DOI Number: 10.37506/v20/i1/2020/mlu/194557

Relationship between Pain-induced Temporomandibular Joint Pain According to Cell Phone Use Frequency

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Abstract

Background/Objectives: The purpose of this study is to investigate whether the use of mobile phone is related to the pain of the jaw joints.

Method/Statistical Analysis: This study was designed as a cross-sectional survey. The purpose of this study was to explain the research objectives of 304 university students in Busan and the data was collected using the convenience sampling method. Of the total 304 subjects, 300 were included from the questionnaire, except for four who were inappropriate to use the data.

Findings: The general characteristics of the subjects were 227 females (75.7%) and 73 males (24.3%) among the 300 respondents. In the index of pain of the joint with the average number of calls per day, 44 people (14.7%) for less than 1 time, 36 people (12%) for 1 to 2 times, 100 (33.3%) for 3 to 4 times, 106 (35.3%) for 4 to 5 times, 14 people (4.7%) for more than 5 times, and analyzed the pain index according to the average number of calls per day showed a significant difference in pain index for 'hard food' ($p = 0.019$) and 'discomfort during closing' ($p = 0.037$). Jaw joint pain index was significantly different between male and female, 4.62 points and 4.35 points, respectively ($p = 0.001$). However, there was no significant difference from other joint pain symptoms.

Improvements/Applications: It was difficult to generalize the results to all university students because the study was limited to university students in some universities in Busan area. In addition, it is necessary to consider other factors of pain in the joint, and further study on cell phone and joint pain through the diversification of the sample area and the increase in the number of samples is considered. However, it is hoped that it can contribute as a basic data for more systematic epidemiological studies for all citizens in the future.

Keywords: *Temporomandibular joint, pain, cell phone, Frequency, Joint noise.*

Introduction

Recently, with the development of information technology at home and abroad, the use of mobile phones is increasing rapidly. 63.6% of the general public in Korea use smartphones, and the first time smartphones were used in 2011 was 47.8%[1]. Compared to 40% of total distributed smartphones in Korea, the utilization rate is somewhat higher, but considering that the survey targets 15 to 49 years old and are major cities by region, it can be seen that 3 out of 5 adults live in major cities using a smartphone[2]. In addition, it is analyzed that the rapid spread of smartphones has been continued since 2010 and 2011 are almost equally proportioned[3]. As society becomes more sophisticated, specialized, and more competitive, societal stress increases and more patients complain of symptoms of jaw joint disorder. Recently, as patients acquire information about the disease of the jaw joint through various media and increase their interest,

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the demand for treatment of the jaw joint disorder is increasing and the share of dental sector is expected to increase. Frequent use of mobile phones can cause temporomandibular disorders if the habits of talking on the phone between the chin and shoulders, jaw-gripping habits, bad posture, etc. Temporomandibular disorders (TMD) is a generic term that includes many clinical problems in the masticatory and temporomandibular joint sites and refers to a complex of several disorders that occur in the chewing system[4]. In addition, the causes of temporomandibular disorders include direct facial trauma such as traffic accidents, beatings and shocks, bad habits such as cracking, dent bites, poor posture, lip or cheek bites, occlusion or malocclusion, stress, depression, and anxiety. Psychological factors, such as these various factors act in combination, causing, persisting and worsening temporomandibular disorders. The main symptoms of temporomandibular disorders are clinical features such as pain and discomfort in the jaw or masticator muscle, pain in occlusion, limitation and impairment of mandibular movement, and joint noise[5]. The most common of these is pain, which can be painful to the masticatory muscles or dislocations (the area corresponding to the front of the ear)[6]. The causes of temporomandibular disorders have a variety of factors, of which five major factors are occlusion, trauma, emotional stress, influx of deep pain, and dysfunctional activity[7]. In other words, the symptoms of temporomandibular disorders and oral facial pain are very diverse, the causes are also very complex, and interest and research on temporomandibular disorder diseases continue[8]. However, there have been many reports on the prevalence and specific analysis of temporomandibular disorders, but few studies have investigated the relationship between cell phone usage and temporomandibular pain. Therefore, the purpose of this study is to investigate whether the use of mobile phone is related to the pain of the jaw joints.

Method

This study was designed as a cross-sectional survey. From November 3, 2018 to November 10, 2018, the purpose of this study was to explain the research objectives of 304 university students in Busan and the data was collected using the convenience sampling method. Of the total 304 subjects, 300 were included from the questionnaire, except for four who were inappropriate to use the data.

Mention the statistical details, the number of samples used, statistical tools/software used/SD/level of significance, repeatability etc.

Self-investigated questionnaire using structured questionnaire, the general subjects, the presence of traumatic trauma and treatment experience, subjective symptoms of temporomandibular joint and habits related to temporomandibular joint health, and diaphragmatic disorder related to temporomandibular disorder were identified.

The questionnaire used in this study included 7 questions about general matters, 2 questions about trauma and presence of treatment experience, 23 questions about subjective symptoms of temporomandibular joints, and 20 related habits related to temporomandibular health. A total of 53 questions consisted to 1 item of opening disorder related to temporomandibular disorder.

Statistical analysis of the collected data was done using IBM SPSS Statistics 24 program. The general subjects were calculated by frequency analysis, and the pain index according to gender, daily call volume, and average weekly talk time was calculated by One-Way ANOVA.

Results and Discussion

The general characteristics of the subjects were 227 females (75.7%) and 73 males (24.3%) among the 300 respondents. The number of respondents was 209 (69.7%) under 18-20 years old and 91 (30.3%) under 21-33 years old. The distribution of mobile phone usage by type was 211 students (70.3%) who frequently use SNS during the day, 73 students (24.3%) who did not, and 16 students (5.3%) who do not know. Average number of calls per day was 14 (4.7%) for less than 1 time, 106(35.3%) for one to two times, 100 (33.3%) for three to four times, 36 (12%) for four to five times, and 44 (14.7%) for more than five times. The average weekly talk time on cell phones was 105 people (35%) under two hours, 69 people (23%) between two to three hours, 58 people (19.3%) between three to four hours, 19 people (6.3%) between four to five hours, and 48 people (16%) for more than five hours [Table 1].

Table 1. General Characteristics of Subjects

			%
Gender	Male	73	24.3
	Female	227	75.7
Age	Between 18 to 20	209	69.7
	Between 21 to 33	91	30.3

			%
Possession of a mobile phone	Yes	300	100
	No	0	0
SNS usage	Frequent use	211	70.3
	Do not use	73	24.3
	Do not know	26	5.3
Call count	Less than 1 time	14	4.7
	1 to 2 times	106	35.3
	3 to 4 times	100	33.3
	4 to 5 times	36	12
	More than 5 times	44	14.7
Average talk time per week	Less than 2 hours	105	35
	Between 2 to 3 hours	69	23
	Between 3 to 4 hours	58	19.3
	Between 4 to 5 hours	19	6.3
	More than 5 hours	47	16.0

In the index of pain of the joint with the average number of calls per day, 44 people (14.7%) for less than 1 time, 36 people (12%) for 1 to 2 times, 100 (33.3%) for 3 to 4 times, 106 (35.3%) for 4 to 5 times, 14 people (4.7%) for more than 5 times, and analyzed the pain index according to the average number of calls per day showed a significant difference in pain index for 'hard food' ($p = 0.019$) and 'discomfort during closing' ($p = 0.037$) [Table 2].Jaw joint pain index was significantly different between male and female, 4.62 points and 4.35 points, respectively ($p = 0.001$). However, there was no significant difference from other joint pain symptoms [Table 3].

In the case of pain in the joints according to the average weekly talk time, 106 less than 2 hours (35%), 69 between 2 to 3 hours (23%), 58 between 3 to 4 hours (19.3%), 19 between 4 to five hours (6.3%), and 48 for over 5 hours (16.0%). As a result of analyzing the pain index of the joint according to the average weekly talk time, there was a significant mean difference between group in 'Joint noise' ($p = 0.050$) [Table 4].

Table 2. Joint pain in accordance with the average number of calls per day

Sort	Average number of calls per day					p-value*
	Less than 1 time	1 to 2 times	3 to 4 times	4 to 5 times	More than 5 times	
	n = 44	n = 36	n = 100	n = 106	n = 14	
Inconvenience when yawning	4.16±1.14	3.83±1.06	4.02±1.01	3.97±1.09	4.29±1.77	0.605
Joint noise	4.07±1.32	3.47±1.13	3.58±1.18	3.61±1.36	3.86±1.88	0.206
Opening disorder	4.64±0.65	4.19±1.04	4.42±0.88	4.57±0.78	4.57±1.74	0.162
Jaw joint pain	4.36±0.89	4.14±1.13	4.32±0.97	4.32±0.86	4.64±1.65	0.588
Jaw discomfort	4.43±0.90	4.11±1.01	4.28±0.89	4.40±0.81	4.57±1.60	0.364
Jaw joint stiffness	4.45±0.82	4.14±0.99	4.29±0.89	4.41±0.81	4.64±1.45	0.299
Hard food	4.09±1.01[a]	3.33±1.04[a]	3.84±1.04[a]	3.94±0.92[a]	3.86±1.83[b]	0.019
Chin shift during opening and closing	4.48±0.95	4.06±0.98	4.20±1.04	4.38±0.93	4.57±1.70	0.206
Discomfort while closing	4.61±0.75[a]	4.28±0.74[a]	4.48±0.72[a]	4.26±1.02[a]	4.86±1.35[b]	0.037

*p-value was calculated by One-Way ANOVA, [ab]Duncan's post-hoc test; No significant differences in the same characters.

Table 3. Jaw joint pain index by gender

Sort	Gender		p-value*
	Male n = 73	Female n = 227	
Inconvenience when yawning	4.21±1.10	3.95±1.09	0.861
Joint noise	3.86±1.31	3.60±1.29	0.880
Opening disorder	4.58±0.78	4.45±0.93	0.182
Jaw joint pain	4.40±0.96	4.30±0.98	0.981
Jaw discomfort	4.58±0.81	4.26±0.94	0.078
Jaw joint stiffness	4.48±0.81	4.31±0.92	0.399
Hard food	4.14±1.07	3.76±1.04	0.383
Chin shift during opening and closing	4.38±0.98	4.28±1.04	0.803
Discomfort while closing	4.62±0.57	4.35±0.96	0.001

*p-value was calculated by t-test

Table 4. Joint pain index according to weekly average talk time

Sort	Weekly average talk time on the phone					p-value*
	Less than 2 hours	2 to 3 hours	3 to 4 hours	4 to 5 hours	More than 5 hours	
	n = 105	n = 69	n = 58	n = 19	n = 47	
Inconvenience when yawning	3.94±1.26	4.00±1.04	4.02±0.91	3.95±0.97	4.21±1.10	0.845
Joint noise	3.57±1.47	3.64±1.25	3.52±1.17	3.74±0.99	4.08±1.20	0.050
Opening disorder	4.58±1.02	4.42±0.79	4.33±0.85	4.42±0.96	4.60±0.77	0.219
Jaw joint pain	4.31±1.10	4.28±0.95	4.22±0.96	4.21±1.08	4.54±0.71	0.571
Jaw discomfort	4.40±1.01	4.19±0.91	4.14±0.95	4.21±0.92	4.69±0.59	0.457
Jaw joint stiffness	4.43±0.98	4.28±0.82	4.12±0.90	4.26±0.99	4.60±0.74	0.888
Hard food	3.95±1.10	3.75±1.01	3.50±1.03	3.68±1.06	4.25±0.96	0.095
Chin shift during opening and closing	4.38±1.10	4.17±1.06	4.03±0.96	4.16±1.07	4.71±1.02	0.192
Discomfort while closing	4.50±0.94	4.16±1.01	4.26±0.72	4.37±0.96	4.79±0.54	0.472

*p-value was calculated by One-Way ANOVA

In recent years, the prevalence of pain disorders in the neck and shoulders has increased due to inadequate sedentary work[9]. In addition, studies have been linked to the occurrence of temporomandibular disorders[10], and a study on the change in the prevalence of jaw joint disorders in Korean has shown that the prevalence of jaw joint disorders gradually increases over the last three years[11]. Therefore, the purpose of this study was to investigate the relationship with the jaw joint pain according to the frequency of cell phone use. According to the study, the average number of calls per day was 44 people (14.7%) for less than 1 time, 36 people (12%) between 1 to 2 times, 100 people (33.3%) between 3 to 4 times, 106 people (35.3%) between 4 to 5 times, 14 people (4.7%) for more than 5 times. In other words, the average number of call per day was 180 or more (60%). The higher the volume, the more significant differences there were between 'hard food' and 'discomfort during closing'. The higher the number of phone calls per day, the more relevant the pain in the jaw joints. The most significant difference in symptom of 'discomfort during closing' in the pain of the joints by gender seems to be because women reach puberty earlier than men and this affects the teeth. Average weekly talk time was 106 people (35%) for under 2 hours, 69 people (23%) between 2 to 3 hours, 58 people (19.3%) between 3 to 4 hours, 19 people (6.3%) between 4 to 5 hours, and 48 people (16.0%) for more than 5 hours. As the average weekly talk time increased, the question 'I feel pain when I opened my mouth or closed' was found to be significantly related. The average weekly talk time is increasing, indicating that you are experiencing joint pain. However, it was difficult to generalize the results to all university students because the study was limited to university students in some universities in Busan area. This study examined the use of mobile phones and the pain related to the jaw joints through a limited number of university students in Busan. As a frequency of use of mobile phones increased, we expected that the pain of the jaw joints would vary. However, the lack of questionnaire questions resulted in disappointing results. In addition, it is necessary to consider other factors of pain in the joint, and further study on cell phone and joint pain through the diversification of the sample area and the increase in the number of samples is considered. However, it is hoped that it can contribute as a basic data for more systematic epidemiological studies for all citizens in the future.

Conclusion

The purpose of this study was to examine 300 university students in Busan to investigate the association with the incidence of pain the jaw joint as the frequency of cell phone usage increases by using SPSS WIN 24 to analyze and the results are as follows:

1. In the index of pain of the joint with the average number of calls per day, 44 people (14.7%) for less than 1 time, 36 people (12%) for 1 to 2 times, 100 (33.3%) for 3 to 4 times, 106 (35.3%) for 4 to 5 times, 14 people (4.7%) for more than 5 times, and analyzed the pain index according to the average

number of calls per day showed a significant difference ($p<0.05$) in pain index for 'hard food' ($p = 0.019$) and 'discomfort during closing' ($p = 0.037$)

2. Jaw joint pain index was significantly different between male and female, 4.62 points and 4.35 points, respectively ($p = 0.001$). However, there was no significant difference from other joint pain symptoms.

3. In the case of pain in the joints according to the average weekly talk time, 106 less than 2 hours (35%), 69 between 2 to 3 hours (23%), 58 between 3 to 4 hours (19.3%), 19 between 4 to five hours (6.3%), and 48 for over 5 hours (16.0%). As a result of analyzing the pain index of the joint according to the average weekly talk time, there was a significant mean difference between group in 'Joint noise' ($p = 0.050$).

Ethical Clearance: Not required

Source of Funding: This work was supported by Dongseo University, "Dongseo Cluster Project" Research Fund of 2020

Conflict of Interest: Nil

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