Traumatic Spinal Injuries: An Autopsy Study at Tertiary Health Care Center of Rajasthan During the Year 2017-18

R.K.Punia[1], Sanjay Achra[2]

[1]Senior Professor & Former Head, Forensic Medicine SMS Medical College, Jaipur (Raj.), [2]Sanjay Achara Medical Officer, BDK Govt. Hospital, Jhunjhunu & Former M.D. Resident Forensic Medicine SMS Hospital, Jaipur, (Raj.)

Abstract

Introduction: India is a developing country with traumatic fatalities is on the rise. Accurate injury profiles are helpful in prevention strategies as well as clinical and community services for persons suffering trauma especially of spinal region.

Aim & Objectives

Aim: To study the pattern of traumatic spinal injuries observed in medico-legal autopsies at S.M.S. Hospital, Jaipur during the study period 2017-18

Objectives

1. To observe the pattern of traumatic spinal injuries.
2. To observe survival pattern among the patients with soinal injuries
3. To observe the demographic data of traumatic spinal injuries.

Material & Method: Descriptive type of observational study of autopsy conducted at Mortuary of Department of Forensic Medicine, SMS Hospital, Jaipur from 1st April, 2017 to 31st March, 2018among Bodies with spinal injuries brought for medicolegal study during study period

Observations: a total number of 150 autopsy cases were included in the study.

Out of 150 cases of traumatic spinal injuries, there were 132 males (88%) and 18 females (12%). Maximum numbers of fatalities with spinal injuries were observed in 21-30 years age group (24.66%), there were 75.33% cases from rural regions unemployed (50.67%).

Majority of cases suffered fatality in one to seven days after the traumatic episode (41.33% cases). Road traffic accidents were the major offenders (44.00%) in the present study followed by falls. Level of spinal injury Mid cervical 53 (35.33%). Associated vertebral injuries seen along with spinal injuries as fractures of vertebrae in 49.33% cases and fractures along with dislocations in another 49.33% cases.

Suggestions:- Male of earning age group should be target group for education and awareness of spinal injuries prevention education. Mid cervical protection modalities should be deployed

Key words:- *spine, cervical, vertebral injuries*

Corresponding Author:-
Dr. R.K.Punia,
Senior Professor & Former Head, Forensic Medicine,
S.M.S. Medical College, Jaipur (Raj.)
rkpunia86@gmail.com

Introduction

Spinal injuries one of the major causes of death and disability around the globe1 including India2 and are of a major public health concern. Spinal injury may be caused by traffic and non traffic accidents, falls from

same or higher levels, fall of heavy objects on the head, neck and back of the body, etc. which may vary in manner from accidental or self inflicted or inflicted by others3,4. Trauma to the spine may result in fractures with and without dislocations of the spine, acute injury of inter-vertebral discs, and neurovascular injuries5. Although well protected by bony vertebral encasement and tough muscular and ligament support, yet damage to spinal cord may result, directly by fractures or dislocations of vertebrae or indirectly due to acceleration and deceleration injuries (whiplash injury) resulting in concussion, lacerations, hemorrhage, contusions and prolapsed of spinal cord. Trauma to the spinal cord leads to neurological damage that may affect motor, sensory, visceral, genital and nutritional functions[1].

India is a developing country with traumatic fatalities, like road accidents and falls, on the rise. Accurate mortality statistics from these vices of development are collected in various regions over different periods by researchers [6,7,8]. Such statistics of morbidity and mortality profiles are helpful in recommendations of prevention strategies, improving emergency trauma care, and to frame appropriate services with affordable health packages for their management. No mechanisms of documentation of such statistics including spinal injuries are available at National level in the country. Also, the available literature pertaining to traumatic spinal injuries in medico legal deaths is deficient in this region.

Epidemiological studies are always an asset in planning prevention strategies as well as clinical and community services for persons suffering trauma. They also provide a baseline for monitoring the effectiveness of interventions. Epidemiology of a particular ailment is linked to social, environmental, cultural and biological issues and thus varies over regions and times.

This study was thus initiated in order to observe the pattern of traumatic spinal injuries in medico-legal autopsies of traumatic fatalities at S.M.S. Hospital, Jaipur during the year 2017-18, discuss their causes and their contributions to mortality. An attempt was made to suggest recommendations to clinicians as regards to formulation of more effective diagnostic and management protocols and suggest measures to prevent mortality in cases of vertebral trauma with or without injuries to the spine.

Aims & Objectives

Aims

To study the pattern of traumatic spinal injuries in medico-legal autopsies at S.M.S. Hospital, Jaipur during the study period

Objectives

1. To observe traumatic spinal injuries pertaining to region and associated fractures/ dislocations of vertebral column

2. To observe the mode, mechanism, and manner of traumatic spinal injuries.

3. To observe medico-legal and socio-demographic profile of traumatic spinal injuries.

Material & Method

This study was carried out at the Department of Forensic Medicine, SMS Medical college & Hospital, Jaipur after obtaining due clearance from research and review board of SMS Medical college & Hospital, Jaipur as dissertation of MD Course .

Study type:

Descriptive type of observational study.

Study Area:

Mortuary, Department of Forensic Medicine, SMS Hospital, Jaipur.

Study Period:

One year from 1st April, 2017 to 31st March, 2018

Study Universe:

Medico-legal autopsies conducted at SMS Hospital, Jaipur during the study period.

Cases:

Medico-legal autopsies conducted at SMS Hospital, Jaipur during the study period with traumatic spinal injuries

Inclusion criteria:

Autopsy cases of traumatic spinal injuries

Exclusion criteria:

1 autopsy cases with incomplete body presented for postmortem examination

2. Cases with traumatic spinal injuries with history of previous pathological conditions of spine.

3. Cases of spinal injuries due to mechanical asphyxia.

4. Subjects with other medical, surgical or metabolic conditions affecting mortality are excluded

Sample Size

Sample size was calculated at 95% confidence level assuming prevalence of 75.95% cases with cervical cord injuries as found in reference article at the absolute allowable error of 10% for which sample of 70 cases of medico-legal autopsies of traumatic spinal injuries in medico-legal deaths were required for the present study.

Method

Detailing of medico-legal information was done on basis of information in the inquest papers and that available from attendants of the deceased. Detailed data were recorded pertaining to the pattern of spinal injuries, region involved, level of spinal injury, duration of survival, isolated and non-isolated spinal injury along with details of associated injuries,

During autopsy, vertebral column was examined from anterior as well as from posterior approach, in different cases. If injuries were observed in the spine, then spinal canal was dissected further to visualize the spinal cord.

Ethical Clearance : Taken from research , Review and Ethical committee of SMS Medical College & Hospital, Jaipur.

Statistical Analysis

The findings were then entered in Microsoft excel datasheet and tabulated for data analysis. Continuous variables were summarized as mean and standard deviation whereas nominal/ categorical variables as proportions. Statistical analysis was then conducted using Medcalc 7.4 version software. Chi square test was used for analysis of nominal categorical variables. P value<0.05 was considered as significant.

Observations

A total of 3139 medico-legal autopsies were conducted at SMS Hospital, Jaipur during the study period, out of which the total number of autopsies in which spinal injuries were documented were 193 cases but the calculated sample size was 100 cases and after eliminating the cases of fatalities with spinal injuries as per the inclusion and exclusion criteria, a total number of 150 cases were included in the study.

Table 1: Age group and gender wise distribution of medico-legal fatalities with spinal injuries

Age Group	Gender		Total
	Male	Female	
00-10	01 (0.75%)	02 (11.11%)	03 (02.0%)
11-20	12 (09.09%)	00 (0.0%)	12 (08.0%)
21-30	34 (25.75%)	03 (16.66%)	37 (24.66%)
31-40	29 (21.96%)	06 (33.33%)	35 (23.33%)
41-50	23 (17.42%)	05 (27.77%)	28 (18.66%)
51-60	23 (17.42%)	02 (11.11%)	25 (16.66%)
>60	10 (07.57%)	00 (0.0%)	10 (06.66%)
Total	132 (88.0%)	18 (12.0%)	150 (100%)

Out of 150 cases of traumatic spinal injuries, there were 132 males (88%) and 18 females (12%). The overall male: female ratio was 22:3. Maximum number of fatalities with spinal injuries were observed in 21-30 years age group (24.66%), followed by 31-40 years (23.33%), 41-50 years (18.66%), 51-60 years (16.66%), 11-20 years (8%), and > 60 years (06.66%). Least number of traumatic fatalities with spinal injuries were observed in < 10 years age group with only three cases (02%). There was no female casualty with spinal injuries in 11-20 years and in more than sixty years age group. The youngest female was seven years of age and the oldest one was sixty years of age.

Table 2: Distribution of cases of medico-legal fatalities with traumatic spinal injuries according to mode of injury (traumatic episode) (n=150)

Mode of injury	**Number of cases**
Road traffic accident	67 (44.67%)
Fall from height	55 (36.67%)
Fall of heavy object	15 (10.0%)
Slip & fall	09 (06.0%)
Assault	03 (02.0%)
Run over by train	01 (0.66%)
Total	150 (100%)

Road traffic accidents were the major offenders (44.67%) in the present study followed by falls occurring from same or higher levels (42.67%). 10% cases suffered injuries due to fall of heavy object on the upper body and least fatalities resulted due to injuries inflicted by others deliberately (2%) and railway death (one case- 0.66%).

Table no. 3 Distribution of cases of medico-legal fatalities with traumatic spinal injuries according to the level of spinal injury and Survival Period

Level of spinal injury	**Survival period**				**Total**
	Brought dead or within 06 hrs	**06-24 hrs**	**01-07 days**	**>07 days**	
Upper cervical	02 (25%)	01 (12.5%)	02 (25%)	03(37.5%)	08 (5.33%)
Upper & mid cervical	05(38.46%)	0 (0.0%)	05 (38.46%)	03(23.08%)	13 (8.67%)
Mid cervical	12(22.64%)	0 (0.0%)	23 (43.39%)	18(33.97%)	53(35.33%)
Mid & lower cervical	03(09.68%)	0 (0.0%)	14 (45.16%)	14(45.16%)	31(20.67%)
Lower cervical	04(16.67%)	01 (04.16%)	12 (50%)	7 (29.17%)	24 (16%)
Thoracic	02(15.38%)	01 (07.7%)	04 (30.77%)	06(46.15%)	13 (8.67%)
Lumbar	02(33.33%)	0 (0.0%)	02 (33.33%)	02(33.34%)	06 (4.0%)
Lumbo-sacral	0 (50%)	0 (0.0%)	0 (0.0%)	2 (100%)	02 (1.33%)
Total	30 (20%)	03(02.0%)	62 (41.33%)	55(36.67%)	150 (100%)

Categorizing the spinal injury according to its level, it was observed that there were 129 cases (86%) of cervical injuries, 13 cases of thoracic injuries (08.67%) and remaining 05.33% (08 cases) of Lumbar (06 cases) and lumbo-sacral (02 cases) levels. The cervical injuries were further divided into Upper (C1-C2), Mid (C3-C5) and Lower (C6-C7). Out of 129 cervical injuries, there were eight cases of upper cervical (06.2%), 53 cases of mid cervical region (41.1%), 13 cases involving upper and mid cervical regions (10.2%), 24 cases of lower cervical (18.5%) and remaining 31 cases involving mid and lower cervical regions (24%). Combined, there were 75.2% cases in which the mid cervical region was affected in trauma.

While observing the level of spinal injuries in relation to the survival period, it was found that 50% cases of lower cervical, 45.16% cases with mid to lower cervical injury, 43.39% cases of mid cervical injury, 38.46% cases of upper to mid cervical injuries and 25% cases upper cervical and lumbo-sacral; and 30.77% cases of thoracic injuries died in one to seven day period. 38.46% of upper to mid cervical, 25% cases each of upper and 22.64% cases of mid cervical, 16.67% cases of lower cervical and 09.68% cases of mid to lower cervical were either brought dead or died within six hours. 45.16% cases of mid to lower cervical, 37.5% cases of upper cervical region, 33.97% cases of mid cervical, 29.17% cases of lower cervical and 23.08% cases of upper to mid cervical region succumbed to the injury after a period of one week. 46.15% cases of thoracic injuries died after one week, 30.77% cases died in one day to one week, 15.38% cases died on spot or in six hours and rest 7.7% cases died in six to twenty four hours. In injuries caused to lumbo-sacral region of spine, it was observed that 25% cases each died either on spot or within a week. Rest 50% cases suffered fatality after one week's time. No case of lumbo-sacral injury suffered fatality in six to twenty four hours.

Conclusion

Spinal injuries were commonly observed in day to day accidents and also displayed reasonable fatality. Fatality resulting from spinal injuries was delayed in most cases thus implying the need for timely and effective intervention for prevention of mortality. There is a need to increase the establishment of specialized spinal injury management centers across the country. Early referral and transfer of patients from peripheries to specialized centers needs to be encouraged for further preventing mortality. Thus, more tertiary trauma care centers should be established with efficient services for spinal injuries.

Steps must also be taken to improve injury surveillance and the quality of data collected. Detailed and relevant studies on larger samples will guide prevention efforts aimed at risk factors in the individual and the environment and provide feedback to trauma care providers. Further monitoring of these trends will influence training, improve the focus of the trauma service and direct the provision of more effective care to these severely injured patients.

Limitations of the Study

Anything that is perfect is dead. The thesis/ dissertation is alive due to its limitations. No scientific study is ever over without limitations. Postmortem studies arguably have additional limitations. There are multiple confounding factors which need to be considered.

1. All the above data was recorded as per available information and medico-legal examination but was not cross tallied with police investigation records.

2. The data recorded was on the basis of Hospital records and verbal questionnaire and history given by attendants of the victim or deceased.

3. The study is limited to the outcomes of the incidence. Due to lack of interview with the persons available at the site of incidence, the factors that contributed to the cause of trauma is unknown and hence not included in the study.

4. Limited sample size and minimal detailing for few variables.

5. Spinal cord dissection was carried out on autopsy in cases with observable vertebral injures, thus missing out cases of spinal cord trauma without injury to bony encasement.

Recommendations

I. RECOMMENDATIONS FOR THE TREATING DOCTORS TO PREVENT THE MORTALITY IN SPINAL INJURIES

All the cases of trauma must be properly evaluated for spinal injuries and promptly managed to prevent mortality and morbidity.

Preventive measures like intermittent catheterization, aseptic procedures in setting up intravenous line, chest physiotherapy and pulmonary toileting to reduce mortality from sepsis.

Special care and attention should be given and frequent turning of patients must be done to prevent bed sores help to prevent bed sores and other complications leading to death due to septicemia and multi organ failure.

Regional Tertiary case specialized Spinal injury centers should be established and early referral of cases with Traumatic spinal injuries should be encouraged to such specialized centers to reduce mortality in these cases.

III. RECOMMENDATIONS TO DECREASE THE INCIDENCES OF TRAUMATIC SPINAL INJURIES

high speed vehicles should be with well equipped safety measures.

High speed interceptors should be installed at all major roads and highways.

Bikers should be made aware about the safety gears and sensitized beyond just traffic mandatory gears.

Extended neck protection helmets should be promoted for sale by subsidy and promotional money awards.

Substance abuse while driving and pedestrian use should be discouraged.

Workers should be educated about basis safety standards and equipment like ropes and harnesses to be used while cutting trees, working on high rise buildings and under construction projects.

Preventive measure must be compulsion on heights for people at risk.

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