self-respect and self-control are as follows. The higher the knowledge of AIDS, the higher the self-esteem and self-control. Optimistic bias has a positive correlation with involvement in AIDS. And optimism bias has a negative correlation with self-respect and self-control. The level of involvement in AIDS had a positive correlation with self-esteem. And the level of involvement in AIDS has been shown to be correlated with the amount of self-esteem and self-control.

Conclusion

A high level of knowledge about AIDS and a high level of involvement in AIDS shows a high degree of self-esteem and self-control, which is expected to ultimately be implemented as a positive health act on AIDS prevention. And you may neglect to manage your health under the influence of optimism bias, as seen by the result that optimism bias has a negative correlation between self-respect and self-control. Thus, a strategic approach to reducing optimism bias is needed. Increasing the level of knowledge and involvement of university students in AIDS will allow university students to engage in desirable health practices. It is also expected that by analysing detailed factors such as self-esteem and self-control among university students, providing preventive education for each trait will affect the decreasing number of AIDS patients in their 20s.

In an era where information is rapidly changing and communicated through the development of the Internet and the use of smartphones, college students are indiscriminately exposed to sex. For college students who are emotionally sensitive against the reality placed in an open environment and whose values for sex are not immediately formed, the issue of sex can no longer be a serious one. In particular, college students are highly vulnerable to the spread of AIDS at a time when they are free to engage in sexual activities. Therefore, methods of AIDS prevention education will have to be presented in various ways in response to the rapidly changing perception of sex.

Looking at the results of this study, we found that the degree of optimism about AIDS was found to have an optimistic bias. In other words, they are perceived to be less likely to be infected with AIDS than others who have the same conditions as themselves. As a result, they will not think they are subject to AIDS prevention education, which is likely to have a negative impact as well as lower the effectiveness of AIDS prevention education.

The degree of engagement showed a significant correlation with optimistic bias, confirming that the higher the involvement, the more optimistic bias increases. By increasing the relevance or importance of AIDS to me in terms of AIDS prevention education, attitudes toward AIDS will change and reduce the optimism bias.

Self-respect showed a significant negative correlation with optimistic bias, confirming that the higher the self-respect, the lower the optimism bias. Raising self-respect needs to be considered when planning AIDS prevention education because it increases sense of accomplishment and confidence, is responsible for one's actions, makes good use of information and resources around one's surroundings, and reduces optimism bias.

Self-control, like self-respect, shows a significant static correlation, and the higher the self-control, the lower the optimism bias. High self-control is necessary to consider when planning AIDS prevention education because it results in lowering the optimistic bias while acting as a deterrent to problem behaviour.

In conclusion, it can be seen that optimism bias has a significant correlation with many important variables. Therefore, not only should it emphasize the transfer of knowledge and practice in AIDS prevention education, but it should also seek educational measures to reduce the optimistic bias that you will not be infected with AIDS.

This study identified the degree of optimism bias and the main variables that are correlated with it, and based on this study; specific program development and effectiveness for preventive education are needed.

Ethical Clearance: Not required

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Conflict of Interest: The authors declare no conflict of interest.

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Study on the Consciousness of Sex and the Attitudes of Homosexuality in Students Majoring in Health Care

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ABSTRACT

College students majoring in health care who will lead the future health community studied consciousness of sex, attitudes toward homosexuality and acceptance of homosexuality. From March 5 to 15, 2018, the program was conducted for students majoring in health education who are attending a four-year university located in South Chungcheong Province. First, the purpose and procedure of the study were described and agreed upon by students, and the results of the survey were analyzed using the SPSS statistics program. Research shows that sexual consciousness, attitudes toward homosexuality and acceptance of homosexuality differed a lot according to demographic characteristics. Correlations have shown that students who are open-minded about sex have a positive attitude toward homosexuality and have high acceptance of homosexuality. A proper education is needed based on the results of the study, as the values and behaviors of incorrect sex can lead to a lot of confusion and physical damage.

Keywords: *Acceptance of homosexuality, Attitudes of homosexuality, College student, Consciousness of sex, Health care*

Introduction

According to Kim & Lee, (2006: 77-104) the rapid transformation of modern society into an industrial and information society has resulted in the introduction of modern people's open values and culture, the development of information media, and the change of consciousness, attitude and behavior of our society's sexuality¹. Kim, Park & Jeong, (2015: 17-42) suggest that Sexual consciousness is used in a wide range of meanings, including sexual knowledge, sexual attitudes and sexual behavior, which greatly affect health and physical development, and by acquiring knowledge of one's own body changes in advance, can facilitate psychological adaptation of the process and escape from the various dangers posed by sexual behavior². Therefore, a proper understanding and accurate knowledge of sex helps prevent and effectively cope with sexual problems and is an important factor in leading a more satisfying and responsible sex life by Kim & Kim, (2008: 123-138)³. The opening of the sex culture has also caused many changes in the concept of sex among university students, leading to many conflicts and confusion in the formation of values for sex, which are still early in adulthood suggested by Choi & Kim, (2011: 1253-1259)⁴.

According to Yoo, (2005: 125-139) recently college student's last name has been recognized as a means of expressing affection or seeking pleasure or pleasure, rather than a mere tool for childbearing. The trend of gender openness has greatly influenced changes in attitudes and behavior toward sex among college students, a time when sexual activity is active, away from admissions-oriented education⁵. The sense of sexuality that develops during college years can be transferred to sexual behavior right away, so it has strong influence as a social factor that can change the sex culture of our society. However, sexual values are not yet mature, leading to unwanted pregnancy, premarital intercourse, bold sexual behavior, exposure to sexually transmitted diseases, and psychological disruption of sexual consciousness due to irresponsible sexual behavior. That is suggested by Kang, (2017: 259-279)⁷. To quote Chung's research, (2015: 4679-4688) the indiscriminate acquisition of sexual knowledge can lead to a backlash against sex, create anxiety, shame and disgust about sex, and lead to unhealthy relationships and reckless sexual impulses⁸. Therefore, to realize a sound sex culture, organic and systematic education of families, schools and social institutions for establishing correct sexual consciousness and gender norms from the perspective

of human respect and gender equality is continuously required like Sung's research, (2009: 73-80)⁹.

To quote Silverstein's research, (2009: 161-163) Homosexuality means feeling sexual desire for the same biological sex¹⁰. Kim, (2013: 103-128) suggest that according to the American Psychiatric Association (APA), sexual orientation is defined not as a choice of individual will, but as a matter of birth, but as a matter of sexual orientation or difference in lifestyle¹¹. According to Kim & Ha, (2018: 723-732) in the past, negative attitudes toward homosexuality are gradually changing into acceptable attitudes, and in our society, rather than being protected and respected by a single human right, we have begun to recognize them as a status quo rather than a problem, but sexual minorities experience social discrimination, abuse and fear due to their sexual orientation, and even self-depressed, self-depressed, self-depressed, self-assessed, self-assessed¹². Jang, (2017: 560-569) suggests that the psychological maladjustment of homosexuals is related to social prejudice and negative attitudes of many heterosexuals¹³. To quote Lee, Kwon & Lee's research, (2012: 129-147) in Korea's various youth counseling cases, 11-17.7 % of adolescents are agonizing over their homosexual experiences, and homosexual-related issues are no longer an issue to be overlooked by a few¹⁴. In addition, homosexuality is reported to be higher than nonreligious groups, that is suggested Heo, (2004)¹⁵. And he said that the more outgoing religious people are, the less negative they are toward homosexuals and the more religious they are, the more negative they are. According to Lee, (2006: 1-19) it is also reported that the more men are affected by homosexual attitudes, the less educated are the less educated, the more authoritarian and conservative are the more homophobic they are, while the more they have experience in homosexuality, the more positive they are about homosexuality¹⁶.

In general, the perception of gender roles that reflect the age and sociocultural background is an influence on homosexual attitudes and acceptance, and through this study, we want to examine the degree of homosexuality-related perceptions at this time.

Method

Research Subjects: A study was conducted on university students majoring in health care at a university located in Chungcheong Province. Students who explained the

purpose and method of the study and agreed to it were given questionnaires and asked to write their own honestly.

Measurement Tools: The consciousness of sex used in this research was modified and supplemented to suit the purpose of this research by Lee, (2006)¹⁷. It was composed of a five-point scale of Likert and contained such contents as perception of sex, reason, premarital sex, sexual problems and masturbation. The higher the score, the more expressive the sex, the more acceptable it is about premarital relationships, and the more open the sense of sex.

The acceptance and attitudes toward homosexuality were used by Yoon, (2016) who modified and supplemented the "Attitude Toward Homosexuality"¹⁸. It consists of 23 questions, and the higher the score, the better the social distance to homosexuality and traditional heterosexuality, the more favorable the homosexual attitude is, and the negative content is translated into reverse.

Data Analysis: Data collected for the purpose of the study was analyzed using SPSS 18.0 statistical program using the following analysis methods.

First, average and percentage were calculated on sociodemographic characteristics of the subjects.

Second, average and standard deviation were calculated to analyze the consciousness of sex and the acceptance and attitudes toward homosexuality of the subject.

Third, t-test and ANOVA were conducted to explore the differences in consciousness of sex and the acceptance and attitudes toward homosexuality according to sociodemographic characteristics of the subject.

Fourth, correlation analysis was conducted to explore the relation between consciousness of sex and the acceptance and attitudes toward homosexuality.

Result and Discussion

Sociodemographic Characteristics of Subjects: The demographic characteristics of the subjects are as follow. The comparable figures were 81.2 percent for girls and 18.8 percent for boys, 32.7 percent for first graders, 31.6 percent for second graders, 18.6 percent for third graders and 17 percent for fourth graders.

In religion, 42.6 percent of Christians, 4.3 percent of Catholics, 2.7 percent of Buddhists and 50.4 percent of those without religion. In the case of religious people, 14.0 percent said they are working very hard on the extent of their participation in religious activities, 46.6 percent said they are generally working hard, 21.3 percent said they are doing it in a perfunctory manner, and 18.1 percent said they are doing little.

On living conditions, 38.3 percent said they live with their parents, 32.5 percent said they live in dormitories and 29.1 percent said they live alone.

When asked about the state of the household's economy, 6.5 percent said they were well off, 80.0 percent said they were moderate, and 13.5 percent said they were poor.

As for the level of study you think you are good at, 11.7 percent were good at it, 38.6 percent were good at it, 37.9 percent were mediocre, 10.1 percent were poor, and 1.8 percent was poor at it.

According to the survey on the types of high schools graduated, 47.6 percent studied in one classroom in coeducational schools, 19.3 percent studied in another class, and 33.2 percent went to a school that was only male or female.

When asked whether they have friends of the opposite sex, 48.7 percent said they do not have friends of the opposite sex, and 51.3 percent said they do not.

When asked about their experience of having sex, 60.3 percent said they did not have sex, and then 39.7 percent said they did.

Asked about their sexual orientation, 92.8 percent said they were heterosexual, 0.4 percent said they were gay and 6.7 percent said they were bisexual. When asked if they knew any homosexuals, 76.5 percent said no, and 23.5 percent said no.

When asked about their relationship with homosexuals, 73.3 percent said they were positive, 25.7 percent said they were negative.

When asked whether gay people are for or against the festival, 7.4 percent said yes, 39.7 percent said yes, 34.1 percent opposed, and 18.8 percent said absolutely no.

Mean value on consciousness of sex and the acceptance and attitudes toward homosexuality

The average and standard deviation of the subject's sexual consciousness, homosexual attitude and homosexual acceptance are as follow.

Consciousness of sex was 3.67 ± 0.45 . Sexual awareness was 4.14 ± 0.62 . Heterosexual relationship was 3.57 ± 0.79 . Prenuptial relationship was 3.20 ± 0.82 . Sex problem was 3.31 ± 0.61 . Masturbation was 4.13 ± 0.93 .

Attitude of homosexuality was 3.60 ± 0.76 . Social distinctions against homosexuality were 3.43 ± 0.91 . Traditional heterosexuality was 3.77 ± 0.69 .

Acceptance of homosexuality was 3.37 ± 1.05 .

Differences in consciousness of sex according to sociodemographic characteristics: Differences in consciousness of sex according to sociodemographic characteristics are as follow. Comparing sexual consciousness according to demographic characteristics, the results show that there are differences in sex, grade, religion, religious participation, level of study that you think whether or not you have sex, sexual orientation, and pros and cons of the Queer Festival.

Depending on the grade, fourth grade was higher than first grade, third grade was higher than second grade, fourth grade was higher than second grade, and there were statistically significant differences. Religion showed that non-religious students outnumbered Christian students. According to the degree of participation in religious activities, students who said they are doing little are generally working harder. Students who answered that they are very good at their own level of study are higher than those who said they are not good at it. Many students answered that they have friends of the opposite sex. People with sexual relations turned higher. Sexual orientation showed that bisexuals were higher than heterosexuals. Opinions on the gay festival showed that students who were absolutely in favor or in favor were higher than those who were absolutely against it.

Differences in attitude of homosexuality according to sociodemographic characteristics: Comparing homosexual attitudes according to demographic characteristics, the results showed that there are differences in sex, religion and religious participation, sexual orientation, relationships with gay acquaintances and pros and cons of the Queer Festival.

Male students were found to be higher in gender and statistically significant differences were found.

Religion was higher than Christian students without Buddhism, Catholicism or religion. According to the degree of participation in religious activities, the highest number of students answered that they are working very hard, in a perfunctory way, or doing very little. In terms of sexual orientation, heterosexuals were higher than homosexuals, and bisexuals were higher than homosexuals and heterosexuals, the survey showed. Opinions on the gay festival showed that students who were absolutely in favor or in favor were higher than those who were absolutely against it.

Differences in acceptance of homosexuality according to sociodemographic characteristics: Comparing the acceptance level of homosexuality according to demographic characteristics, the results showed that there are differences in sex, religion, religious participation, and sexual orientation, relationships with gay acquaintances and pros and cons of the Queer festivals.

In gender, female students were found to be higher and statistically significant differences were found. Religion was higher than Christian students without Buddhism, Catholicism or religion. Among them, the highest number of students answered Catholicism. According to the degree of participation in religious activities, more students answered that they are working very hard, in a perfunctory way, or doing very little. Among them, the highest number of students answered that they are doing little. In terms of sexual orientation, heterosexuals were higher than homosexuals, and bisexuals were higher than homosexuals and heterosexuals, the survey showed. Opinions on the gay festival showed that students who were absolutely in favor or in favor were higher than those who were absolutely against it. Among them, the highest number of students answered, "I absolutely agree."

Relation between consciousness of sex and the acceptance and attitudes toward homosexuality: The relationship between sexual awareness, homosexual attitudes and homosexuality is as follow. Acceptance of homosexuality was found to be related to consciousness of sex, sexual awareness, prenuptial relationship, masturbation, attitudes of homosexuality, social distinctions against homosexuality and traditional heterosexuality.

Conclusion

College students are entering early adulthood from adolescence, and in all respects they are immature. College students with sexual self-determination at this time may

experience many confusion and physical damage from immature sex values and incorrect sexual behavior.

Therefore, we expect that the mature sex values and sexual behaviors of university students will be used as a basis for the preparation of educational programs for the purpose of social sex, as well as the correct knowledge and experience related to biological performance.

It is difficult to generalize the results of a study among students at a local university. However, in terms of gender awareness, homosexuality, and homosexuality tolerance differ depending on religious characteristics, it could be a good result if church or religious groups and gatherings can provide an opportunity to address these gender concerns and questions. And it's also a very sensitive and curious thing about sex.

As it is the time, I hope that there will be many institutions where proper knowledge and information can be obtained. and develop a sense of the distorted knowledge and culture of the present time. It is necessary to correct misconceptions about sex among college students, who are imbued with mass media such as TV, the Internet, and movies, and to foster sensible thinking.

If there is a chance, regular sex education should be provided. It is necessary that active education should be provided to develop a sense of right values and discernment by understanding the sexual impulses and desires that occur during this period, free from the negative attitude of unconditionally sinful and taboo.

Good values are especially important because nursing students will play a big role in creating a healthy society in the future. They should also be discharged into professionals who can implement proper sex education. Later on, they will have to become professionals who can conduct sex-related programs, lectures and education, and make preparations to continue counseling and help them. It is also necessary to add more concepts to the correlation between sexuality, sexual knowledge and gender values, and to conduct an expanded survey, and to provide a smart and correct solution to the concept of homosexuality.

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Conflict of Interest: The authors declare no conflict of interest.

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Analysis of Walking-speed of Cruise Ship Passenger for Effective Evacuation in Emergency

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ABSTRACT

In Korea, people are paying growing attention to leisure activities on ships as they grow wealthy, and as a result, the volume of passenger ships and the number of passengers are on the rise. In case of emergency such as fire, evacuation on a cruise ship is different from other buildings due to unique spatial characteristics(e.g. evacuation route) and other factors(e.g. the ship's movement). For this reason, a special evacuation plan is needed in consideration of passengers' walking on a ship. Passengers of a cruise ship without an experience of on-board life participated in the experiment for comparative analysis of walking speed along the corridors(horizontal walking) and stairs(vertical walking) that are used as evacuation path in case of a marine emergency. For the experiment, the participants' movements along the designated horizontal and vertical routes were recorded by several CCTVs, and recorded videos were analysed to calculate walking speed based on the distance between two baselines and the time it took to cross them. For horizontal walking, walking speed dropped by 13.5% when the ship was sailing than when at berth; particularly, in sections that are partly narrowed with obstacles, walking speed fell sharply by 20~25%. For vertical walking, the ship's movements had less impact on walking speed, and downward walking was faster than upward walking by 20% for both when the ship was at sea and at berth. By age, participants ages 60 and over walked slowest for both horizontal and vertical walking. When the ship was sailing, its movements affected walking speed by age less for horizontal walking than for vertical walking. By gender, speed difference was relatively smaller when the ship was at sea, and men's walking speed was more affected by the ship's movements. Further research is needed on evacuation speed in a simulation of an actual marine emergency such as fire, as well as research on pre-evacuation time in consideration of sleeping facilities within a ship.

Keywords: Cruise Ship, Walking Speed, Evacuation Safety, Human-behavior, Full-scale Test

Introduction

People are paying growing attention to leisure activities that involve ship as their wealth increases. Accordingly, traveling by passenger ships and cruise ships is increasing. In Korea, the share of domestic travel

is high for cruise tours, and for overseas cruise tours, destinations are concentrated in the Asian region. In terms of cruise ship passengers, 65.3% of passengers are 60 years old or older, and women account for 58.1%¹⁾. Since most cruise ships are built for traveling, and to accommodate long-term passengers, they have various convenience, entertainment and sleeping facilities. In case of emergencies such as fire, fire fighters cannot be called from the outside, and fire should be extinguished within the ship. Particularly, many obstacles are onboard that obstruct effective evacuation in case of marine emergencies, including closed and narrow paths, and difficulty of walking due to movements of the ship. And, the last point of evacuation is on the sea that people face

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secondary risks in many cases. Further, unlike crew members, passengers lack knowledge and evacuation training regarding marine accidents that it is hard to make voluntary and reliable decision on paths of evacuation in case of an emergency. Moreover, evacuation on a ship is different from other buildings because ships' movements are affected by waves and other weather elements. Thus, techniques need to be developed to improve evacuation skills of passengers unfamiliar with on-board life to be prepared for marine emergencies.

Literature Review

Walking is the basic skill in evacuation, which can be measured in three dimensions: speed(m/s, in/min, km/hr), stride(m, cm), and the number of steps(step/s, steps/min). Among them, speed is most important in evacuation. Walking speed is usually studied in actual walking experiments, and it varies by a person's features(e.g. age, gender), spatial characteristics(e.g. horizontal, vertical, large space, corridors)^{2),3)}. IMO(International Maritime Organization) presented standard walking speed by passengers' age groups and moving paths to assess evacuation capacity and effectiveness on a particular ship⁴⁾. Hwang(2013) conducted research on walking speed on ship for people in their 20s who are not familiar with onboard life, in terms of horizontal and vertical moving, as well as moving in a group. He argued that walking speed changed by 27.2% by a ship's movement, and in a group moving, the speed difference between a front group and a back group was 50% due to intervention⁵⁾. Yoshida(2001) conducted research on the impact of a ship's rolling and pitching on walking speed, and reported that the shorter the cycle of these movements, the slower the walking speed⁶⁾.

Materials and Method

Overview of cruise ship and experiment conditions:

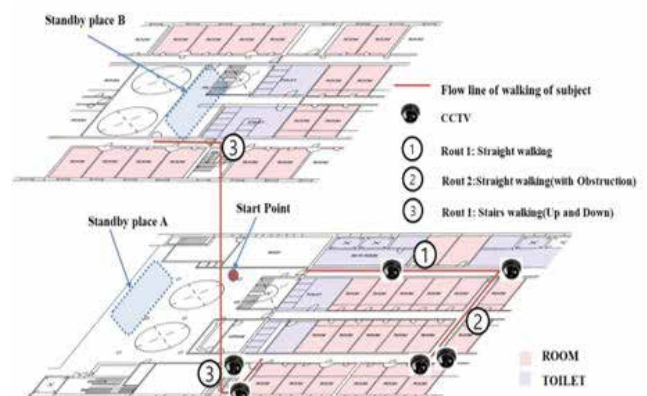
For this research, a 21,535 ton Ro-Pax cruise ship was examined that can accommodate 681 passengers. And weight of this cruise ship is GRT: 9,690ton and DWT: 4,249 ton. Volume of ship is 160m×25m×13.5m. The cruise ship harbors various lodging facilities, performance halls, convenience stores, bathing facilities, singing lounges, restaurants, lounges, and souvenir shops; programs include various performances and firework show. Accordingly there is a heavy traffic along

the paths of the ship, and bottlenecks are observed at narrow paths and entrances at certain hours.

To assess the ship's movement, its rolling and pitching was measured at the horizontal plane of the ship's central part where it can be observed. The mean ship-motion of the experiment was Yawing(X): 286.19[degree], Pitching(Y):3.91[degree] and Rolling(Z):2.27[degree]. During the operation of the ship, the pitching and rolling fluctuation angles excluding the midnight time zone were measured as $\pm 1^\circ$ and the fluctuation period was 5 to 15 seconds. And the weather was clear and the average wind conditions were 5 ~ 6m/s and the wave height was 1 ~ 1.5m.

Overview of experiment participants: Cruise ship passengers participated in the experiment to measure walking speed of people unfamiliar with onboard life, and crew members were not included. A total of 79 passengers participated(22 males, 57 females). The composition of the participants reflected the characteristics of Korean ship use. In Korea, there are many older users, and the percentage of women is high. Therefore, the participants in this experiment consisted of 15 people in their 60s, 20 people in their 50s, 20 people in their 40s, 16 people in their 20s and 30s, and 8 people in their teens. They did not participate in more than one experiment. And participants are not a crew members and they are inexperienced in shipboard life on a passenger ship.

Method and scope of experiment: This study is a preliminary experiment to improve evacuation capacity of ship passengers unaccustomed to onboard life, and main paths of a cruise ship were examined, which are used for evacuation in case of an emergency.





Route ①

Route ②

Route ③

Figure 1: Passenger moving route and CCTV installation location

Passengers' walking speed was measured for horizontal and vertical (both upward and downward) movements when the ship was sailing and staying at berth. The participants were asked to walk along the horizontal section and vertical section of the three routes (①, ②, ③), and their movements were recorded by CCTV at various points (Figure 1).

The participants move one by one after measuring the body size at the standby place A. After one participant left and spent 5 minutes, was sending the next participant. Subjects who completed horizontal walking and vertical upward movement waited at standby place B. The experiment was completed by moving vertically downward again when all the subjects were in standby place B. The recorded videos were analyzed to calculate walking speed based on the distance between two baselines and the time it took to cross them. In Figure 1, Route ① indicates a horizontal section for straight walking, Route ② indicates a horizontal section with obstacles, and Route ③ indicates a vertical section for climbing up and down the stairs. Route ① is an open-ended section for horizontal walking and the participants will move horizontally in a straight line. The total distance of Route ① is 20.35 m, and the effective width is 1.18m in the movable space. Route ② is a section for horizontal walking, where it is partly narrowed due to obstacles. The total distance of the route 2 is 10m, and the effective width is 1.18m in the movable space. However, for the route 2, the distance where it is partly narrowed due to obstacles is 3m and effective width of reduced due to an obstacle is 0.8m. Route ③ is a vertical section for climbing up and down the stairs. The movement distance at the stairs is 4.98 m, and the effective width of the stairs is 1.19 m. The participants can use the handrails in stairs. Participants in the experiment started one by one to measure the individual move time and started the next participant after a sufficient time after

departure. After walking on the horizontal movement section, the participant passes through the horizontal movement section with the obstacle, and the vertical upward movement is performed through the staircase. After all the participants completed the vertical upward movement, they were moved vertically downward one by one in the waiting place.

Results and Analysis

Horizontal Walking: Horizontal walking was examined when the cruise ship was at berth and at navigation. Figure 2 shows average walking speed, frequency and normal distribution for Route ①.

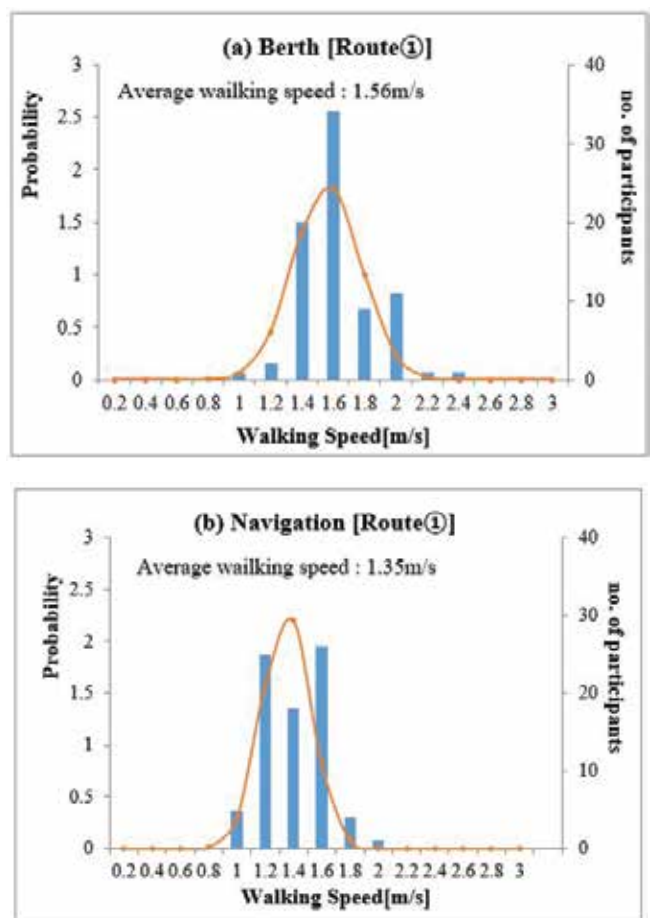


Figure 2: Horizontal Walking speeds on Route ①

At Route ①, the average walking speed was 1.56m/s when the ship was at berth, and 1.35m/s at sea, or a 13.5% drop due to movements of the ship.

Figure 3 show walking speed for Route ② that is partly narrowed with obstacles. The average walking speed was 1.17m/s when the ship was at berth, and 1.07m/s at sea, a smaller drop of 9.5% in speed.

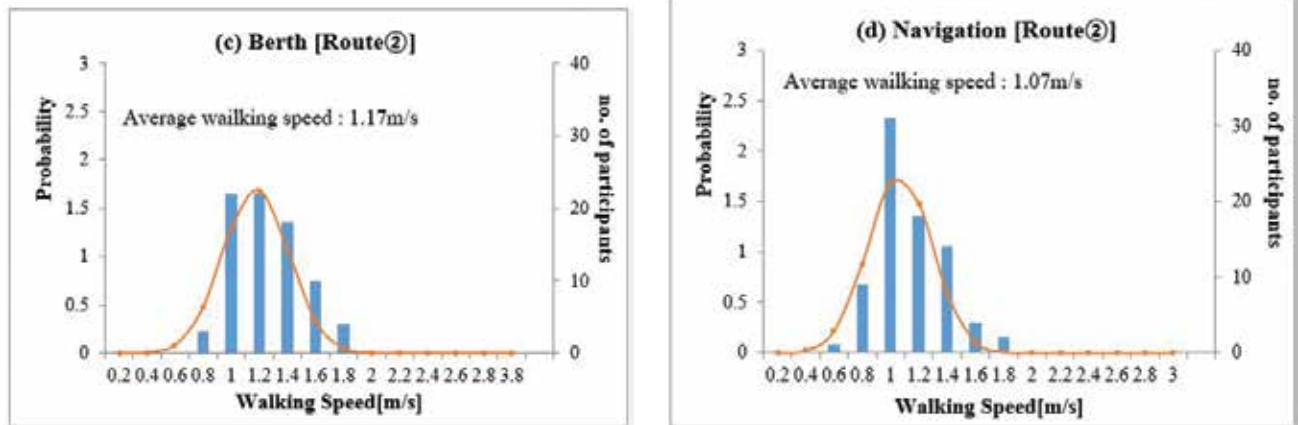


Figure 3: Horizontal Walking speeds on Route ②

Compared to Route ①, walking speeds both at berth and at sea slowed down on Route ②, each by 25% and 20.7%, indicating that the obstacles had even greater impact on walking speed than the ship's movement. Dispersion was greater for Route ② than for Route ①, indicating that passengers could not walk as they usually did due to obstacles. Then the participants' walking speed was compared by age and gender (Table 1).

For horizontal walking, walking speed was slower for all age groups when the ship was sailing than at berth. At berth, walking speed was the lowest for participants ages 60 and over at 1.47m/s, and the highest for participants ages 20 to 39 at 1.68m/s.

When the ship was sailing, the difference of walking speed across age groups was relatively smaller, indicating that physical ability had greater influence on walking speed when the ship was at berth.

Table 1: Walking speed was compared by Age and Gender (m/s)

Age	Gender	Route①			
		Berth ^(a)	Sea ^(b)	(a)-(b)	
Over 60	Female	1.38	1.36	1.97	0.03
	Male	1.56	1.38		0.18
50~59	Female	1.49	1.33	1.33	0.17
	Male	1.61	1.33		0.29
40~49	Female	1.56	1.41	1.35	0.16
	Male	1.58	1.30		0.29
20~39	Female	1.56	1.29	1.38	0.28
	Male	1.81	1.43		0.39
Teenager	Female	1.54	1.31	1.36	0.25
	Male	1.83	1.45		0.50

Conted...

Age	Gender	Route ②(Obstruction)			
		Berth ^(c)	Sea ^(d)	(c)-(d)	
Over 60	Female	1.06	1.10	1.04	-0.04
	Male	1.18	0.97		0.21
50~59	Female	1.11	1.03	1.01	0.08
	Male	1.14	0.98		0.16
40~49	Female	1.20	1.07	1.09	0.13
	Male	1.18	1.11		0.07
20~39	Female	1.24	1.09	1.11	0.15
	Male	1.39	1.13		0.26
Teenager	Female	1.06	0.87	1.19	0.19
	Male	1.63	1.50		0.13

In other words, when the ship was sailing, its movement did not affect people's walking speed by their age as much. By age, male participants' walking speed on Route ① was 1.7m/s, compared to female participants' 1.51m/s when the ship was at berth. When the ship was sailing, they each was 1.34m/s and 1.38m/s. Men walked faster than women, and the gender difference was not significant when the ship was sailing. On Route ②, walking speed was 1.3m/s for men, 1.14m/s for women when the ship was at berth; when the ship was sailing, it was 1.14m/s and 1.03m/s, respectively.

The speed difference depending on the ship's state was relatively smaller for women, indicating that men's walking speed was more affected by the ship's movement.

Vertical walking: Vertical walking experiment was done on Route ③ for when the ship was at berth and at navigation. Figure 4 show the participants' average

walking speed, frequency of walking speed and normal distribution when climbing up the stairs. When the ship was at berth, participants' average walking speed was 0.6m/s when climbing up. When the ship was sailing, it was 0.57m/s, respectively. In the case of the upward movement, the was similar results as the average walking speed of moving in a general building.

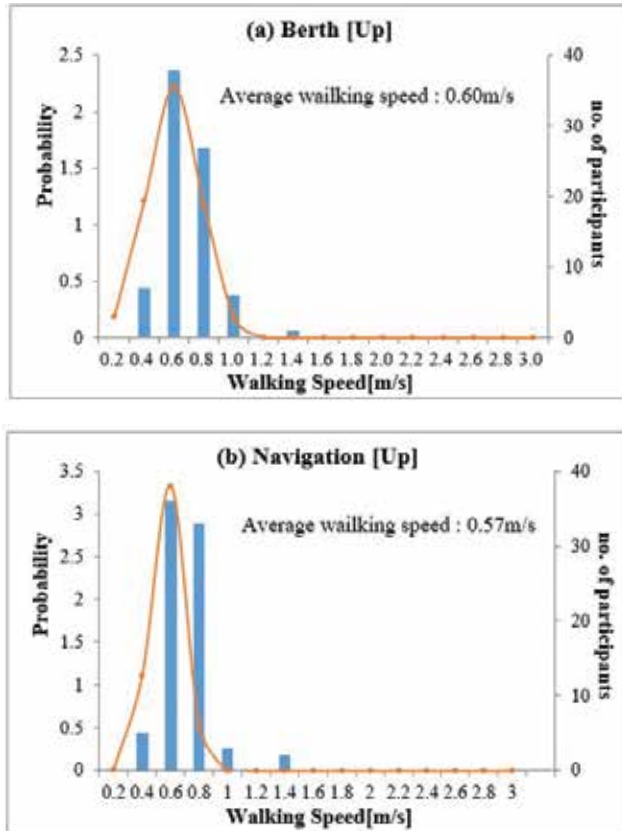


Figure 4: Upward walking speeds on Berth and Navigation

Figure 5 shows participants' average walking speed when climbing down the stairs. When the ship was at berth, participants' average downward walking speed was 0.76m/s and when the ship was sailing, it was 0.71m/s.

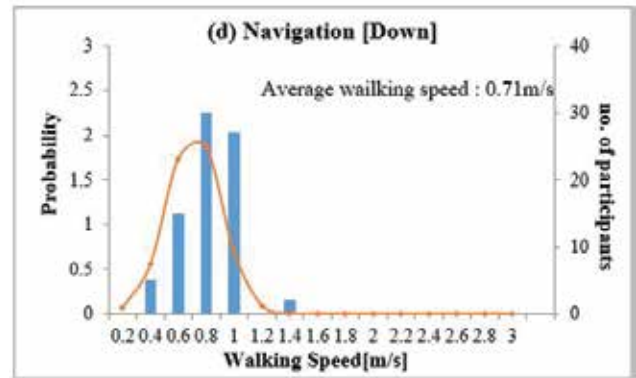
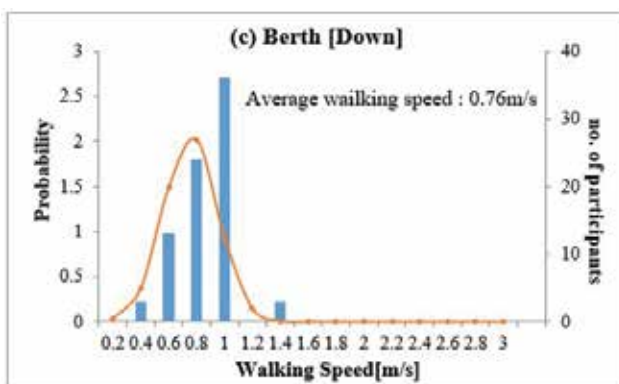


Figure 5: Downward walking speeds on Berth and Navigation

For vertical walking, the speed was about 20% faster for downward movement both when the ship was at sea and at berth. Walking speed was slower when the ship was sailing, but the difference was smaller compared to horizontal walking. This suggests that a ship's movement has less impact on vertical walking on the stairs compared to horizontal walking. Another observation is that dispersion was greater for downward walking speed than for upward walking speed, indicating that the participant's walking ability varied more widely for downward walking. And the older participants were more likely to use the handrails on the stairs.

Vertical walking speed by age and gender compared the participants' walking speed for vertical walking by age and gender. The speed was the lowest for the participants ages 60 and over and the highest for teenagers. For participants ages 60 and over, upward and downward walking speeds were similar, but as the age got lower, downward walking speed increased faster than upward walking speed.

Conclusion

For this study, passengers unaccustomed to on-board life, who cannot easily grasp a marine emergency and not familiar with internal space of the ship, participated in an experiment to measure their walking speed when the ship was at berth and at sea.

It is a preliminary study to minimize casualty in case of a marine accident, and produced the following findings.

- For horizontal walking, participants' walking speed dropped by 13.5% when the sea was sailing than when at berth, but the drop was smaller for vertical walking.

- For horizontal walking, participants' walking speed dropped sharply both when the ship was at berth(25%) and at sea(20.7%) in a section that is partly narrowed with obstacles, and the stride width significantly affected walking speed.
- For vertical walking, downward walking was 20% faster than upward walking for both when the ship was at sea and at berth, and the ship's movement did not significantly affect vertical walking on the stairs.
- For vertical walking, participants' physical ability had more impact on downward walking than upward walking.
- By age, participants ages 60 and over moved at the slowest speed for both horizontal and vertical walking.
- For horizontal walking, the ship's movement had relatively less impact on participants' walking speed by age when the ship was at sea compared to when at berth.
- As the participants' age got lower, downward walking speed increased faster than upward walking speed, but both speeds were similar for participants ages 60 and over.
- By gender, men walked faster than women in both horizontal and vertical walking.
- For horizontal walking, speed difference between gender was smaller when the ship was at sea, and men's walking speed was more influenced by the ship's movement.

In this study, an experiment was conducted on cruise ship passengers' walking speed. Further research needs to be done on passengers' evacuation speed in a simulation of a marine accident such as fire, with additional study on pre-evacuation time in consideration of sleeping facilities within a ship.

Ethical Clearance: Not required

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Conflict of Interest: Nil

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A Qualitative Study of Hospice Perceptions and Image of the Elderly in Health Care College Students

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ABSTRACT

The problems in an aging society are regarded as social issues to be tackled according to the obligations and rights in the balance between the nation's publicity nature and individuals' dignity and social responsibility. This is descriptive research aimed at investigating the image of the elderly in healthcare majors aged ≤ 25 years by their general characteristics and at determining the associations among the sub-areas of the image. They scored an average of $4.11 \pm .29$ for the general image of the elderly. For the sub-areas, they scored highest for generosity ($4.19 \pm .71$), followed by vitality ($3.70 \pm .60$) and flexibility ($3.07 \pm .92$). For the items, they scored highest for cold-warm (4.95 ± 1.38), followed by estranged-intimate (4.67 ± 1.49), wise-foolish (4.64 ± 1.27), and gentle-strict (4.37 ± 1.52). They scored lowest for slow-quick (2.80 ± 1.22), unoccupied-busy (2.83 ± 1.49), conservative-progressive (2.88 ± 1.48), and stubborn-obedient (2.96 ± 1.36). They scored an average of $3.16 \pm .29$ for the hospice perception. There were statistically significant differences in gender ($t = -2.24$, $p = .02$) and growing urban size ($t = 2.44$, $p = .02$). There was no statistically significant difference in hospice perception according to general characteristics. The correlation between the image of the elderly and the hospice perception was not statistically significant. Based on the results of this study, it is suggested to develop a customized education program reflecting the image of the elderly and Hospice perception. Future research will develop a curriculum that integrates the awareness of the elderly and social perception of hospice. We suggest the need to gain insight into these curriculums during the age of super aging.

Keywords: Flexibility, Generosity, Image of the Elderly, Hospice Perception, Vitality

Introduction

The problems of South Korea are regarded as social issues to be tackled according to obligations and rights in the balance between the nation's publicity nature and individuals' dignity and social responsibility. South Korea has already become an aging society since 2000 and was expected to become a super-aged society by 2026^[1]. In 2016, Statistics Korea reported that the elderly population formed 12.8% of the whole population and it is expected to exceed 20% by 2026 and 40% by 2058^[2]. The 20.9% of the elderly population aged ≥ 65 years are found to participate in no social relationship or activity; this finding indicates

'loneliness in old age.' Among them, elderly men (23.3%) lead a life more disconnected from society than elderly women (19.2%)^[3].

The elderly has been conducted in each area of the South Korean society since it became an aging society^[4], aging have focused on unproductive and dark parts related to old age, highlighting the negative aspects of the elderly^[5,6]. It found that the elderly had warm, estranged, gentle, sympathetic, wise, generous, and soft images in the positive respect and slow, dependent, unoccupied, emotional, conservative, small, and static ones in the negative respect. The experience of the relationships with the elderly in childhood affected image and the quality of the experience of living together with an elder rather than the experience itself contributed to the formation of the images^[7]. It is therefore necessary to change the image of the elderly in a positive direction.

Hospice is an all-in-one treatment that combines both physical and spiritual care. It aims to take care of the entire

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family as well as the dying patient. Hospice is the act of caring for the terminally ill patient and his family in the process of death. It is a way to maintain the dignity and high quality of life as human beings for the rest of their lives. It is physical, emotional, social, and spiritual help to bring the last moments of life to rest and care to alleviate the pain and sorrow of the bereaved families. The goal is to let the seeds accept death and live as comfortable as possible in hope. It is a total approach to life and death, and it is the act of maximizing their qualitative life at the limit of the quantitative life of the terminal patient.

This study aims to provide basic data for the development of educational programs by examining the relationship between the image of the elderly and the hospice perceptions of healthcare university students.

The purpose of this study was to investigate the image that the elderly healthcare majors had and determine the associations among the sub-areas of the image. The specific objectives of this study are as follows:

To identify the respondents' general characteristics.

To determine the level of the image of the elderly the respondents had and the level of its sub-areas.

To determine the variation in the image of the elderly by the respondents' general characteristics.

To determine the associations among the sub-areas of the image of the elderly the respondents had.

The relationship between the image of the elderly and hospice perceptions was studied.

Method

Study Design: This is descriptive research aimed at investigating the image of the elderly and perception on hospice in healthcare majors aged ≤ 25 years by their general characteristics and at determining the associations among the sub-areas of the image.

Subjects: This study was conducted in 129 healthcare majors aged ≤ 25 years. 138 out of 140 questionnaires distributed were returned; of these, a total of 129 copies were finally analyzed, with the exception of 9 inappropriate ones.

Instruments and Demographic Characteristics: The demographic characteristics included age, gender, religion, the size of the city where they grew up, current

status of living together with grandparents, experience of participating in voluntary service for the elderly, concerns about the elderly, experience of taking a lecture regarding health in old age, experience of getting attached to the elderly, and life satisfaction.

Instruments and Image of the Elderly: According to Kim et al.^[8] were adapted 37 pairs of corresponding adjectives to the sample of nursing students in South Korea from the 50 pairs developed in order to measure the image of the elderly with 18 items for vitality, 14 items for generosity, and 5 items for flexibility. Each item was rated on a seven-point Likert scale to determine positive or negative ideas with opposite adjectives at the extremes. In the range of 7 points for each item, the section between 3.5 and 4.5 is considered neutral. Reverse items were reversely coded before statistical processing; its reliability was estimated at .88 among nursing students in previous study and at .81 in this study.

Instruments and Hospice Perception: This study is based on the results of a study by Kim et al.^[9], which is composed of 4 items of hospice definition and philosophy, 2 items of hospice service, 8 items of hospice service, 4 items of hospice ethics and psychology, Needs' 2 items, total of 6 items, 20 items 4 points scale. Previous study was reliability of the instrument was .84 and reliability was .82 in this study.

Data Collection: For data collection, the participants were told that the data would be kept anonymous in ethical consideration and given explanation about the purpose and methods of the study. They were also told that they could withdraw from the research any time when they did not want to give any answer and that the data would be used only for the purpose of the study; after which, they were asked to give a written consent before the survey, which was conducted from March 20 to 31, 2019.

Data Analysis: The collected data were analyzed using an SPSS/WIN 18.0 program. The respondents' general characteristics were presented in frequency, percentage, and the mean and standard deviation. The image of the elderly the respondents had was presented in the mean and standard deviation, the maximum, and the minimum. For the variation in the image of the elderly by the respondents' general characteristics, independent t-test and one-way ANOVA were performed. The correlations among the sub-areas of the image of the elderly

the respondents had were analyzed using Pearson's correlation. The correlation between image and hospice perception for the elderly uses Pearson's correlation.

Result and Discussion

Self-love means taking care of themselves warmly and accepting the fact that they belong to a group. Contrary to the current society putting emphasis on cool, chic, and cynical characters, they can promote a sense of solidarity and empathy with self-concept useful for psychological well-being by applying a hope of warmth and consideration to themselves^[8]. Individuals aged ≥ 55 years are able to focus on their favorites. They need to raise the quality of life through simplicity and give up what they need to give up in realities. They need to be able to say "No" as circumstances require. Need to say "No" not because of self-negation but because they know better one. Then, other generations can naturally have respect and awe for the elderly because of their benevolence, warmth, kindness, and generosity^[10].

This is an exploratory study aimed at investigating the image of the elderly in healthcare majors aged ≤ 25 years and at making suggestions for healthy old age. As for the respondents' general characteristics, the mean age was 19.07 years; 73.6% were aged < 20 years and 26.4% 20-25 years. 17.8% of the respondents were male and 82.2% were female. 29.5% had a religion and 70.5% had no religion. 31.8% grew up in large cities and 68.2% in smaller cities. Most of them (95.3%) did not live together with grandparents. 89.9% had participated in voluntary service for the elderly and 10.1% had never participated. 27.9% were much concerned about the elderly, 66.7% were moderately concerned, and 5.4% had no concern. Most of them (71.3%) had never taken a lecture regarding health in old age. As for attachment to the elderly, 47.3% were much loved, 42.6% tended to be loved, and 10.1% were given little attention. 61.2% were satisfied with their life, 36.4% were moderately satisfied with their life, and 2.3% were dissatisfied with their life.

The experience of hospice volunteer participation is 7.0% and 93.0% respectively. Most of them did not have volunteer participation experience. In hospice care interest is 26.4%, which is usually. 58.1% and 15.5%, respectively. Most of them were interested more than usual. In the experience of hospice lectures had a 10.1% of the students were satisfied with the program and 89.9% were not satisfied. Most of them had no experience in

hospice-related lectures. In the end-of-life experience had a 61.2% and 38.8% had no experience.

The image of the elderly differed statistically and significantly by gender, with males scoring $3.99 \pm .31$ and females scoring $4.14 \pm .28$ ($t = -2.24$, $p = .02$), as well as by the size of the city where they had grown up, with large cities scoring $4.20 \pm .30$ and smaller ones scoring $4.07 \pm .28$ ($t = 2.44$, $p = .02$). The image of the elderly differed significantly by gender and the size of the city where the respondents had grown up among their general characteristics.

This study are similar to those of the previous study because nursing students' survival of the school year, religion, grandparents, residence experience with the elderly, relationship with the elderly, and image of the elderly were not statistically significant^[11].

There was no statistically significant difference between the general characteristics of the subjects and the hospice perceptions. The same as the results of previous studies on nursing students^[10].

For the items, they scored highest for cold-warm (4.95 ± 1.38), followed by estranged-intimate (4.67 ± 1.49), wise-foolish (4.64 ± 1.27), and gentle-strict (4.37 ± 1.52). They scored lowest for slow-quick (2.80 ± 1.22), Busy-unoccupied (2.83 ± 1.49), Progressive-conservative (2.88 ± 1.48), and stubborn-obedient (2.96 ± 1.36).

The old age requires wisdom based on experiences. The related image study of dental hygiene students and elderly people, the need for wisdom about the elderly was recognized^[12]. Integrative thinking with the pieces of knowledge is needed to solve problems. In such a situation, the elderly who are experienced in living can make better, rational communication with other generations on the basis of wisdom unique to old age.

They scored an average of $4.11 \pm .29$ for the general image of the elderly; for its sub-areas, they scored highest for generosity ($4.19 \pm .71$), followed by vitality ($3.70 \pm .60$) and flexibility ($3.07 \pm .92$). The average perception on hospice score was $3.22 \pm .29$ as shown in table 1. The overall average of hospice perception of nursing students was 3.85. In detail, hospice is a nursing that promotes the quality of life by supporting the people at the end of the illness as much as possible. 3.43. The results of this study are similar to those of previous studies^[13].

The correlation among the sub-areas of the image of the elderly the respondents had is as follows: Significant positive correlation was found between vitality and generosity ($r=.41$, $p<.001$), between vitality and flexibility ($r=.37$, $p<.001$), and generosity and flexibility ($r=.25$, $p=.004$). That is, the more vital, the more generous and flexible; the more generous, the more flexible. The correlation between the image of the

elderly and the hospice perceptions was not statistically significant as shown in table 2.

Therefore, this study explored four values-wisdom, love, self-love, and social activity-as a way of keeping healthy in old age. One can require the inner power accumulated through self-awareness and training for old age. Only the individuals who accept aging naturally can become old elegantly.

Table 1: Level of Image of the Elderly and Perception on Hospice

(N = 129)

Variables	M ± SD	Min	Max	Range
Image of the Elderly	4.11 ± .29	2.73	5.35	1~7
Vitality	3.70 ± .60	1.67	6.00	1~7
Generosity	4.19 ± .71	1.00	5.93	1~7
Flexibility	3.07 ± .92	1.00	5.60	1~7
Perception on hospice	3.22 ± .29	2.40	3.80	1~4

Let us enjoy the present, accept our age, and regard the remaining time as a gift. Let us not neglect even a tiny, trivial piece of happiness^[14].

It is believed that the combination of these values can make one's own old age healthy. The nursing student recognizes that the image of the elderly is wise, friendly, trustworthy, generous, benevolent, good, and patient. On the other hand, they also perceive themselves as inactive, boring, unproductive, sick and inflexible, dependent, conservative, unattractive, and complaining^[15]. Hospice awareness recognizes that it is unethical for end-stage patients to be brought to the ICU or treatment rooms and semantics for end - of - life patients are meaningless^[16]. Therefore, the purpose of this study was to clarify the relationship between image and hospice perception of the elderly in order to provide data for hospice - related problems that will arise as the elderly population increases during the aging society.

Table 2: Correlation among Sub-areas of Image of the Elderly

(N = 129)

	Vitality	Generosity	Flexibility	Image of the elderly	Perception on hospice
	r (p)				
Vitality	1	.41 (< .001)	.37 (< .001)	-.02 (.841)	-.01 (.877)
Generosity		1	.25 (.004)	-.05 (.540)	.04 (.643)
Flexibility			1	-.22 (.012)	-.21 (.017)
Image of the elderly				1	.02 (.841)
Perception on hospice					1

Conclusion

Image of the elderly was followed by generosity (4.19 ± .71), vitality (3.70 ± .60) and flexibility (3.07 ± .92). This will increase the positive elements of generosity shown to the elderly and reduce the bias of the elderly by decreasing the flexibility of the elderly,

which is a negative factor. If elderly people could not cope properly with societies, the quality of life of elderly people will be lowered as well as social costs.

Hospice perception was 3.22 ± 0.29. However, there was no correlation between the image of the elderly and hospice perception.

Based on the above results, it is suggested to develop customized education program reflecting the elderly image and hospice perception in health care college students. In addition, there is a need to gain insight into the age of super aging through the development of curriculum that can integrate the situation of the elderly and the social perception on hospice.

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Evaluation of Usability on Mobile Detector X-ray Absorption, Scattering, and Phased Image Phantom

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ABSTRACT

Existing X-ray medical imaging acquired the image data of X-ray absorption difference using the difference in density of the subject tissue. X-ray scattering and phase contrast imaging technology is a technology that dramatically increases boundary information between homogeneous materials of similar density using scattering and phase contrast information. To acquire and evaluate absorption, scattering, and phase contrast images, using the phantom made of polyethylene, on a round rod with a diameter of 3×1cm, a hole with a diameter of 0.5cm was drilled on 5 round rods, and the medical phantom was produced by sealing with sodium chloride, neon, calcium, phosphorus, and selenium powder. At a distance of 40cm from the focus, the distribution of absorbed doses have shown $1,277 \pm 0.31 \mu\text{Gy}$ in the center area. The measurement dose in the anode side direction was $110.1 \pm 0.35 \mu\text{Gy}$ and the cathode side direction was $117.7 \pm 0.77 \mu\text{Gy}$. It has shown dose inequality that depends on the geometry of the target. It has shown similar tendency in 60cm and 80cm Compared with absorption images in graphite materials, it was confirmed that scattering and phase contrast images were showing relatively high image information. These results are expected to be utilized as an important basic data for reducing medical exposure dose and acquiring, evaluating and utilizing X-ray absorption, scattering and phase contrast images.

Keywords: *Absorption, Scattering, Phase contrast, Usability, Radiation healthcare*

Introduction

The X-ray was discovered on Friday evening, November 8, 1895 by Professor Röntgen. It has great historical significance to science such that it was deemed to have opened the age of modern physics. X-ray is generated by colliding accelerated electrons under high voltage against a metal plate called a target using a kind of vacuum discharge tube called an X-ray tube. For the types of X-rays, there is braking radiation that generates electromagnetic waves while suddenly stopping due to the Coulomb force when accelerated electrons pass near nuclei of tungsten objects, and if the electrons of the K angle are empty, there is a characteristic X-ray which is generated as the electron of L angle transits. The probability of X-ray occurrence is 90% for braking radiation, and 10% for characteristic X-ray^[1-5].

X-ray wavelength is shorter than ultraviolet ray and longer than gamma ray. X-rays and gamma rays have a short wavelength and high energy, so they penetrate deep inside the matter. Because of this nature, with X-rays, we can look into the inside of a material like magic. Because X-rays are not directly visible, it is necessary to convert the image to a visible image using a film or a detector. The x-ray detector is made using the properties of X-ray ionizing the matter. Here, ionization means a phenomenon in which atoms and electrons are separated into positive ion and free electron by releasing electrons from neutral atoms.

The most important applications of X-ray are medical diagnosis. The X-ray was the only way to obtain images of the inside of a human body without damaging the human body until the introduction of ultrasound in 1953 or magnetic resonance imaging technology in 1973. But with the emerging of electronics and a rapid development of computers, X-rays are used not only for simple imaging but also for various methods such as computed tomography(CT, 1970s ~), fluoroscopy (1950's~), and digital tomosynthesis, etc.

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Simple imaging is the simplest test of shooting the part of human body such as chest, abdomen, skeleton using x-ray and x-ray films. This test is used to diagnose tuberculosis, pneumonia, lung cancer, kidney stones, and fractures. However, X-ray film has a disadvantage in that it requires the use of toxic substances during development and takes a long time to develop. To complement this, since the 1990s, the digital radiography has been developed to display images on computer monitors immediately after shooting based on amorphous silicon, and currently, various computer aided diagnostics techniques are being used.

Over the past 100 years, advances in various technologies have been made centering on x-ray generator and x-ray detection technology, and it is expanding its use to medical, industrial, food, as well as pure science and arts fields. The application field and scope of X-ray will increase more and more. Since medical radiation using X-rays occupies most of the annual average dose, there are efforts to institutionalize the management of exposure doses, to minimize exposure dose, and to obtain optimal images^[6-9].

Existing X-ray medical imaging has acquired the image data of X-ray absorption difference using the difference in density of the subject tissue. X-ray scattering and phase contrast imaging technology is a technology that dramatically increases boundary information between homogeneous material of similar density using scattering and phase contrast information in radiation healthcare^[10-15]. In addition, it has a feature of acquiring image with excellent image quality with low radiation dose than existing image acquisition technology using X-ray absorption difference ^[15-20]. For this reason, in this study, by self producing the phantom that can acquire and evaluate X-ray absorption images, phase contrast images and scatter images, a mobile detector-based absorption doses were evaluated, and X-ray absorption difference images, scattering images, and phase contrast images were obtained with its usability analyzed.

Research Method

X-ray Dose Measurement Evaluation: For the detector the mobile detector of DR Tech was used, and for X-ray generator, the foreign medical equipment CXD-R185 system was used. For dose measurement, the measurement distance of X-ray tube and dosimeter was

40 cm, 60 cm, and 80 cm. For exposure conditions, the average value was obtained by measuring 10 times for each distance condition using the irradiation of 22kVp 20mA 630ms.

For dosimetry device, using a glass dosimeter Dose Ace (Model GD-352M and FGD-1000, Asahi Techno Glass Cooperation, Shizuoka, Japan), the annealing process was heated at 400°C for 1 hour before the dose measurement and the background values were measured after cooling. After measuring the dose under each condition and after the pre-heating is carried out at 70°C for 1 hour, the average value was calculated by repeatedly measuring the integral dose value 10 times through the reader after cooling. Calibration of glass dosimeter used ¹³⁷Cs radioactive standard from the Japanese radiation standards to conduct calibration with glass element with 6 mGy irradiated to measure^[Figure 1, Figure 2].



Figure 1: Glass dosimeter measuring element



Figure 2: Glass dosimeter device reader and a preheating device

Absorption, scattering, phase contrast image acquisition phantom production and image evaluation: To acquire and evaluate absorption, scattering, and phase contrast images, using the phantom made of polyethylene, on a round rod with a diameter of 3×1cm, a hole with a diameter of 0.5cm was drilled on 5 round rods, and the medical phantom was produced by sealing with sodium chloride, neon, calcium, phosphorus, and selenium powder. Acquisition of absorption, scattering, and phase contrast images were acquired and

analyzed by irradiating it at the exposure conditions of 22kVp 20mA 630msec using a self produced phantom by setting the distance between the focus and subject at 300mm, fixed grid at 700mm, and the distance between the focus and detector at 1,448mm.



Figure 3: Absorption, scattering, and phase contrast image acquisition radiation healthcare phantom

Research Results and Considerations

X-ray Dose Measurement Evaluation Result: Using the CXD-R185 X-ray generator, X-ray absorption dose was measured and evaluated with a glass dosimeter by changing the distance of the x-ray focus to 40cm, 60cm, and 80cm. For X-ray irradiation conditions, by setting the irradiation at 22kVp 20mA 630ms, the mean and standard deviation values were measured by measuring 10 times for each condition.

At a distance of 40cm from the focus, the distribution of absorbed doses have shown $1,277 \pm 0.31\mu\text{Gy}$ in

the center area. The measurement dose in the anode side direction was $110.1 \pm 0.35\mu\text{Gy}$ and the cathode side direction was $117.7 \pm 0.77\mu\text{Gy}$. It has shown dose inequality that depends on the geometry of the target. In addition, with the measurement dose of $93.3 \pm 0.41\mu\text{Gy}$ in the upward direction and $60.3 \pm 0.34\mu\text{Gy}$ in the downward direction of focus, the absorbed dose showed a different dose distribution with respect to the focal point.

At a distance of 60cm from the focus, the distribution of absorbed doses have shown $500.3 \pm 0.16\mu\text{Gy}$ in the center area. The measurement dose in the anode side direction was $83.5 \pm 0.32\mu\text{Gy}$ and the cathode side direction was $87.3 \pm 0.31\mu\text{Gy}$. It has shown dose inequality that depends on the geometry of the target. In addition, with the measurement dose of $79.2 \pm 0.30\mu\text{Gy}$ in the upward direction and $47.3 \pm 0.28\mu\text{Gy}$ in the downward direction of focus, the absorbed dose showed a different dose distribution with respect to the focal point.

At a distance of 80cm from the focus, the distribution of absorbed doses have shown $129.8 \pm 0.31\mu\text{Gy}$ in the center area. The measurement dose in the anode side direction was $57.0 \pm 0.27\mu\text{Gy}$ and the cathode side direction was $60.9 \pm 0.16\mu\text{Gy}$. It has shown dose inequality that depends on the geometry of the target. In addition, with the measurement dose of $51.2 \pm 0.34\mu\text{Gy}$ in the upward direction and $37.2 \pm 0.47\mu\text{Gy}$ in the downward direction of focus, the absorbed dose showed a different dose distribution with respect to the focal point[Table 1].

Table 1: X-ray dose measurement evaluation result

Direction	Exposure dose (40cm)	Exposure dose (60cm)	Exposure dose (80cm)
Cathode	$117.7 \pm 0.77\mu\text{Gy}$	$87.3 \pm 0.31\mu\text{Gy}$	$60.9 \pm 0.16\mu\text{Gy}$
Anode	$110.1 \pm 0.35\mu\text{Gy}$	$83.5 \pm 0.32\mu\text{Gy}$	$57.0 \pm 0.27 \mu\text{Gy}$
Center	$1,277 \pm 0.31\mu\text{Gy}$	$500.3 \pm 0.16 \mu\text{Gy}$	$129.8 \pm 0.31 \mu\text{Gy}$
Up	$93.3 \pm 0.41 \mu\text{Gy}$	$79.2 \pm 0.30\mu\text{Gy}$	$51.2 \pm 0.34 \mu\text{Gy}$
Down	$60.3 \pm 0.34 \mu\text{Gy}$	$47.3 \pm 0.28 \mu\text{Gy}$	$37.2 \pm 0.47 \mu\text{Gy}$

These results are similar to those of other studies[11-15] and it was confirmed that the dose inequality phenomenon occurs with the same tendency due to the geometrical structure of the x-ray tube in the medical X-ray low energy region. In addition, it was confirmed that as the distance got farther away from the focus, the absorption dose was lowered. This phenomenon shows that when performing a disease

examination using X-ray, it is helpful to keep a far distance as possible.

Absorption, scattering, phase contrast acquisition, phantom production and image acquisition evaluation result: To acquire and evaluate absorption, scattering, and phase contrast images, using the phantom made of polyethylene, on a round rod with a diameter of 3*1cm,

a hole with a diameter of 0.5cm was drilled on 5 round rods, and the medical phantom was produced by sealing with sodium chloride, neon, calcium, phosphorus, and selenium powder. Acquisition of absorption, scattering, and phase contrast images were acquired and analyzed by irradiating it at the exposure conditions of 22kVp 20mA 630msec using a self produced phantom by setting the distance between the focus and subject at 300mm, fixed grid at 700mm, and the distance between the focus and detector at 1,448mm.

15P material absorption, scattering, phase contrast imaging result

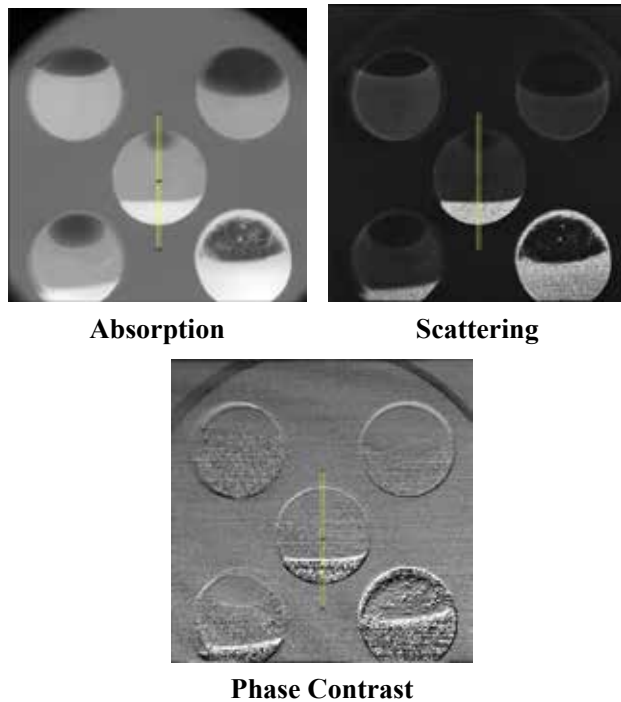


Figure 4: 15 P material absorption, scattering, phase difference image evaluation result

X-ray absorption images are obtained by the difference of absorption decay coefficient of the matter, where the larger the density difference of the tissue, the greater the difference in the contrast of the images, it becomes easier to diagnose the disease or to check for foreign matter. On the other hand, X-ray scattering and phase contrast images are obtained by imaging the x-ray velocity difference at two nearby points as the x-ray passes through the matter, thus it is more efficient than X-ray absorption difference image and can reduce radiation dose since the real part of the refractive index that determines this speed is about one thousand times larger than the absorption coefficient in radiation healthcare^[15,19,20].

As a result of evaluating the 15P material absorption, scattering, and phase contrast images, the evaluation results of absorption image information and the evaluation results of scattered image and phase contrast image did not show significant difference[Figure 4].

Nacl material absorption, scattering, phase contrast image result

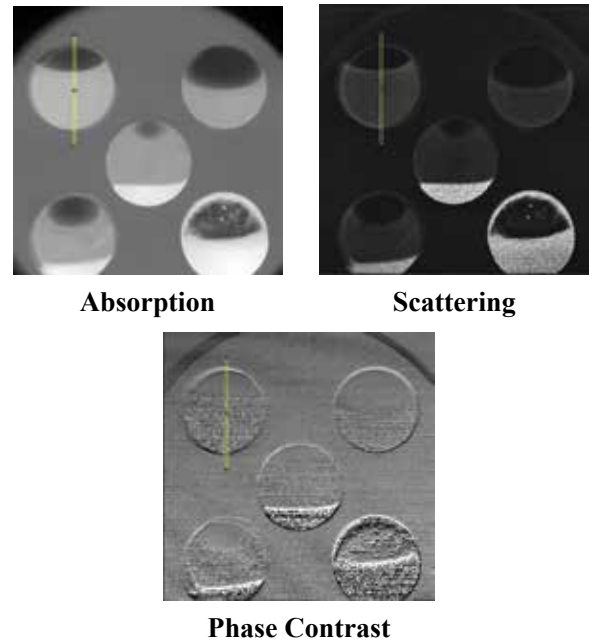


Figure 5: Nacl material absorption, scattering, phase contrast image evaluation result

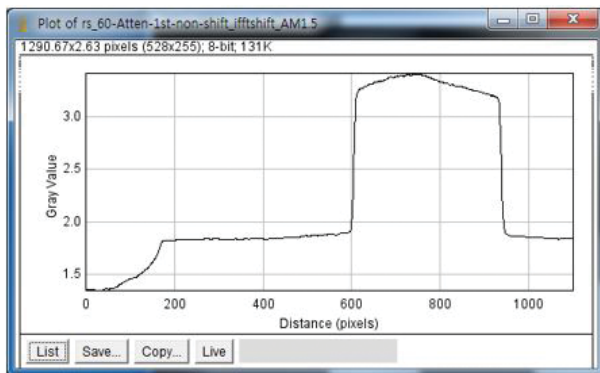
Since the x-ray absorption contrast image is generated by the x-ray attenuation coefficient of the tissue, the distortion of image information occurs according to the geometric location. Overcoming these drawbacks is scattering and phase contrast image. Scattered image and phase contrast provides high discrimination in identifying matters by calibrating the geometric distortion and the degree of scattering through mathematical algorithms.

As a result of evaluating the Nacl material absorption, scattering, and phase contrast images, the evaluation results of absorption image information and the results of scattering and phase contrast images did not show a significant difference[Figure 5].

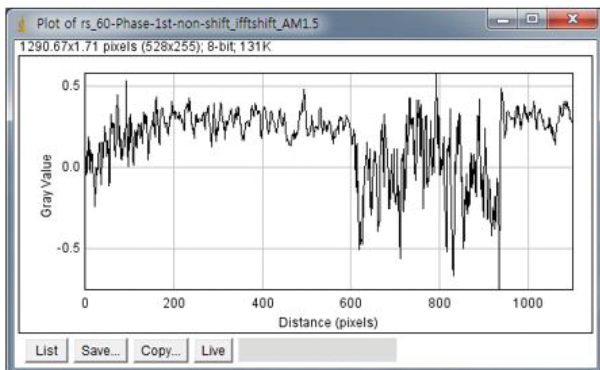
Graphite material absorption, scattering, phase contrast image result: Organ or tissue composed of a substance with a low effective atomic number significantly reduces the contrast or resolution of the image in the absorption difference image, therefore the identification ability of the image is deteriorated. However, scattering

and phase contrast images improve the contrast and resolution of images even with low atomic numbers thus it can be helpful for diagnosing diseases from images by increasing the ability to identify images.

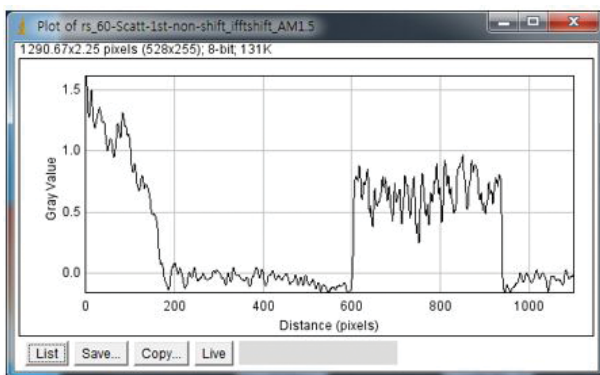
The result of [Figure 6] shows the ability to identify scattered and phase-contrast images when the graphite material with low atomic number is compared with absorption image. It can be seen that although absorption imaging degrades the identification ability, but the identification ability is increased in scattered image and phase contrast images.



Absorption



Scattering



phase Contrast

Figure 6: Graphite material absorption, scattering, phase contrast image evaluation result

This result confirms the usefulness of scattering and phase contrast images when describing areas of soft tissue having a low X-ray absorption difference in organs and tissues of the human body. In addition, scattering and phase contrast imaging is a technology that dramatically increases boundary information between homogeneous materials or similar materials with little difference in density, it can be used for clinical breast cancer imaging or low dose computed tomography in radiation health care.

Along with the development of X-ray scattering image and phase contrast imaging technology, it is thought that many studies on the reduction of exposure dose should be carried out with more research and development on medical phantom that can acquire and evaluate images quantitatively.

Conclusion

In this study, a phantom that can acquire and evaluate the X-ray absorption, scattering, and phase contrast images was self produced and the X-ray dose was measured, analyzed and its images were obtained and analyzed.

At a distance of 40cm from the focus, the distribution of absorbed doses have shown $1,277 \pm 0.31 \mu\text{Gy}$ in the center area. The measurement dose in the anode side direction was $110.1 \pm 0.35 \mu\text{Gy}$ and the cathode side direction was $117.7 \pm 0.77 \mu\text{Gy}$. It has shown dose inequality that depends on the geometry of the target. It has shown similar tendency in 60cm and 80cm.

As a result of acquiring and analyzing the absorption, scattering, and phase contrast images of sodium chloride, phosphorus, and graphite materials, there was no difference in the amount of absorption, scattering, and phase contrast images of sodium chloride and phosphorus. Compared with absorption images in graphite materials, it was confirmed that scattering and phase contrast images were showing relatively high image information in radiation healthcare.

These results are expected to be utilized as an important basic data for reducing medical exposure dose and acquiring, evaluating and utilizing X-ray absorption, scattering and phase contrast images.

Ethical Clearance: Not required

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Effects of Open and Closed Kinetic Chain Exercises on the Balance Using Elastic Bands for the Health Care of the Elderly Females

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ABSTRACT

Background: Open chain and closed chain exercises carried out exercises using elastic bands are not complicated and easy to follow as health care of the elderly and to evaluate the impact on the balance of the elderly females.

Objective: The purpose of this study is to investigate the effects of elastic bands used in open and closed kinetic chain exercises on the balance of elderly females aged ≥ 65 years.

Method: This study included 30 females ≥ 65 years; participants, were randomly divided into two groups: the closed kinetic exercise group ($n = 15$) and the open kinetic exercise group ($n = 15$). Closed/open kinetic exercises were performed three times a week for four weeks.

Results: Static and dynamic balance abilities were measured before and after exercise to determine its effects. One leg standing balance test(OLST) was used to evaluate static balance, while an functional reaching test(FRT) was used to evaluate dynamic balance. The changes in the static balance (OLST) were significant difference ($p < .05$) between the closed chain exercise group and the open chain exercise group, but the OLST between the two groups did not show any significant difference. The changes in the static balance (FRT) were significant difference ($p < .05$) between the closed chain exercise group and the open chain exercise group, but there was no significant difference between the two groups. There was a significant difference ($p < .05$) before and after exercise in the open chain exercise and the closed chain exercise ($p < .05$) groups, but there was no significant difference between the two groups.

Conclusion: Open and closed chain exercises using elastic bands are effective in improving the balancing ability; may aid in minimizing falls in elderly individuals.

Keywords: Elastic bands, Closed kinetic exercise, Open kinetic exercise, Elderly women, Static balance, Dynamic balance

Introduction

In order to prolong a healthy life, it is necessary to not only treat the diseases of the elderly but also to improve their health care. A decrease in the balance ability and exercise response time are the two physical characteristics associated with the elderly population,

which hinder independent living and lowers the quality of life. The emerging problem resulting from these issues is an increased risk of falling, which in turn, can have serious health implication¹.

The Physical and functional disabilities caused by falls can lead to severe complications in the elderly and recovery time is considerably longer compared to younger individuals². Although falling can occur at all ages, 50% of the elderly population experience falls and one third of the elderly population aged > 65 years' experience recurrent falling³.

The causes of decreased balance are several factors such as degeneration of somatosensory senses including

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the proprioceptive sensation, visual impairment, electrography, and central nervous system damage⁴. Balongun et al⁵. reported that balance ability is maintained well until the age of 40, but balance ability is continuously decreased in both sexes after the forties. Overstall et al⁶. showed a sharp decrease especially before and after 60 years of age. Since the decline in balance ability is a factor of fall, the improvement of balance reduces the possibility of falling and reduces the economic cost of falling, which has an important effect on quality improvement and health care of the elderly.

It can be classified into kinematic closed chain motion and open chain motion according to the resistance motion method used. Closed kinetic chain exercise usually refers to weight-bearing exercise, a movement that receives strong external resistance by restricting the distal movement of the body⁷. The mechanical receptors are sensitive to changes in the pressure of the capsules and promote the proprioceptive sensation. In addition, it acts as an efferent and has a great effect on the stability of the injured joint⁸.

Open kinetic chain movement is a method of moving freely in the far side of the limb and exercising in a fixed state in the body side. As a result, not only does the superior muscle contraction dominate, but it also generates more traction and rotational force⁹. In previous studies, closed and open chain exercises have been reported to improve muscle strength. Therefore, it is conceivable that in elderly individuals with impaired physical function, it could improve their physical activity and increase their participation in social activities by reducing their likelihood of falling¹⁰.

Resistance exercise using a weight device is not suitable as an exercise for the elderly because it requires a lot of caution when applied to the elderly because of the risk of causing injury of the elderly due to the wrong use of the weight device¹¹. Therefore, the elderly exercise program using the elastic band rather than the weight exercise device such as dumbbell or barbell or the mechanical load exercise can be a superior exercise method in stability and utilization.

Elastic band exercise may be used for muscle strength exercise using elastic resistance, aerobic exercise for improving cardiorespiratory function, flexibility exercise for improving muscle and joint height, stimulation of nerve root by inherent receptor stimulation in traumatic and disordered patients¹².

Because it is easy to carry the elastic band, it is possible to exercise schedule anytime and anywhere by moving with the band. Also, the home program using the elastic band can promote exercise participation by exercising according to the convenience of the elderly¹³.

Elastic band exercise is not only an improvement in the strength, balance and flexibility of the elderly, but is also effective in maximizing muscle strength and increasing muscle strength as much as a traditional resistance exercise program¹⁴. Therefore, effective exercise in which elderly people with diseases such as muscles, nervous system, and the like are weak and weak, and those who are not regularly exercising are more secure and easily accessible to the elderly¹⁵.

In this study, we will try to derive more effective exercise results by evaluating and comparing the difference in balance of female elderly people by conducting open chain movement and closed chain movement using easy and intricate elastic band to the elderly.

Method

Participants and Duration: This study was conducted from August 1, 2018 to August 29, 2018 in the welfare center in Daejeon. The study involved elderly persons aged ≥ 65 years and the criteria for selecting the subjects were as follows: 1) no visual field problems, 2) no circulatory systemic disease such as hypertension, 3) restricted exercise due to pain, 4) no neurological damage to balance or gait, and 5) those who voluntarily agreed to participate in the study.

Evaluation Tools: OLST were used to evaluate static balance, while FRT were used to evaluate dynamic balance. Measurements were taken three times at each session, from which the average value was calculated. Evaluations were performed before and after exercise training.

One leg standing test (OLST): To measure the static balance ability in a short time compared to the other tests and the interatomic as an evaluation tool for predicting the risk of falling reliability ICC = 0.9 and sensitivity is 95% and the specificity was 58% . The participant was instructed to opens his/her eyes in a line state and raise their hands sideways, horizontally to the ground, lifting one foot according to the direction of the inspector. The raised leg was then bent 90°to the knee joint. Both eyes were kept floating and the maximum start-up was measured until the upper and lower body was shaken¹⁶. A total of three measurements were performed and the mean values were recorded.

Functional reach test (FRT): The examiner stands next to the wall and tilts the body as far forward as possible, with the hand tip along the test line, with the shoulder 90 ° flexion and fully extended to the front horizontally. Measure the distance, in cm, that the fingertip of the subject's hair has traveled over the test line before falling from the ground. A check is placed next to prevent falls. The retest reliability of the FRT evaluation was 0.92 and the inter-rater reliability was .98. In addition, there is a limitation in functional balance if the measured value is less than 15cm ~ 17.5cm. This is because it is used to estimate the balance of the elderly in the community and to predict the fall¹⁷.

Intervention Methods: The exercise intervention method was applied to the exercise group by revising and supplementing the elastic band exercise program of a previous study²². Elastic band (ECOYOGI, China) is for orange beginner, size is 2m, width is 15cm, weight is 78g, and thickness is 0.3mm. The subjects were randomly assigned to each group and were divided into ten open kinetic chain exercise group using elastic bands and ten closed band exercise groups using elastic bands. Each group exercise was performed with 5 minutes of preparation exercise, 5 minutes of restorative exercise, and 1 minute of rest for pain or discomfort; this regimen was performed, for a total of 40 minutes, 3 times a week for a total of 4 weeks. Physical therapy was performed by four physical therapists and two assistants.

Open Kinetic Chain Exercises: Bending and stretching of the hip joint by pulling or pushing the elastic band around the ankle while keeping it standing. Sit on a chair or lie on the floor, tie an elastic band to the ankle, and pull or push back and forth to flex and move the knee joint.

Closed Kinetic Chain Exercises: The leg is bounded by the shoulder width, and the elastic band is tied to the waist belt and the ankle. The bending motion and the bending motion of the knee are performed by the mini squat movement while the bending motion and the bending motion of the hip joint are performed simultaneously.

Analysis Method: The SPSS 20.0 program was used for data analysis. To investigate the normal distribution of categories between the groups, the Shapiro-Wilk test was performed. To evaluate changes before and after the exercise programs in both groups, a Wilcoxon signed-rank test was used. Lastly, to evaluate differences between the two groups, a Mann-Whitney U test was performed. The significance level of the study (α) was .05.

Results

Characteristics of the Participants: The mean age of the closed chain exercise group was 73.73 ± 2.52 years, the mean height was 159.26 ± 4.72 cm, and the mean weight was 56.27 ± 4.13 kg, the mean age of the open chain exercise group was 72.86 ± 2.77 years, the height was 159.93 ± 5.37 cm and the weight was 55.53 ± 3.48 kg. The general characteristics are shown in Table 1. Independent sample t-tests were performed to assess the homogeneity between the two groups. There was no significant difference between the two groups[Table 1].

Table 1: General characteristics of the subjects

	CKC group ¹⁾ (n = 15)	OKC group ²⁾ (n = 15)	p
Age(years)	$73.73 \pm 2.52^*$	72.86 ± 2.77	.378
Height(cm)	159.26 ± 4.72	159.93 ± 5.37	.721
Weight(kg)	56.27 ± 4.13	55.53 ± 3.48	.603

* mean $\pm$ standard deviation

1) Closed Kinetic Chain Exercise

2) Open Kinetic Chain Exercises

OLST Change: The closed kinetic chain exercise group with elastic band showed a significant increase in the OLST measured balance; from 5.82 ± 1.08 sec before exercise to 6.60 ± 1.04 sec after exercise ($p < .05$). The open kinetic chain exercise group using elastic bands showed a significant difference before and after exercise [5.98 ± 1.06 sec before exercise to 6.51 ± 1.03 sec after exercise($p < .05$)]. OLST between the two groups showed no significant difference [Table 2].

Table 2: Change in balance

	CKC group ¹⁾ (n = 15)	OKC group ²⁾ (n = 15)	Z	p
OLST(sec)				
pre	$5.82 \pm 1.08^*$	5.98 ± 1.06	-.353	.724
post	6.60 ± 1.04	6.51 ± 1.03		
Z	-3.411	-2.982		
P	.001	.003		
FRT(cm)				
pre	17.53 ± 2.55	17.86 ± 2.03	-1.195	.232
post	19.93 ± 2.22	19.00 ± 2.83		
Z	-3.487	-2.716		
P	.000	.007		

* mean $\pm$ standard deviation

¹⁾ Open Kinetic Chain Exercise

²⁾ Closed Kinetic Chain Exercises

OLST: One Leg Standing Test

FRT: Functional Reach Test

FRT Change: The closed kinetic chain exercise group with elastic bands showed a significant difference from 17.53 ± 2.55 cm before exercise to 19.93 ± 2.22 cm after exercise ($p < .05$). The open kinetic chain exercise group using elastic bands also showed a significant difference before and after exercise (17.86 ± 2.03 cm before exercise to 19.00 ± 2.83 cm after exercise) ($p < .05$). FRT between the two groups showed no significant difference [Table 2].

Discussion and Conclusion

Recently, the Ministry of Public Administration and Security announced that Korea entered the aged society at the end of August 2017¹⁸, and now the elderly person needs a solution to maintain a qualitatively healthy life. In addition, there is a need for regular, diverse, and effective exercises.

The purpose of this study was to investigate the effect of exercise and open chain exercise on the balance of female elderly people.

Kwon et al¹⁹. reported on the effect and effectiveness of the open chain exercise and closed chain exercise on the balance control ability and muscle activity in the normal adult subjects for 6 weeks and found that the static balance and dynamic balance ability were improved in the closed chain exercise. Furthermore, Yi and Ki²⁰ investigated the effect of closed power chain exercise, using props, on physical fitness, fall efficacy, depression, physiological stress, physical fitness, and health consciousness of elderly women.

Duncan et al²¹. reported that the risk of falling is four times higher for elderly people below 15.24 cm than those below 25.4 cm. Using the elastic band exercise method, Kim et al²². showed that the balance of FRT was significantly increased from 16.89 cm to 23.41 cm postoperatively in 30 elderly subjects aged ≥ 75 years ($p = .001$). Han et al²³. demonstrated a significant (13.68cm) difference in the FRT values of 50 minute exercise three times a week for 8 weeks in subjects aged ≥ 75 years old. In the present study, there was a

significant difference in FRT between the open and closed chain exercise groups. In a study by Closed chain exercise has been demonstrated to be more effective than open chain exercise in terms of proprioceptive sensory input²⁴. Increased sense knee and ankle joint position play important roles in restoring dynamic balance by increasing cognitive ability and perception of body parts.

The results of the previous studies and the results of this study suggest that the resistance exercise using the elastic band enhances the balance ability by strengthening the leg strength. In addition to the above results, it is strongly recommended that exercise therapy in combination with general physical therapy is recommended for elderly people in the elderly, because the exercise can be applied to the abdominal and back muscles using elastic band after general physical therapy. Muscle strength is an important factor in balance control and is reported to be a major cause of aging disability²⁵. Therefore, we introduced the lower extremity strengthening exercise as a means to improve balance ability, and the resistance exercise using elastic band is an effective method for the elderly who can improve the strength reduction by aging.

Zhang et al²⁶. regarded OLST as an elderly person with poor balance ability if they could not open his/her posture for more than 20 seconds. In the case of the performance of the OLST with eyes closed, except for visual information, the retention time was reduced in both groups compared to when eyes were opened and the, However, in the muscle strengthening exercise group using elastic bands, the retention time was significantly improved in both the open and closed states following the training. This was, when the eyes were opened and the, OLST retention time was 6.60 ± 1.30 seconds, which is equivalent to more than 5 seconds²⁷. In this study, there was a significant difference in OLST between the open and closed chain exercise groups.

In the present study, static balance and dynamic balance were significantly increased in both the open and closed chain exercise groups using elastic bands. However, there was no difference between the two exercise methods. Through the results of this study, we can conclude that open and closed chain exercise using elastic bands are more effective for improving balance ability.

In addition to the above results, it is strongly recommended that exercise therapy in combination

with general physical therapy is performed by elderly individuals. Furthermore, the exercise can be applied to the abdominal and back muscles using elastic band after general physical therapy. Therefore, we introduced the lower extremity muscle strengthening exercise as a means to improve the balance ability. Closed kinetic chain exercise using elastic bands can promote a reversal of the decrease in muscle strength aging. Future studies should focus on applying this research to a more diverse population in order to confirm the findings of this study.

Ethical Clearance: Not required

Source of Funding: Nil

Conflict of Interest: Nil

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Fundamental Study for Establishing Standardized e-IRB Computer System in Healthcare

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ABSTRACT

The Ministry of Health and Welfare in Korea has been obliged to establish the IRB. However, in many cases, items that should be included in the review process are omitted in the process of modification. Therefore, this study analyzes the IRB-related deliberations and evaluation forms of the institutional bioethics committee members of public and private universities that were announced for evaluation and certification of the institutional committee in 2016. The data were collected the new review documents and the review exemption documents that are open to the homepage. Then, we analyzed the items included in the paper form for new deliberation and exemption from each university, and analyzed for form standardization of the institutional bioethics committee based on the data. Most of the research proposal and bioethical compliance pledges were included in the new application form, but the manuals for the subjects, the consent form, and the consent form for the use of personal information were often omitted. The e-IRB standardized system should be developed which not only include the form, but also provide information about the contents for protection of research subject and personal information for the researcher or the deliberation committee member.

Keywords: Healthcare, IRB, e-IRB, Bioethics, Standardization

Introduction

The “Act on Bioethics and Safety”, which came into force on February 2, 2013, removed the term “life science technology” such as embryo research and genetic testing/research, and expanding the application scope of human subjects. Human-oriented research defined by the Ministry of Health and Welfare includes studies that physically intervene in people, research on interaction such as communication and interpersonal contact, and research that uses information to identify individuals. The Ministry of Health and Welfare has been obliged to establish the Institutional Review Board (IRB) as of February 2013, based on Article 10^[1] of the Act^[1].

For institutions violating IRB installation obligations, penalties of up to KRW 5 million are imposed in accordance with Article 70^[1] of the Act. As the IRB has to be expanded, mandated, and be installed in research institutes in the life sciences and medical sciences as well as the social sciences, the Ministry of Health and Welfare has established the Public Institutions Bioethics Committee. The Bioethics Committee for Public Organizations has commenced the first pilot project of the Korea Health Medical Center in 2010, held a deliberation committee meeting in 2013 as a member of the Bioethics Committee for Public Organizations, and introduced the e-IRB and has been holding four meetings of the committee each month to date ^[1,2].

Public institution bioethics committee can entrust work through the agreement if there are not more than 5 researchers engaged in the institution or less than 30 number of research reviews in the last three years even though the IRB is not installed in the institution itself^[3]. The IRB’s main responsibilities are to review the scientific and ethical feasibility of the study protocol,

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to confirm the safety of the subjects and to confirm the consent process of legitimate procedures, to protect personal information, and to investigate and supervise the process and result of research^[4]. In addition, it plays a role in education and operation such as education for researchers and employees, establishment of measures for protection of vulnerable research subjects, and preparation of ethics guidelines for researchers^[5,6]. As the countermeasures for the safety of the subjects have been strengthened, the Public Bioethics Committee of Public Institutions has introduced the institutional committee evaluation and certification system with the goal of an introduction of Korean version system for the quality control of institutions and committee of institutions, strengthening the institutional committee role as an ethical institution, improving of bioethical environment and enhance trust as an international standard, and establishing and managing the role of each institution committee type in accordance with the bioethics and safety law. It is mandatory to evaluate the institutional committee from year of 2016 to 2019 through implementation of the pilot evaluation from year of 2013 to 2015. In order to implement the current evaluation and certification system aiming at IRB quality management, preparations for IRB staff are essential. However, according to a study by^[7], the number of IRB staff in the institution of 1,000 to 1,500 beds has varied from 0.4 to 3.8. In addition, it appears that IRB has an excessive burden on the work itself. A comparison of the US IRB with the Korean IRB reveals a lack of supporting IRB work and administrative staff in Korea. The role of the IRB staff includes a wide range of roles to be undertaken, such as educating researchers and employees at the relevant institutions, establishing protective measures for vulnerable research subjects, and preparing ethical guidelines for researchers. In addition, the time required for the preparation of documents for evaluation and certification may be a cause for the lack of review of the ethical feasibility to protect the study subjects which is main work of IRB^[8-10].

It is necessary to construct a computerized support system that can faithfully fulfill the role of supervising the ethical feasibility of IRB's main purpose. Therefore, this study analyzes the IRB-related deliberations and evaluation forms of the institutional bioethics committee members of public and private universities that were announced for evaluation and certification of the institutional committee in 2016. The results of this study will be helpful for the IRB staffs, researchers and review committee members

to review the ethical feasibility of the research. This study analyzes the IRB-related deliberation and evaluation forms of the institutional bioethics committee of public and private universities, which were announced for evaluation and certification of the institutional committee in 2016, and provides basic data on the establishment of standardized e-IRB system.

Materials and Method

Subjects: The subjects of this study were selected 30 institutions which provide IRB form among the 47 Institutional Bioethics Committees of public and private universities, which were announced for evaluation and certification of the institutional committee in 2016.

Research Method: The research data were collected by downloading the new review documents and the review exemption documents that are open to the homepage of the institution 's bioethics committee of the selected university. Then, we analyzed the items included in the paper form for new deliberation and exemption from each university, and analyzed for form standardization of the institutional bioethics committee based on the data.

Statistical Analysis: The statistical program R was used for the analysis of this study. The independent variables were national and public universities and the study conducted chi-square test.

Method

Characteristics of the Subject: Table 1 shows the characteristics of the study subjects. The survey subjects were 30 public and private universities. Seoul was the highest with 33.3%, followed by Busan 13.3%, Gangwon 10.0%, and Gyeonggi 10.0%. Gwangju, Daegu, Jeonnam, and Chungnam were 6.7%, and Gyeongnam and Daejeon were 3.3%.

Table 1: The General Characteristics of Research Subjects

Region	Public	Private	Total
Gangwon	2 (25.0)	1 (4.5)	3 (10.0)
Gyeonggi	-	3 (13.6)	3 (10.0)
Gyeongnam	-	1 (4.5)	1 (3.3)
Gyeongbuk	-	-	-
Gwangju	-	2 (9.1)	2 (6.7)

Conted...

Daegu	1 (12.5)	1 (4.5)	2 (6.7)
Daejeon	-	1 (4.5)	1 (3.3)
Busan	2 (25.0)	2 (9.1)	4 (13.3)
Seoul	1 (12.5)	9 (40.9)	10 (33.3)
Sejong	-	-	-
Ulsan	-	-	-
Incheon	-	-	-
Jeonnam	1 (12.5)	1 (4.5)	2 (6.7)
Jeonbuk	-	-	-
Jeju	-	-	-
Chungnam	1 (12.5)	1 (4.5)	2 (6.7)
Chungbuk	-	-	-
Total	8(100.0)	22(100.0)	30(100.0)

Application form for new examination by university based on Public Institution Bioethics Committee: Table 2 shows the results of the analysis of application forms of public and private universities based on the new application forms provided by the Public Institution

Bioethics Committee. Most of the universities selected in this study included the research plan (100% public and 90.9% private) and the Pledge of Bioethics Compliance (62.5% public and 90.5% private). There were many cases in which the explanatory manual and the consent form for research subjects were not included (37.5% public and 13.6% private). In addition, most of the universities were missing the form of consent to use personal information.

Main items of required documents for new review application: Table 3 shows the major items of the documents submitted by each university. Most of the new application forms include the names of the research subjects, research supervisors, co-researchers, information of main researchers, study period, the types of research in the research methodology. It also included information on research commissioned agencies. In addition, there were many cases in which plans for the study budget, research types, references, and anonymization were not included.

Table 2: The new review application forms

Contents	Public	Private	Total	p-value	Contents	Public	Private	Total	p-value
Documents to be submitted for new deliberation				1.000 ^a	Resume				0.666 ^a
Yes	8(100.0)	20 (90.9)	28 (93.3)		Yes	5 (62.5)	11 (50.0)	16 (53.3)	
No	-	2 (9.1)	2 (6.7)		No	3 (37.5)	11 (50.0)	14 (46.7)	
Application for deliberation exemption				0.407 ^a	Research Expense Plan				0.300 ^a
Yes	44 (50.0)	11 (50.0)	15 (50.0)		Yes	3 (37.5)	6 (27.3)	9 (30.0)	
No	44 (50.0)	11 (50.0)	15 (50.0)		No	5 (62.5)	16 (72.7)	21 (70.0)	
Research plan				1.000 ^a	Personal Information Agreement				0.112 ^a
Yes	5 (62.5)	13 (59.1)	18 (60.0)		Yes	1 (12.5)	-	1 (3.3)	
No	3 (37.5)	9 (40.9)	12 (40.0)		No	7 (87.5)	22(100.0)	29 (96.7)	
Instructions and agreement for the subject				0.689 ^a	Abstract of research plan				1.000 ^a
Yes	3 (37.5)	3 (13.6)	6 (20.0)		Yes	2 (25.0)	11 (50.0)	13 (43.3)	
No	5 (62.5)	19 (86.4)	24 (80.0)		No	6 (75.0)	11 (50.0)	17 (56.7)	
Checklist for deliberation exemption				1.000 ^a	New project evaluation checklist				0.267 ^a
Yes	2 (25.0)	6 (27.3)	8 (26.7)		Yes	2 (25.0)	2 (9.1)	4 (13.3)	
No	6 (75.0)	16 (72.7)	22 (73.3)		No	6 (75.0)	20 (90.9)	26 (86.7)	
Change table				0.678 ^a	Pledge of Bioethics Compliance				0.284 ^a
Yes	4 (50.0)	8 (36.4)	12 (40.0)		Yes	5 (62.5)	19 (90.5)	24 (82.8)	
No	4 (50.0)	14 (63.6)	18 (60.0)		No	3 (37.5)	2 (9.5)	5 (17.2)	
Total	8(100.0)	22(100.0)	30(100.0)		Total	8(100.0)	22(100.0)	30(100.0)	

^a Using the exact test of a fisher

Main items of the documents for exemption from deliberation: Table 4 summarizes the main items of the documents submitted for the exemption of deliberation in this study. The most commonly used item was cause of exemption (50.0%). In the item of the exemption of deliberation documents, research subjects were 46.7%, the information of the research supervisor was 46.7%, and IRB education was 3.3%.

Discussion and Conclusion

The purpose of this study was to identify the items and contents of each form in order to standardize the application forms for the new deliberation and the exemption application form for the 30 public and private universities which have institutional bioethics committee in Korea. As a result, most of the research proposal and bioethical compliance pledges were included in the new application form, but the manuals for the subjects, the consent form, and the consent form for the use of personal information were often omitted. In addition, the exemption form for deliberation was supposed to prepare the content of exemption reasons, but the contents of the complete IRB education were not included. It is meaningful that this study first analyzed the items and contents of the application forms for new deliberation and exemptions from the Institutional Bioethics Committee in Korea. In addition, it is meaningful to provide basic data for developing standardized e-IRB format through analysis result. Currently, the Institutional Bioethics Committee of each university has changed the format provided by the Public Institution Bioethics Committee according to the research environment of each university. However, in many cases, items that should be included in the review process are omitted in the process of modification. In the future, it will be necessary to have a standardized application form to protect the research

subjects participating in the study in accordance with the purpose of establishing the Institutional Bioethics Committee with the introduction of e-IRB. Based on the analysis of this study, future e-IRB forms should include the pledge of compliance with bioethics which is the most important to protect the current research subjects, the manual and agreement for research subjects, and the consent to use personal information. The review committee members of the Institutional Bioethics Committee should make sure that this study accurately assesses whether there is any damage to the research subject. In addition, according to the analysis of the results of this study, many universities did not include the content of complete IRB education in the application. However, both the researcher and the co-researchers will need to complete the study of bioethics in order to carry out the research, so this part should also be included in the e-IRB form. As institutional bioethics committees are mandated for each institution that conducts recent research, researchers also face many confusion and difficulties in completing the application form for IRB deliberation. Standardized form provision and education is considered to be a way for researchers to easily participate in mandatory IRB deliberation. Therefore, the e-IRB standardized system should be developed which not only include the form, but also provide information about the contents for protection of research subject and personal information for the researcher or the deliberation committee member. By providing education with application through e-IRB, the researcher will consider how to protect the research subject, and this will be in line with the purpose of establishing the Institutional Bioethics Committee. Finally, we propose that the e-IRB system quickly educates researchers on questions. For example, it is to allow researchers to look up terminology quickly, via the pop-up system of IRB term. This system help researchers faithfully write IRB.

Table 3: Main items of required documents for new review application

Contents	Public	Private	Total	p-value	Contents	Public	Private	Total	p-value
Research subjects				1.000 ^a	Research type				0.166 ^a
Yes	8(100.0)	20(90.9)	28(93.3)		Yes	2(25.0)	1 (4.5)	3(10.0)	
No	-	2(9.1)	2(6.7)		No	6(75.0)	21(95.5)	27(90.0)	
Information of supervisors				0.545 ^a	Research approval number				0.148 ^a
Yes	8(100.0)	19(86.4)	27(90.0)		Yes	8(100.0)	15(71.4)	23(79.3)	
No	-	3(13.6)	3(10.0)		No	-	6(28.6)	6(20.7)	

Conted...

Information of co-researcher				1.000 ^a	Research goal and importance				1.000 ^a
Yes	7(87.5)	18(81.8)	25(83.3)		Yes	-	2(9.1)	2(6.7)	
No	1(12.5)	4(18.2)	5(16.7)		No	8(100.0)	20(90.9)	28(93.3)	
Information of main researcher				1.000 ^a	Research contents				0.287 ^a
Yes	4(50.0)	10(45.5)	14(46.7)		Yes	-	5(22.7)	5(16.7)	
No	4(50.0)	12(54.5)	16(53.3)		No	8(100.0)	17(77.3)	25(83.3)	
Pharmacist				0.267 ^a	Target review contents				1.000 ^a
Yes	1(12.5)	-	1(3.3)		Yes	1(12.5)	2(9.1)	3(10.0)	
No	7(87.5)	22(100.0)	29(96.7)		No	7(87.5)	20(90.9)	27(90.0)	
Research period				0.155 ^a	Reference				0.550 ^a
Yes	8(100.0)	16(72.7)	24(80.0)		Yes	-	4(18.2)	4(13.3)	
No	-	6(27.3)	6(20.0)		No	8(100.0)	18(81.8)	26(86.7)	
Research type				0.545 ^a	Number of subject				0.143 ^a
Yes	8(100.0)	19(86.4)	27(90.0)		Yes	8(100.0)	15(68.2)	23(76.7)	
No	-	3(13.6)	3(10.0)		No	-	7(31.8)	7(23.3)	
Multilateral Cooperative Research				0.682 ^a	Consent of subject				0.391 ^a
Yes	5(62.5)	10(45.5)	15(50.0)		Yes	7(87.5)	15(68.2)	22(73.3)	
No	3(37.5)	12(54.5)	15(50.0)		No	1(12.5)	7(31.8)	8(26.7)	
Subject-related information				0.374 ^a	Characteristics of research				0.226 ^a
Yes	7(87.5)	14(63.6)	21(70.0)		Yes	6(75.0)	10(45.5)	16(53.3)	
No	1(12.5)	8(36.4)	9(30.0)		No	2(25.0)	12(54.5)	14(46.7)	
Size of budget				0.210 ^a	IRB approval of other institutions				0.384 ^a
Yes	1(12.5)	9(40.9)	10(33.3)		Yes	4(50.0)	6(27.3)	10(33.3)	
No	7(87.5)	13(59.1)	20(66.7)		No	4(50.0)	16(72.7)	20(66.7)	
Information of research commissioned agencies				0.345 ^a	Anonymization				0.638 ^a
Yes	5(62.5)	18(81.8)	23(76.7)		Yes	1(12.5)	6(27.3)	7(23.3)	
No	3(37.5)	4(18.2)	7(23.3)		No	7(87.5)	16(72.7)	23(76.7)	
Data submission to research provider				0.638 ^a	Presence of Human Derivatives				1.000 ^a
Yes	1(12.5)	6(27.3)	7(23.3)		Yes	1(12.5)	3(13.6)	4(13.3)	
No	7(87.5)	16(72.7)	23(76.7)		No	7(87.5)	19(86.4)	26(86.7)	
Type of review				0.682 ^a	Risk of research				0.545 ^a
Yes	3(37.5)	12(54.5)	15(50.0)		Yes	-	3(13.6)	3(10.0)	
No	5(62.5)	10(45.5)	15(50.0)		No	8(100.0)	19(86.4)	27(90.0)	
Total	8(100.0)	22(100.0)	30(100.0)		Total	8(100.0)	22(100.0)	30(100.0)	

^a Using the exact test of a fisher

Table 4: Main items of the documents for exemption from deliberation

Contents	Public	Private	Total	p-value	Contents	Public	Private	Total	p-value
Research subject				1.000 ^a	Consent of subject				0.545 ^a
Yes	4 (50.0)	10 (45.5)	14 (46.7)		Yes	-	3 (13.6)	3 (10.0)	
No	4 (50.0)	12 (54.5)	16 (53.3)		No	8(100.0)	19 (86.4)	27 (90.0)	

Conted...

Information of the research supervisor				0.545 ^a	Research grant institution				0.550 ^a
Yes	4 (50.0)	10 (45.5)	14 (46.7)		Yes	-	4 (18.2)	4 (13.3)	
No	4 (50.0)	12 (54.5)	16 (53.3)		No	8(100.0)	18 (81.8)	26 (86.7)	
Route of submission				1.000 ^a	Period of research				0.545 ^a
Yes	-	2 (9.1)	2 (6.7)		Yes	-	3 (13.6)	3 (10.0)	
No	8(100.0)	20 (90.9)	28 (93.3)		No	8(100.0)	19 (86.4)	27 (90.0)	
Co-researcher				1.000 ^a	IRB approval of other institutions				1.000 ^a
Yes	-	3 (13.6)	3 (10.0)		Yes	-	2 (9.1)	2 (6.7)	
No	8(100.0)	19 (86.4)	27 (90.0)		No	8(100.0)	20 (90.9)	28 (93.3)	
Type of research				0.267 ^a	Completed IRB training				1.000 ^a
Yes	1 (12.5)	3 (13.6)	4 (13.3)		Yes	-	1(4.5)	1 (3.3)	
No	7 (87.5)	19 (86.4)	26 (86.7)		No	8(100.0)	21(95.5)	29 (96.7)	
Number of subject				0.155 ^a	Cause of exemption				1.000 ^a
Yes	-	4 (18.2)	4 (13.3)		Yes	4 (50.0)	11(50.0)	15 (50.0)	
No	8(100.0)	18 (81.8)	26 (86.7)		No	4 (50.0)	11(50.0)	15 (50.0)	
Total	8(100.0)	22(100.0)	30(100.0)		Total	8(100.0)	22(100.0)	30(100.0)	
^a Using the exact test of a fisher									

Ethical Clearance: The study was approved by the Institutional Review Board (IRB No. KYU-2019-166-01) of Konyang University.

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Conflict of Interest: Nil

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A Novel Hybrid FLANN-PSO Technique for Real Time Fingerprint Classification

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ABSTRACT

In this paper we are presenting a Particle swarm optimized functional link neural network for classifying a collection of real time fingerprints in the field of biometric recognition. From the collected fingerprints the feature vectors are extracted as a collection of different angle oriented features using the Gabor filter bank. The classes of the fingerprints are assigned as per the Henry System. For classification a novel FLANN-PSO algorithm is used and tested for accuracy through different parameters and different angular features of the fingerprints. In this work we have obtained an accuracy of 98% for real time collected fingerprint images. It has been compared with other classifiers and the results obtained of this work in terms of accuracy and MSE value has shown appreciable improvement over the other algorithms.

Keywords: Particle swarm optimization, angular features, parameters, Henry system

Introduction

A fingerprint can be classified and recognized by its local features like (ridge bifurcation and termination) and global features or singular points like (left loop, right loop, whorl, arch and tented arch) based on the complexity of the attributes. But when a distorted fingerprint needs classification, the local feature information as alignment match process fails to identify the process with accuracy. For this type of distorted and noisy fingerprints we need to analyze its detailed global features described by the Henry System^{11, 12}. The global features e.g. LL, RL, W, A and TA are Henry's classification present in each and every individual human beings in this world and are unique for the person as shown in fig.1.

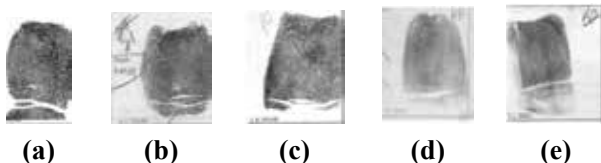


Fig. 1: Five fingerprint classes from NIST-9 database (a) right loop (b) left loop (c) whorl (d) arch (e) tented arch

In this paper we have extracted the unique global features of the noisy distorted fingerprints collected from NIST-9 database images, by using Filter bank

approach^{12,13}. The features are collected in terms of feature vectors of each individual fingerprints and stored in a feature sheet and further classification is tested using a novel Particle swarm optimized FLANN. The Functional link ANN [1] is an excellent classifier. Here we have used PSO as an optimizer to optimize the weight parameters of the network for faster convergence with least mean square error values.

Motivation:

- To makeover the complexity and linearity of multilayer as well as single layer neural network, the FLANN architecture is suggested.^{1,2}
- Here the primary advantage of the PSO based encoding technique is in its capacity to decrease trapped status in local optima and increase the classification accuracy as well as the training speed.^{2,3}

Accomplishment of this work:

In this work

- First the real time fingerprint images are collected from different persons and the respective features are extracted by filter bank method and stored in an excel sheet as a Real time database.

- The feature database is then passed to a FLANN-PSO hybrid network for classification.
- Here we have obtained a classification accuracy of 98% with a best cost value in terms of MSE as 0.009. The total execution time for the process is calculated to be 681.9 seconds.
- Finally the results are compared with other existing algorithms^{12,14,15}, which shows that it is a better classifier than other existing algorithms.

Real time Database Collection and Feature Extraction: Classification of fingerprints is basically tested on standard database e.g. NIST 9. But in this work we have focused on generating a real time database of fingerprint samples. Here we have collected a group of 50 fingerprint sample images from 10 students of Silicon Institute of Technology, Bhubaneswar. The images are captured through fingerprint sensors and stored in a memory. So a total of 50 fingerprints consisting of all 5 classes of fingerprints originates the database for further processing task.

Feature Extraction: It is a process of extracting the minute details present in each and every individual class of fingerprints and makes each one identical. The groups of fingerprints are assigned to a particular class if the majority details are similar in both the samples. In order to assign a particular class to each one of the fingerprints, here the feature extraction step is done. During feature extraction the following steps are carried out as given in fig.2.

- Feature vector creation
- Normalization and Segmentation of fingerprint image
- Orientation field estimation
- Core point estimation
- Circular region formation
- Mean and Variance calculation for each of the sectors

Gabor filtering by 2-D convolution for 0, 45, 90, 135 degrees angles keeping a constant frequency,

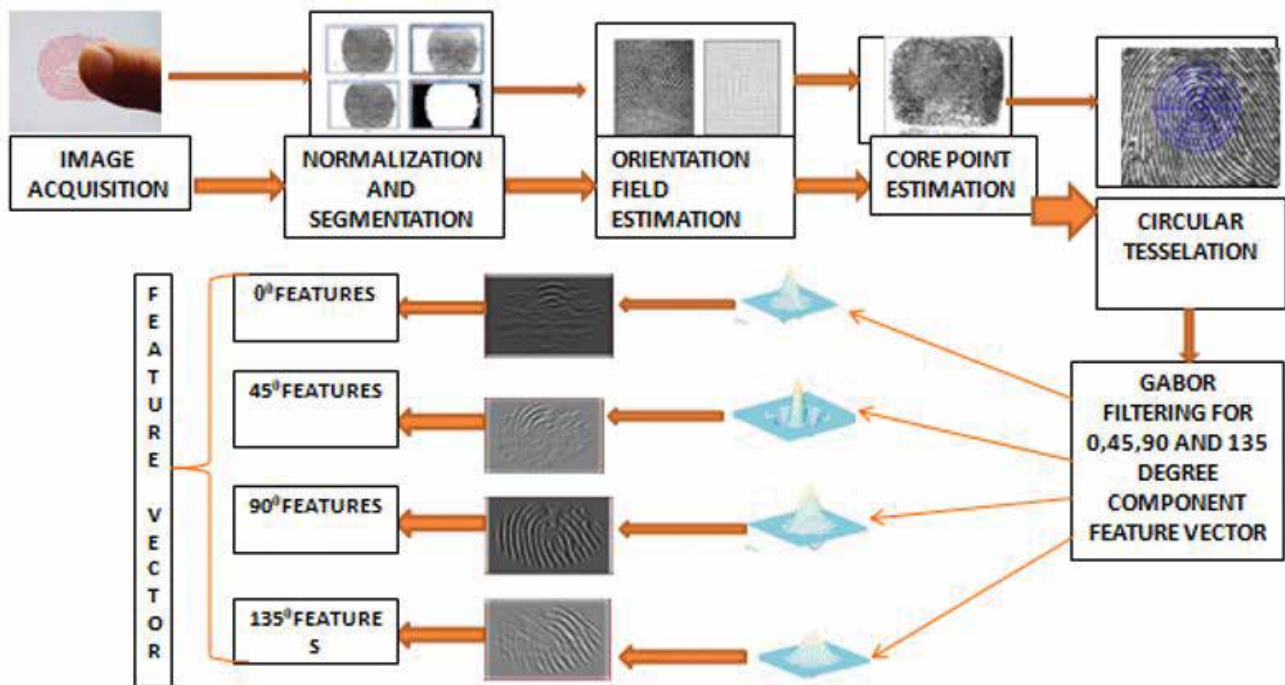


Fig. 2: Feature Extraction process

- separate the decision boundary to indicate the input class.

FLANN Architecture: Here FLANN is used as a single layer network as an alternative approach to the complexities of the multilayer NNs to handle classification problem. The classification of fingerprints is highly non-linear in nature [1, 4 and 5]. FLANN architecture basically consists of two major components like, a neural network and linear mapping for expansion of our input feature vector.

Let our input vector before expansion is $r(i)$, $1 < i < d$, where the elements of $r(i)$ can be written as $r_n(i)$, $1 < n < N$, where N represents the total expansion points if input. The expansion of input pattern is,

$$x_1(i) = r(i), x_2(i) = f_1(r(i)), \dots, x_N(i) = f_N(r(i)) \dots (1)$$

Where, $r(i)$, $1 < i < d$, and d represents the features.

After expansion, it is fed to our network for training. Here the process of learning the network i.e. supervised learning creates problem in classification approach to generate the perfect class boundaries^{8,9}. During pattern classification, our input pattern is assigned to one of the predefined classes. Let the input is a collection of input feature vectors x consisting of N elements as $x_1, x_2, \dots, x_N$. These elements show the measurement of selected feature vector used for classification. Our classifier is used to

FLANN as a Classifier: Here we have used the trigonometric expansion model, where each element of the input feature vector before expansion can be represented as, $r(i)$, $1 < i < I$ where each element $r(i)$ can be represented as $r_n(i)$, $1 < n < N$, where N = number of expanded points for each input element. In our case, $N=11$ and I = represents the total number of features in the feature vector. The expansion can be represented as,

$$x_1(i) = r(i), x_2(i) = \cos \Pi(r(i)), x_3 = \sin \Pi(r(i)), x_4(i) = \cos 3 \Pi(r(i)), \dots, x_{11}(i) = \sin 9 \Pi(r(i)) \dots (2)$$

where, $r(i)$, $1 < i, d$, d is the set of features in the data set.

Then the random weights chosen from the range $[-1,1]$ are multiplied to the output and then added to produce the actual output of the network as given in fig.6^[1]. For comparison the specified desired output is taken into consideration and the corresponding difference is the calculated error and is used to modify the weight in each path q , which can be expressed as,

$$\Delta W_j(k) = \mu \times x_f(k) \times e(k) \dots (3)$$

where, $x_f(k)$ is the functionally expanded input at k^{th} iteration.

For q number of patterns, the change in weight is

$$\overline{\Delta W_j(k)} = \frac{1}{q} \sum_{i=1}^q \Delta W_j^i(k) \dots (4)$$

The weight updation is done by,

$$W_j(k+1) = W_j(k) + \Delta W_j(k) \dots (5)$$

Where, $W_j(k)$ is the j^{th} weight at the k^{th} iteration.

By taking $y(k)$ as the desired output of the network, and $\hat{y}(k)$ as the actual output of the network, the error $e(k)$ can be calculated as,

$$e(k) = y(k) - \hat{y}(k) \dots (6)$$

where,

$$\hat{y}(k) = \sum_{j=1}^J x f_j(k) \cdot w_j(k) \dots (7)$$

and $x f_j$ represents the expansion of input.

Reviews of Particle Swarm Optimization (PSO):

Particle swarm optimization follows the population based algorithm that optimizes the objective function³. Here the solution is based on particles^{3,4}, which imitates bird's flocking and are allowed to fly freely in the search space. In this process each and every particle are allowed to update their respective position and velocity for the whole population. The steps followed during the process are:

- **Initialization of Particles:** Here the particles are allowed to set their velocity and position randomly within a specific range.
- **Velocity Update:** During this, it follows a specific rule to update the velocities of particles in each iteration.

$$\vec{v}_i \leftarrow w \cdot \vec{v}_i + c_1 \cdot R_1 \cdot (\vec{p}_{i,\text{best}} - \vec{p}_i) + c_2 \cdot R_2 \cdot (\vec{g}_{\text{best}} - \vec{p}_i) \dots (8)$$

where,

$\vec{p}_i$ and $\vec{v}_i$ are position and velocity of particle i , $\vec{p}_{i,\text{best}}$ and $\vec{g}_{\text{best}}$ represents the position and best object values, w is used to control the particle flying and R_1 and R_2 are random variables taken in the range $[0,1]$, c_1 and c_2 are used to control the weights of the terms.

- **Position Update:** Here the position of the particles are updated during the iterations as per the following rule,

$$\vec{p}_i \leftarrow \vec{p}_i + \vec{v}_i \dots (9)$$

- **Memory Update:** It makes the update of $\vec{p}_{i,\text{best}}$ and $\vec{g}_{\text{best}}$ when condition is met.

$$\begin{aligned} \vec{p}_{i,\text{best}} &\leftarrow \vec{p}_i \text{ if } f(\vec{p}_i) > f(\vec{p}_{i,\text{best}}), \\ \vec{g}_{\text{best}} &\leftarrow \vec{p}_i \text{ if } f(\vec{p}_i) > f(\vec{g}_{\text{best}}) \end{aligned} \dots (10)$$

Where $f(\vec{x})$ represents the objective function.

- **Termination Criteria:** Here step 2 to step 4 is repeated until the condition specified is achieved. After termination, the corresponding $\vec{g}_{\text{best}}$ and $f(\vec{g}_{\text{best}})$ are identified as solutions.

Proposed fingerprint classification method: The proposed algorithm is based on multichannel Gabor filter bank method, which is tuned in different angle orientations [6,7]. This part of our work forms the extracted feature for classification. Then the features are passed to the FLANN-PSO hybrid classifier for classification.

Feature Vector Creation: In each component image as shown in fig.3, a neighborhood of ridges and furrows in the orientation field those follow the path similar to the filter direction show large variations are considered. Here the global structures are useful features which can be properly captured by the standard deviation of the values [8, 9 and 10]. So the standard deviation of each sectors collectively considered as the feature vector. The feature vector is extracted as given in the following method.

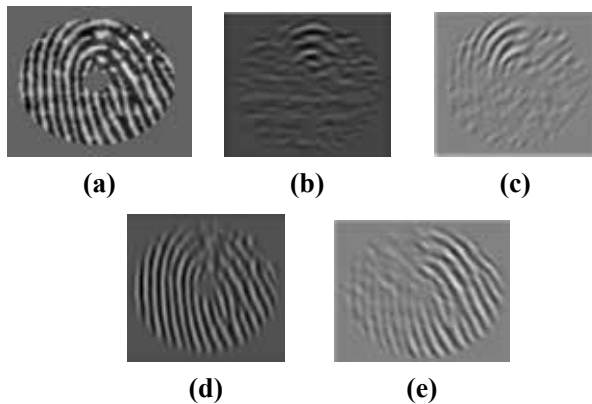


Fig. 3: (a) Normalized image (b) component image 0° (c) component image 45° (d) Component image 90° (e) component image 135°

Let $C_{i\theta}(x, y)$ be the component image corresponding to direction θ for sector S_i . For $i = 0, 1, 2, \dots, 36$ and $\theta \in [0^\circ, 45^\circ, 90^\circ, 135^\circ]$, a feature is the standard deviation $F_{i\theta}$ is defined as:

$$F_{i\theta} = \sqrt{\sum_{k_i} (C_{i\theta}(x, y) - M_{i\theta})^2} \quad \dots(11)$$

where k_i is the number of pixels in S_i and $M_{i\theta}$ is the mean pixel intensity in $C_{i\theta}(x, y)$. So we have a 152 dimensional feature vector.

Here the features associated with 0 degree component image is collected as saved as feature vector for 0 degree orientation and similarly the features are collected from 45 degree, 90 degree and 135 degree respectively and stored in excel sheets to represent the feature vectors with respect to different angle orientations.

Classification using FLANN-PSO Hybrid algorithm: This work uses PSO as an optimizer to update the weight

parameters of FLANN classifier as shown in fig.6. The steps involved during this process are:

- Initially a fixed number of habitats are generated, where each habitat carries the respective weights and bias of the network.
- The best fit value in terms of MSE is calculated. Here the goal is to minimize the error with respect to the desired and the estimated output of the classifier.
- To satisfy the optimization criteria, various operations like Initialization of weights, position and velocity update, memory update are performed and once the condition is satisfied it is terminated to find the best solution in terms of optimization.
- Then the network with high fitness (solution parameters) are passed to the next generation and repeated until the desired goal is achieved as given in fig.4.

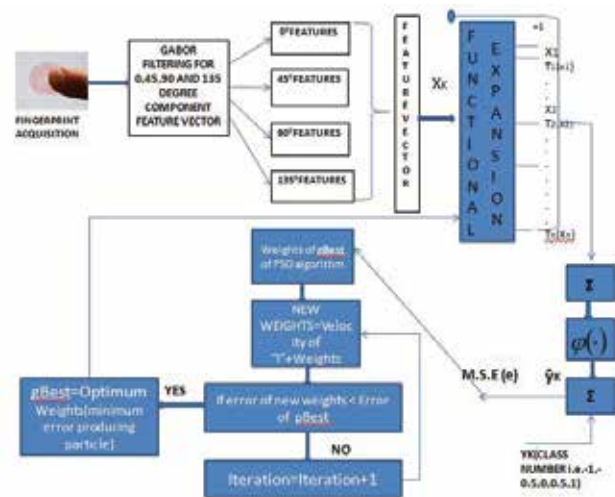


Fig. 4: Structure of the proposed FLANN-PSO hybrid method

Experimental Results: Selected degraded fingerprint images from the created and extracted real time database are feature extracted using filter bank approach and the feature excel sheet is created consisting of 152 features of each fingerprint image. The extracted features of 50 fingerprint images in excel format are used for training and testing of the network. Both the training and test sets of feature vectors are of all the classes starting from class1 to class5. Each class is represented in the excel sheet in terms of five values between 1 to -1 i.e. (-1, -0.5, 0, 0.5, 1) to represent the five classes respectively. The algorithm is tested by taking the C_1 and C_2 parameters

(the cognitive and social parameters) as a fixed value i.e. 2. The population is taken as 1000. It is tested for better performance for different iteration levels like 500, 1000, 2000, 3000 and 5000 respectively. The test confusion matrix and the best cost graph are collected for analysis purpose. During the feature extraction stage a 152 dimensional feature vector is extracted by collectively considering four angle orientations (0, 45, 90 and 135 degrees) respectively. Here each angle orientation vector provides 38 no. of features and finally it forms 152

features for the whole fingerprint. The angular feature vector is tested in the network for (0, 45, 90 and 135 degrees) respectively and finally the whole feature vector is tested for accuracy. From the output graph as shown in fig. and table.1, it is clear that by providing the total feature vector as input to the network, it is providing best classification accuracy of 98% than other angular feature vectors and the best cost value for this is 0.009. The best cost graphs and the confusion matrix are shown in the fig.5 below.

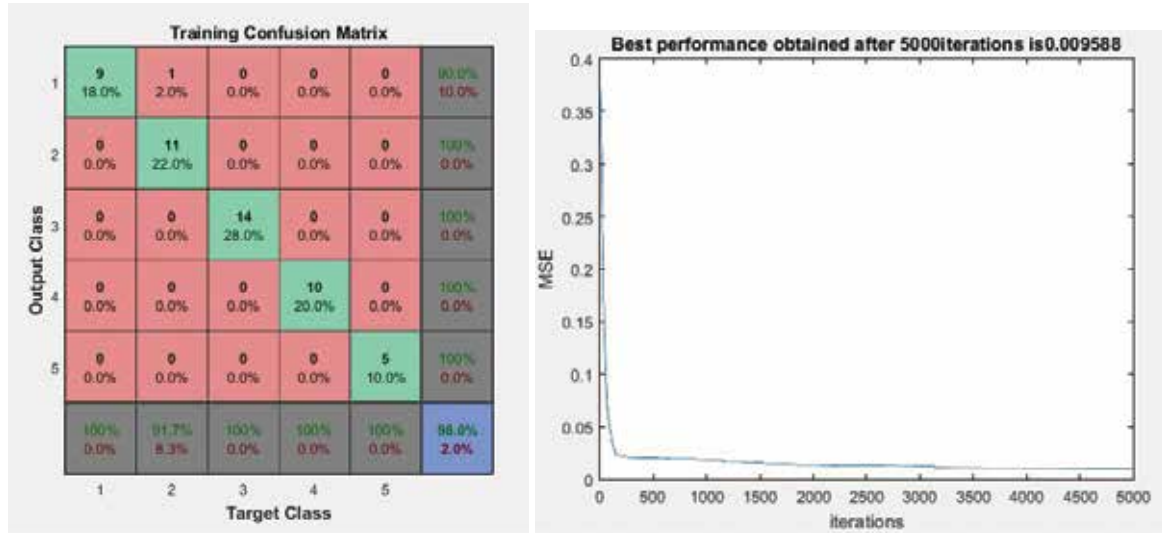


Fig. 5: The Confusion matrix and best cost graph for total feature vector

Here we are reflecting the classification performance in various parameters like Confusion matrix, Best cost graph and total execution time. The confusion matrix consists of 6 rows and 6 columns, where each row represents the predicted class and column represents the actual class as output of the classifier. The diagonal elements of the confusion matrix represent the correct classification percentage of the respective class. The other element in the matrix other than diagonal elements represents the misclassification percentage. In the fig.5, the 6×6 confusion matrix represents the overall result, where the first five rows and five columns represent the predicted and actual class of the classifier. The 6th row and 6th column represent the total classification accuracy of the respective class. The last element in the diagonal array shows the overall classification accuracy of the classifier. The 1×1 element of the matrix represent the classification result of the fingerprint that belongs to class 1 (right loop) as per the Henry system and is classified in the same class in percentage i.e. 18% where as the other elements in the first row i.e. (1×2, 1×3 ... 1×5) show the misclassification percentage. The 1×6 position of the matrix shows the true classification of class 1 (right loop) i.e. 90% and 10% error of misclassification. Similarly the other rows and columns reflect the different classification and error percentage in green and red color digits respectively. The best results are obtained as a mean square error value of 0.009 for 5000 iterations of the network. Its execution time is about 681.9 seconds.

Performance Comparison

Table 1: Performance comparisons of different classification algorithms

Reference Paper	R.Capelli. et. Al(1999)	A.K Jain et.al(1999)	A.Senior et.al(2001)	J.Hu et. Al(2010)	This Work
Classification Method	Image Partition Method	KNN method	HMM + DT method	SVM + GP	FLANN + PSO
Classification Accuracy	93.68%	92.1%	93.37%	93.6%	98%

Table 1 shows the different classification accuracy of fingerprints using different classifier algorithms. As given in the table, R. Capelli et. al. (1999) have adopted Image Partition method to classify the fingerprints into five classes and has got the classification accuracy of 93.68%¹⁴, A.K Jain et. al. also experimented the classification process using KNN and NN and have reached at the accuracy of 92.1%¹². A. Senior et. al. [2001] have adopted the classification using HMM+DT+PCASYS method and could able to classify at 93.37%¹⁵, where as J. Hu et. al. [2010] has tested the classification using SVM+GP method to classify the fingerprints with 93.6% accuracy. Our proposed method is robust enough to classify the fingerprints into five classes with an accuracy of 98% for real time fingerprint database.

Conclusion

In this paper, the real time classification of fingerprints into five broad classes is successfully carried out. During feature extraction the Gabor filter bank play a major role for extracting the vital significant features of the respective fingerprints and then the proposed hybrid FLANN-PSO classifier is able to classify it into five classes. Here we have classified the fingerprints for each angular component feature vector for 0, 45, 90 and 135 degree. Then the classification is also performed considering the whole feature vector consisting of all angle component features. From the results it is seen that the classifier is producing best result of 98% accuracy with a total execution time of 681.9 seconds. The best cost value for this result is 0.009588. The improvement in execution time may be taken up as a future research work considering other attributes.

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The Dual Mediation Effect of Satisfaction with the Quality of Service and Satisfaction with Resident in the Relationship between Subjective Health and Depression among the Elderly in Long-Term Care Facilities

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ABSTRACT

This study aimed to investigate whether satisfaction with the quality of service and satisfaction with resident mediate the relationship between subjective health and depression. Toward this end, the following research questions were set. First, what is the correlation between satisfaction with the quality of service, satisfaction with resident, subjective health, and depression? Second, does satisfaction with the quality of service and satisfaction with resident mediate the relationship between subjective health and depression? The survey was conducted by visiting the nursing homes that allowed this study after a phone call request. Face-to-face interviews with the elderly people in the institutions were done by the investigator and trained graduate students. The survey was completed with 381 elderly people in long-term care facilities (Jan ~ Feb 2017). The analysis of frequency, reliability, and correlation was done using the SPSS PC+ Win. 23.0 programs. The mediation analysis and bootstrapping were done using the SPSS PROCESS macro program (model 6). This study found out that, in the effect of physical health on depression, satisfaction with the quality of service and satisfaction with resident have dual mediating effects. These findings were, first, the worse subjective health is, the higher depression is. Second, raising their satisfaction with the quality service provided by facilities can reduce their depression. Third, because satisfaction with resident can also reduce depression, it is necessary to lead the elderly to adjust themselves to the facilities, and to increase their residential satisfaction, which will reduce depression. First, by encouraging those in facilities to participate in various health programs and take care of their diets and by giving proper treatment, it is necessary to improve their health, which will reduce their depression. Second, by providing various environmental, physical, and social services which fit the demands of the elderly, it is possible to reduce their depression.

Keywords: Long-term care facilities, Dual mediation effect, Depression, Service quality, Resident satisfaction

Introduction

According to Statistics Korea¹, 4.5 persons of the economically productive population (from 15 to 64 years old) will take care of one old person by 2020, 1.7 persons by 2040, and 1.2 by 2060. The growth rate of the elderly population in Korea is higher than in other countries, and the ratio of senior citizens to the economically productive

population is expected to be higher in Korea than in advanced countries by 2030. In such a situation, under the long-term care insurance scheme that started in 2008 to reduce the burden of care of the elderly, the number of nursing homes and those recognized as requiring long-term care is increasing rapidly. The possibility of being put in such facilities among those 65 years old and above is over 43%, with females 52% and males 33%². Thus, it is necessary to establish various measures for those old people who need intensive and long-term care in such facilities.

As the elderly are less likely to voluntarily enter such facilities than to be passively put there, they can feel hopeless and lost, and will very likely be vulnerable to depression. In a foreign study, whereas 0.9 to 9.4%

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of old people residing in local communities suffer from depression, 14 to 42% of those in such facilities do³. Studies of the Korean elderly are not very different. Whereas 29.2% of those living in local communities suffer from depression⁴, 30 to 40% of those in facilities do⁵⁻⁹. Among those elderly using medical welfare facilities for the elderly, 60% of them experience depression, especially if they suffer from chronic diseases¹⁰. Considering that depression among such patients can be ignored, because many of them suffer from mental diseases such as cognitive dysfunction or dementia⁷, the proportion of those who suffer from depression may be very high. Because depression of the elderly can accompany physical and social dysfunction and, in some cases, cause suicide, it is an important public-health problem¹¹ that should not be ignored or left alone. However, because of insufficient understanding of the mental health of the elderly in nursing facilities, they are not properly treated for depression.

There are three models explaining depression of the elderly: a single deterministic factor model, a multiple condition deterministic model, and a multiple interactive causative model, also known as a psychological-social model, which is the most frequently used one⁹. That is, there are very complex and various factors causing depression of the elderly.

It was found out that there is a positive relationship between subjective health and depression⁷⁻⁹. In particular, the variables affecting depression are subjective health, economic condition, and social support of workers in facilities in descending order⁸. Also, the more satisfied one is with the quality of service in the facility, the higher is one's satisfaction with staying there and the quality of life¹²⁻¹⁶. Specifically, the higher the quality of service is, the higher is the satisfaction of users with the facility¹² and with the quality of life¹³. More specifically, according to Jung¹⁶, what most affects satisfaction with life is quality of the service in such facilities. Satisfaction with living arrangements is also related. It was found that the higher is the satisfaction of users of facilities, the higher their satisfaction with life is¹⁵, and the higher their satisfaction with staying there is, the lower their depression is¹⁷⁻¹⁸.

In summary, the above research shows that, among the elderly residing in facilities, health, satisfaction with service quality, satisfaction with staying there, and quality of life are all related to each other. And we can assume

that, in the relationship between health and quality of life among the elderly in facilities, satisfaction with the quality of service or with living arrangements can serve as a mediating variable. However, since the research mentioned above tends to focus on two variables, they fail to grasp the comprehensive relationship among various variables. Thus, they are not very effective in differentiating variables that affect depression of the elderly in facilities nor in finding out measures to reduce it.

Therefore, this study aimed to investigate whether satisfaction with the quality of service and satisfaction with living arrangements mediate the relationship between subjective health and depression. Toward this end, the following research questions were set. First, what is the correlation between satisfaction with the quality of service, satisfaction with living arrangements, subjective health, and depression? Second, does satisfaction with the quality of service and satisfaction with living arrangements mediate the relationship between subjective health and depression?

Method

Research Model: Based on previous studies, I set up a research model as shown in Figure 1, in other words, research model in which satisfaction with the quality of service and satisfaction with living arrangements mediate the relationship between subjective health and depression.

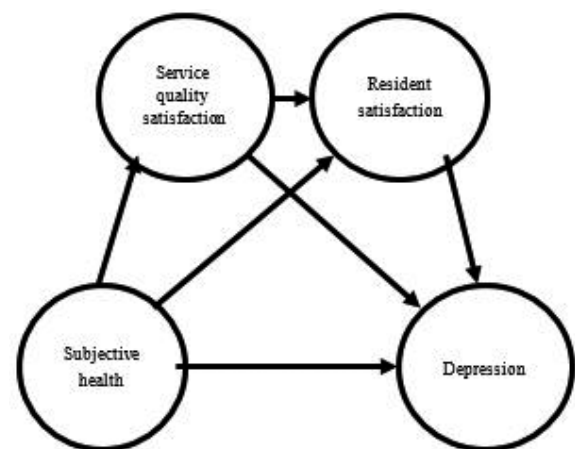


Figure 1: Research model

Research Subject: The survey was conducted by visiting the nursing homes that allowed the study after a phone call request. Face-to-face interviews were done with the elderly people in the institutions by myself and trained graduate students. The survey was completed by 381 elderly people in the long-term care facilities.

Of the elderly in the nursing homes, females were 71.7% and males were 28.3%, that is, about three times as many females as males. For their ages, the group over 80 years old was the biggest, with 61.6%, and their mean age was 79.54 years old, which was fairly old. In marital status, 79.8% had no spouses. For the educational level of the elderly in the institutions, 70.3% had the experience with schools, but 29.7% had no such experience. In economic status, 74.8% belonged to the ordinary families.

Research Tools

Depression: I used the 10-item, 5-point Likert-type scales related to depression among the SCL-90-R¹⁹ measurement tools. In this study, the reliability of the scale in terms of Cronbach's α was .921.

Subjective Health: The subjective health status was as follows: 1 question, 5 point Likert-type question asked, "How is your health compared to your peers?"

Service Quality Satisfaction: SERVPERF index²⁰ with 22 questionnaires and 5-point Likert-type scale (originally 7-point scale). Meaning the scores of 22 questionnaires. The higher the score, the higher the service quality. Cronbach's α =.953.

Resident Satisfaction: Resident Satisfaction Questionnaire (RSQ)²¹ was used. There were 13 questions, on a 5-point Likert-type scale. The higher was the total score, the higher was the satisfaction with living arrangements. The reliability of the scale was a Cronbach's α of .928.

Other Variables: The other variables included sex, age, marital status, education, economic status.

Results and Discussion

Correlation between Main Variables: As shown in Table 1, a significant correlation was found between all variables. The variables of satisfaction with the quality of service and satisfaction with the living arrangements showed the highest correlation coefficient ($r = .645$, $p < .001$), followed by the correlation between satisfaction with the living arrangements and depression ($r = -.371$, $p < .001$). The overall correlation coefficients ranged from .200 to .645, which suggests the absence of multicollinearity. On the other hand, the highest degree was observed for satisfaction with the living arrangements ($4.11 \pm .52$), and depression was the lowest ($2.30 \pm .68$).

Table 1: Correlation coefficients between major variables

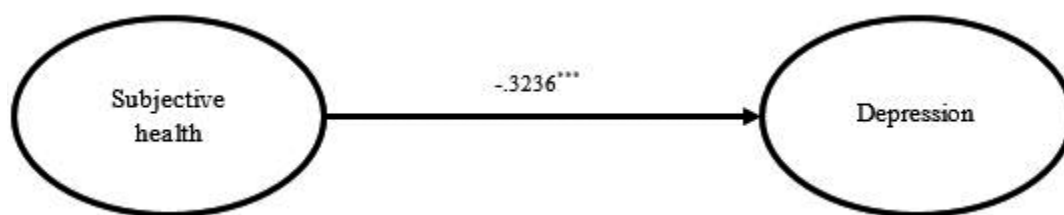
	1	2	3	4
1. Health	1			
2. Service quality satisfaction	.237***	1		
3. Resident satisfaction	.200***	.645***	1	
4. Depression	-.327***	-.347***	-.371**	1
M	3.31	4.07	4.11	2.30
SD	.68	.56	.52	.68

** $P < .01$, *** $P < .001$

Path Coefficients: As shown in Figure 1, the magnitude of the total effect of subjective health on the depression of the elderly living in nursing homes. Figure 3 shows the coefficients of each path for verification of the dual-mediated effect. Analysis of the coefficients of each path reveals statistical significance. However, the direct influence of subjective health on satisfaction with living arrangements (.0527, $p = .1053$) was not significant. The subjective health of the elderly had a statistically significant positive effect on satisfaction with the quality of service (.2045, $p < .001$) and a negative effect on

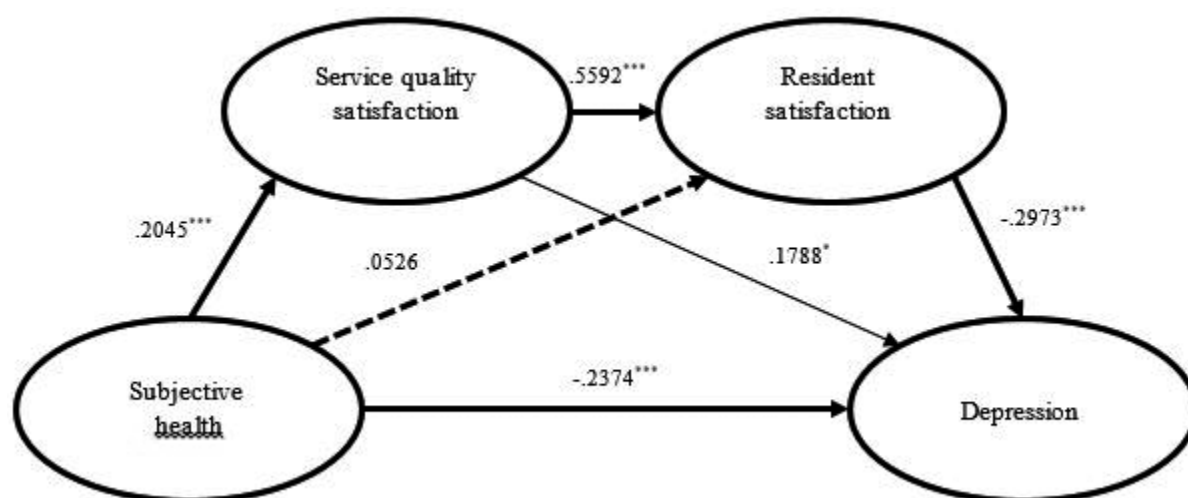
depression (-.2374, $p < .001$). The satisfaction with the quality of service had a statistically significant positive effect on satisfaction with the living arrangements (.5592, $p < .001$), which in turn exerted a statistically significant negative effect on depression (-.2973, $p < .05$).

Although the total effect of subjective health on depression was $\beta = -.3236$ ($p < .001$), the effect of subjective health on depression was $\beta = -.2374$ ($p < .001$), smaller than the former. That is, satisfaction with the quality of service and satisfaction with living arrangements have significant mediating effects on depression.



*** P<.001

Figure 2: The total effect of subjective health on depression



* P<.05 *** P<.001

Figure 3: The dual mediation effect of satisfaction with the quality of service and resident satisfaction

Verification of dual mediation effect: This study used the SPSS PROCESS macro to verify the dual mediation effects in the relationship between subjective health and depression, and verified the mediation effect through bootstrapping²². Therefore, a bootstrap procedure with 5,000 iterations was done, and the confidence interval was set to 95%. As shown in Table 2, the total size of the mediation effect was -.0862 (-.1439 to -.0397), indicating absence of 0 in the 95.0% confidence interval. Therefore, the total mediation effect was significant. The expected performance of the simple mediation effect of subjective health -> satisfaction with the quality of service ->depression was -.0366 (-. 0707 to .0001),

indicating the absence of 0 in the 95.0% confidence interval, which indicates a significant effect. But the expected performance of the simple mediation effect of subjective health -> satisfaction with living arrangements -> depression was -.0156 (-. 0544 to .0034), suggesting the presence of 0 in the 95.0% confidence interval, and an insignificant effect.

However, the expected performance of the dual mediation effect of subjective health -> satisfaction with the quality of service -> satisfaction with living arrangements -> depression was -.034 (-.0749 to -.0123), and without a 0 in the confidence interval of 95.0%. Therefore, the dual mediation effect was proved to be significant.

Table 2: Dual mediating effect of Service quality satisfaction and Living satisfaction

Classification	Mediating effects			
	B	S. E.	BC 95% CI	
Subjective health -> Service quality satisfaction ->Depression	-.0366	.0175	-.0707	-.0001
Subjective health -> Resident satisfaction -> Depression	-.0156	.0172	-.0544	.0134
Subjective health -> Service quality satisfaction-> Resident satisfaction ->Depression	-.034	.0165	-.0749	-.0123
Total Indirect Effect	-.0862	.0265	-.1439	-.0397

Conclusion

This study aimed to investigate whether satisfaction with the quality of service and resident satisfaction mediate the relationship between subjective health and depression. Toward this end, the following research questions were set. First, what is the correlation between satisfaction with the quality of service, resident satisfaction, subjective health, and depression? Second, does satisfaction with the quality of service and resident mediate the relationship between subjective health and depression? The survey was completed with 381 elderly people in the long-term care facilities in Jan. to Feb, 2017. This study found out that, in the effect of physical health on depression, satisfaction with the quality of service and residential satisfaction have dual mediating effects.

These findings suggest the followings. First, the worse subjective health condition is, the higher depression is. Considering that over 40% of the Korean elderly perceive that their general health conditions are bad or very bad, it is very important to improve their health conditions in order to reduce depression among them. Accordingly, by encouraging those in facilities to participate in various health programs, take care of their diets, and be given proper treatment, it is necessary to improve their health, which will reduce depression of them.

Second, raising their satisfaction with the quality of service provided by facilities can reduce their depression. As of 2017, there are 20,377 nursing homes in Korea. The number of old people recognized as needing long-term care is 840,000. However, quality management and guidance and monitoring by the government on such facilities are not enough. So, it seems necessary to more thoroughly manage service quality. That is, by providing various environmental, physical, and social services which fit the demands of the elderly, it is possible to reduce their depression of them.

Third, as residential satisfaction can also reduce depression, it is necessary to lead the elderly to adjust themselves to facilities, and increase their residential satisfaction, which will reduce depression. Above all, as satisfaction with service quality has positive effects on residential satisfaction, it is necessary to find ways to raise their satisfaction with service quality.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Variance of Rates and Costs of Unplanned Readmissions in Tertiary Hospitals in South Korea

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ABSTRACT

This study attempted to estimate rates and costs of unplanned readmissions of high level hospitals Korea. Unplanned readmissions are used as a proxy of the quality of medical services. Korean Health Insurance reimburses tertiary hospitals 5% more fees than general hospitals. The gaps of the health insurance reimbursement rates are not based on the difference in quality of medical services among the level of hospitals. It needs to be reviewed whether the gaps are reflecting difference of the quality of medical services.

The Health Insurance Claims Data of patients readmitted within 28 days after discharge from tertiary hospitals in 2014 were classified into unplanned claims. Unplanned readmissions were compared with planned readmissions.

The risk-adjusted average readmission rate was 6.4% in all tertiary hospitals, but 5.7% in general hospitals with 500 beds or more. Coefficient of variance (CV) of readmission rate was higher in tertiary hospitals (32.8) than general hospitals with 500 beds or more (17.5). However, there was no significant difference in mean medical fees per unplanned readmission between two groups of hospitals. It was 3,810 Won in the tertiary hospitals and 3,834 Won in general hospitals with 500 beds or more.

The findings of this study showed that higher costs did not necessarily yield higher quality of care, suggesting that quality control measures should be required to reduce unplanned readmissions in tertiary hospitals.

Keywords: *readmission, unplanned readmission, healthcare insurance, admission cost*

Introduction

The reimbursement scheme that differentiates medical fees (hospitalization fees, examination fees, and meals) by types of medical institutions to compensate higher investment costs and manpower is being implemented in South Korea. Higher level hospitals usually specialize in more complicated medical treatment cases and are required to have more sophisticated equipment, facilities and highly skilled workforce that demand higher investment and operation costs. For these reasons, 130% medical fee rate is applied to tertiary

hospitals compared with 125% to general hospitals and 120% to hospitals with standard 100% ^[1, 2].

The designation criteria for tertiary hospitals include mostly quantitative characteristics of hospitals and do not include the quality of medical care. Higher payment rates are applied to tertiary hospitals as long as they are able to meet the criteria regardless of the quality of medical care. However, there might be cases that quality of their medical care is lower than general hospitals. It should be confirmed that higher quality of medical care justifies higher fee rates.

It can be assumed that quality medical care services have been provided if a patient is able to recover and discharged from hospital after inpatient care. However, if the patient has to be readmitted to the same hospital or another within a short period of time after discharge, the quality of medical care services should be suspected because the patient could be readmitted by insufficient or

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inadequate care of the previous admission. A readmission has been suggested as a proxy indicator to evaluate the quality of inpatient care services as it usually occurs as a result of poor or inadequate medical services. Because readmission index is considered as a useful indicator for outcome of medical care, efforts are needed to reduce inadequate readmissions [3].

The U.S. Centers for Medicare & Medicaid Services reported that the readmission rate of Medicare beneficiaries age 65 or older was about 20% during the period of 2003-2004. As a consequence, it was reported that some \$17 billion was spent due to unnecessary readmissions. It was also pointed out that estimated \$1.9 billion could be saved annually by reducing readmission rates. In 2013, maximum 1% cut of the total reimbursement was applied to penalize hospitals when their 30-day unplanned readmission rates for the previous three years exceeded the average [4].

There have been some concerns in associating quality of medical care with readmission rate since readmissions can occur due to co-morbidity regardless of efforts in improving medical care services of hospitals[5]. However, readmission rate is an indicator that can be measured by administrative data along with mortality rate. It is easier to measure than mortality rate as it happens more often. There have been many evidences that it is a valid marker to compare outcomes of hospital inpatient services [6].

Readmission rate is considered a reliable indicator to assess the quality of medical care of a hospital. It is necessary to examine whether the additional medical fees are commensurate with higher quality of medical care based on readmission rates by types of medical institutions. Since reimbursements made for tertiary and general hospitals were as much as 50% of the total amount of medical care reimbursements in 2014[7], unplanned readmissions should be reduced to prevent unnecessary costs.

This study attempted to examine whether higher medical fees of tertiary hospitals are commensurate with higher quality of medical care services by comparing frequencies of unplanned readmissions between tertiary hospitals and general hospitals.

Method

Data Source: In this study, we try to compare the tertiary hospitals with the general hospitals over 500 beds. Based

on the assumption that the medical services of advanced tertiary hospitals would be similar, we compared data of the hospitals with 500 or more beds.

Medical care claim statements (submitted to the Health Insurance Review and Assessment Service) of adult patients (age 18-120) who had been admitted to and discharged from tertiary hospitals and general hospitals more than 500 beds during January and December of 2014 were used as index admission. The subjects for comparison were patients discharged from tertiary hospitals and general hospitals. Based on index admission statements, readmissions were defined as cases of patients who were first hospitalized in tertiary hospitals, general hospitals, or hospitals and then readmitted to the same or other hospitals within a 28-day period from the date of discharge during January 2014 and January 2015 [Table 1].

Table 1: Categorizing of admissions

Category	Index Admits	Readmits
data	Health Insurance Claims data	
Target	Adult(age of 18~120) inpatient	
Date	2014. 1. ~ 2014. 12	2014. 1. ~ 2015. 1.
Institutions	Tertiary hospitals and general hospitals more than 500 beds	Tertiary hospitals, general hospitals, hospitals
Definitions	All admission statements (excluding in-hospital mortality)	First readmission to medical institutions within 28 days after discharge

The cases of in-hospital mortality were excluded from index admissions. The cases of patients who were transferred to other medical institutions were also not counted as it was hard to establish a causal attribution relationship between index admissions and subsequent readmissions. Only a claim statement of the final point medical institution was recognized as an index admission. In addition, diseases like cancers with frequent readmissions were excluded. Psychiatric and obstetric hospitals were also not accounted as the quality of these medical services because they could not be easily measured.

Multiple contiguous admissions were consolidated into a single episode of care with one claim statement.

Of 2,363,888 cases of admission statement collected and 1,585,857 cases (67.1%) were analyzed.

Research Model: Index admission statements were classified into two steps, first, single admission and readmission, then, readmissions were classified into planned or unplanned ones [Table 2].

Time frames for readmission, subjects, methods to classify readmissions into planned and unplanned ones, and risk adjustment methods are different from one research to another. Comprehensive criteria^[8] to evaluate readmissions to assess the quality of hospital medical services developed by CMS in cooperation with Yale University were used for this study. The planned readmission is defined always a planned diagnostic group such as chemotherapy, radiotherapy, delivery, rehabilitation, or non-acute disease. All the readmissions not included in the planned readmission were defined as unplanned readmission^[8-10].

Based on the research conducted by Shin and Lee^[9], we used 28-day time frame for readmission. A dependent variable was unplanned readmissions of all-cause, any reason.

All readmissions (all cause and any reason) were included in the analysis if they were readmitted 28 days or less after the previous discharge. The reason that readmission was not distinguished by main diagnosis is that there is no objective basis for the correlation between previous hospitalization and current hospitalization, and it was difficult to deduce quality or reason for readmission based only on documented record on admission^[8].

Table 2: Definition of terms

Terms	Definition
Index admission	All admission statements (in-hospital mortality excluded)
One single admission	Not readmitted
Readmission	Readmitted to medical institutions in 28 days or less after discharge
Planned Readmission	All planned diagnosis (planned diagnostic group such as chemotherapy, radiotherapy, delivery, rehabilitation, or non-acute disease) or non-acute diagnosis and potentially planned readmissions
Unplanned Readmission	All readmissions excluding planned ones

Analysis Method: The 2013 version AHRQ CCS (Agency for healthcare research and quality clinical classifications software), which classifies diseases into 259 diagnosis groups based on ICD-10 code, was applied^[11].

Screening claim statements for the presence of surgical procedure was based on DRG (diagnosis related group) numbers as it classifies diseases based on the KCD code and clinical procedure^[12]. The medical history of previous one year of an index admission subject was traced and classified by the presence of co-morbidity, based on Charlson Index of Quan^[13].

For the calculation of risk-adjusted unplanned readmission rates, hierarchical generalized linear models (HGLMs) was applied, including hospital-specific effect to adjust them for medical institutions. The geometric mean which applied weighted values to five cohorts (medicine, surgery, cardiorespiratory, cardiovascular, and neurology) was used (U.S. CMS method applied)^[8]. SAS Enterprise Guide 4.2 version was used to analyze Health Insurance Claims Data.

For the comparison of variance of the difference between groups the coefficient of variation (CV) was used. It is a simple and intuitive method to use when comparing two data when there is a difference in the average even though the units of analysis are different or the mean numbers are different.

The purpose of this study was to compare the difference between the two groups using the CV, assuming that the quality of care is different between the tertiary hospitals and the general hospitals with 500 or more beds.

A statistical hypothesis testing to verify whether a sample reliably represents total subjects was not necessary since the data analyzed in this study was a complete claims data of admission covering all health insurance beneficiaries. Difference in the analysis of this study can be interpreted as statistically significant, if any.

Result and Discussion

Cost of Admissions: Considering the total cost of medical care without regard to the LOS and the severity of illness, the total cost of the tertiary hospitals and general hospitals 500 beds or more was \$3,825 million. The total cost of the tertiary hospital was \$2,369 million, which was higher than the cost of the general hospital

by \$1,456 million. The cost of single admission of the tertiary hospital was \$1,962 million, and the cost of the planned readmission of general hospitals with 500 beds or more was the least, \$66 million.

The total cost per admission was \$2,412. In the tertiary hospital, the single admission was the lowest with \$2,477, and unplanned readmission was the highest

with \$3,389. In general hospitals with 500 beds or more, single admission was the lowest with \$2,108 and planned readmission was \$2,770. In the tertiary hospitals, the cost per admission was the highest in the case of unplanned readmission. In the general hospitals with 500 beds or more, the cost per admission was the highest in planned readmission [Table 3].

Table 3: Cost of admissions

Size of Hospital	Type of admits	No. of admits	%	Cost of admits	Cost per admits
Total		1,585,857	100.0	3,825	2,412
Tertiary hospitals	Sub total	916,251	57.8	2,369	2,585
	Single admit	792,274	50.0	1,962	2,477
	Readmits	Sub total	7.8	407	3,280
		planned	2.4	115	3,031
		unplanned	5.4	292	3,389
General hospitals (500 beds+)	Sub total	669,606	42.2	1,456	2,175
	Single admit	587,914	37.1	1,239	2,108
	Readmits	Total	5.2	217	2,657
		planned	1.5	66	2,770
		unplanned	3.7	151	2,610

Currency: \$ 1 = 1, 200 won

Risk-adjusted unplanned readmission rate and coefficient of variance: Using the hierarchical logistic regression method, the risk was corrected for each of the five cohorts, surgical, medical, cardiovascular, cardiorespiratory, and nervous. The risk-adjusted standardized unplanned readmission rate was estimated by calculating the weighted average score for each cohort.

Risk-adjusted standardized readmission rate of tertiary hospitals was 6.4% whereas that of general

hospitals with 500 beds or more was 5.7%. The variation of unplanned readmission rates of tertiary hospitals was higher compared to others. CV, an indicator for variation of medical institutions, was 17.5 in general hospitals with 500 beds or more whereas that of tertiary hospitals was 32.8. While there was no large variation in medical fees, the variation of risk-adjusted unplanned readmission rates as a marker of hospital care quality was large in tertiary hospitals [table 4].

Table 4: Risk-adjusted unplanned readmission rate

Category	Total	Tertiary	General hospitals, 500 beds or more
No. of Hospitals	94	43	51
Average(%)	6.0	6.4	5.7
STD	1.5	2.1	1.0
CV	24.5	32.8	17.5

Risk-adjusted unplanned readmission cost and coefficient of variance: The cost per admission of unplanned readmission was \$3,175 in the tertiary hospitals, \$3,195 in the general hospitals with 500 beds or more. The standard deviations (STD) by institutions

were 919 in the tertiary hospital, which was small and about 1/5 of that in general hospitals with 500 beds or more. The CV of risk-adjusted unplanned readmission cost in the general hospitals with 500 beds or more was about 4.5 times larger than the tertiary hospitals.

The cost per admission was similar each other. However, the STD and the CV of the cost per risk-adjusted unplanned readmission in general hospitals with 500 beds or more were much larger than the tertiary hospitals [Table 5].

Table 5: Risk-adjusted unplanned readmission cost

Category	Total	Tertiary	General hospitals, 500 beds or more
No. of Hospital	94	43	51
Cost per admits(\$)	3,186	3,175	3,195
STD(\$)	2,701	919	4,204
CV	84.6	28.9	131.6

Distribution of hospitals for risk-adjusted unplanned readmission rate: Hospitals were classified into two groups by the average of risk-adjusted unplanned readmission rate (6.0%). Hospitals with less than average were 23 (53.5%) institutions in tertiary hospitals and 30 (58.8%) institutions in general hospitals with 500 beds or more among the total 94 hospitals [Table 6].

Table 6: Distribution of hospitals by risk-adjusted unplanned readmission rate

Category	Total	Tertiary Hospitals	General Hospital more 500 beds
No. of Hospitals	Total	43(100.0%)	51(100.0%)
	Lower than the average	20(46.5%)	21(41.2%)
	Higher than the average	23(53.5%)	30(58.8%)

Discussion

In this study, cancer which cause frequent admission for treatment were excluded. Because readmission of cancer may not by insufficient quality of previous inpatient care or a series of procedures in the course of treatment. Some researches excluded cancer cases or cancer surgery in studying unplanned readmission. Further researches need to be conducted to find whether cancer cases are adequate to be included in studying readmission or not. This study was based on CMS of US standards however, it was recommended to establish criteria which could classify planned and unplanned readmission for Korean patients.

In Korea, patients throng into tertiary hospitals in large city such as Seoul. The tertiary hospitals are equipped with personnel, facilities, and equipment, thus the cost of medical care is higher than other level of hospitals. Quality of medical care was evaluated based on unplanned readmission rate with general hospitals with 500 beds or more with presumption that they maintain similar readmission rate with tertiary hospitals.

There was no significant difference in readmission rates between the two groups, but the variation of

readmission rates was greater in the tertiary hospitals. The result implied that the tertiary hospitals had the same additional medical fee rate, but the variation in quality of care was large. STD and the CV of the cost per admission in the general hospitals 500 beds or more were larger than those of the tertiary hospitals. The variation in quality of medical care in readmission rate was stable in general hospitals with 500 beds or more, but unstable in medical cost. Further analysis was needed on the factors affecting the variation in the cost of medical care for the hospitalized in general hospitals.

One of unique characteristics of medical system of Korea was a tendency of tertiary hospitals being concentrated in mega cities. As tertiary hospitals tend to shorten length of hospital stay, hospitalization and discharge cases are being dispersed to local hospitals. We used U.S. CMS criteria for this study to categorize planned and unplanned admissions. The criteria that are more suitable for Korean situation should be developed.

Improvement of patient satisfaction, timely and proper discharge, encouragement of use of outpatient care after discharge, follow up care, proper care in the initial hospitalization, and national level intervention^[14,15] are required to reduce readmissions.

Conclusion

The unplanned readmission rate of tertiary hospitals was higher than that of general hospitals. Despite the fact that 5%p more of medical fees for tertiary hospitals is applied, it can be assumed that the quality of medical services of general hospitals was better than that of tertiary ones.

The CV of unplanned readmission rate was higher in tertiary hospitals than in general hospitals with more than 500 beds, but the CV in cost was smaller in tertiary hospitals.

The variation of unplanned readmission rates for tertiary hospitals was the highest, suggesting that there was a significant difference of medical care quality among tertiary hospitals despite the fact that the same additional rate of medical fees was applied for all range of tertiary hospital services.

The STD and the CV of unplanned readmission cost in general hospitals over 500 beds are large, which means that there is a large disparity in costs among institutions of this hospital level.

Further study on the gap of medical costs in general hospitals will be necessary because there may be differences in the medical costs of each general hospitals depending on the application of too many examinations or non-coverage item in health insurance system.

It is also necessary to review the hospital level adjustment for the institutions with higher readmission rate among the tertiary hospital and for the institutions with less readmission rate among general hospitals over 500 beds.

These findings suggest the significance of monitoring quality of hospital care through variation of unplanned readmission rate of medical institutions. Appropriate interventions to reduce readmissions by improving quality of medical care are required.

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