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청소년 측두하악장애 환자와 수면시간과의 상관관계

청소년 측두하악장애 환자와 수면시간과의 상관관계 김 준 호

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청소년 측두하악장애 환자와 수면시간과의 상관관계

Relationship of Korean teenagers with temporomandibular disorder and sleeping hours

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초록

청소년 측두하악장애 환자와 수면시간과의 상관관계

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연구목적: 수면시간이 부족한 한국 청소년기의 구강안면통증질환의 하나인 측두하악장애와 수면시간과의 상관관계가 있는지를 평가하고자 한다.

연구대상 및 연구 방법: 2012년 조선대학교 치과병원 구강내과에 측두하악장애 증상으로 내원한 11-19세 청소년 522명을 대상으로 측두하악장애분석검사를 시행한 후 검사항목과 주관적인 수면시간과의 상관관계를 비교, 분석하였다.

결과: 청소년 측두하악장애 환자는 남성보다 여성이 더 많았으며, 10대의 연령 증가에 따라 유병율은 증가하였고 수면시간은 유의하게 감소하였다. 주소, 시각사상척도, 비기능적 습관, 진단명, 두통, 목과 어깨통증 그리고 치료기간과 수면시간과의 관계에 있어서 통계적 유의성은 없었다.

결론: 10대의 연령증가에 따라 측두하악장애 유병율은 증가하였으며, 반비례적으로 수면시간은 감소하였다.

주제어: 수면시간, 측두하악장애

Ⅰ. Introduction

Temporomandibular disorders (TMDs) are musculoskeletal diseases in the orofacial region and characterized with clinical symptoms such as pains in temporomandibular joint (TMJ), masticatory muscle, clicking sound and mouth opening limitation [1]. The prevalence of these disorders is varying yet ranging between 40-60% for whom has at least more than one TMD [2]. In previous domestic literatures, the range of age for these disorders (i.e., TMDs) was shown to be high in between 10-20 years old and prevalence rate was elevated with age [3-5]. There are five major etiological factors responsible for TMDs: occlusal condition, trauma, emotional stress, deep pain input, and para-functional activity [2]. Of these factors, para-functional activities include non-functional oral habits such as clenching, and bruxism that are mostly related with stress and sleeping and shown as nocturnal activities.

Sleep recovers consumed and damaged human body during daytimes and is important when it comes to reorganization of information as well as other brain functions related to memories. If adequate sleeping is not provided, mental/physical activities in normal daily life would be significantly declined and hallucinations and psychotic aspects might be shown in serious cases [6]. Sleeping disorders has been reported to be responsible for pain related physical diseases and affect headache, neuropathic pain, fibromyalgia, rheumatoid arthritis, bruxism, and orofacial pains [7]. Likewise, although it has been widely accepted that sleeping and pains is closely related each other, there is a paucity of literature studied orofacial patients including subjects with temporomandibular disorders; in case of South Korea, there are only two studies have been done regarding the association between sleeping and orofacial pains by, Lee[6] and Tae et al. [7].

An adolescent period is for rapid physical growth and critical in regards to development of personality, emotion and sociality. Contemporary youths however, are being exposed to various issues with learning disorders,

sleeping disorders and drug abuses that are significantly impacting normal life due to increases in cyber leisure activities (computer games and internet surfing) as well as examinations-oriented education [1]. The authors therefore would like to investigate the association between sleeping hours and TMDs, one of orofacial pain diseases found in an adolescent period, in Korean teenagers who lack with sleeping hours.

Ⅱ. Materials and Methods

A. Study subjects

Adolescents with TMDs, between the ages of 11 and 19, who visited the dental clinic of Chosun University in 2012, were enrolled for the study. Patients underwent the examinations for TMDs and the correlation between TMDs and subjective sleeping hours was investigated. Medical records of 522 patients (324 female patients and 198 male patients) were analyzed except for patients either without pains/discomforts or visited due to external injuries (Table 1). The sleeping hours were utilized for the analysis only if a subject was able to clearly and accurately describe their average sleeping hours. The current study was performed with an approval of the Bioethics Review Committee (CDMDIRB 1429-171)

B. Analysis items

1. Chief complaints

Major symptoms of TMDs were included including pains and discomforts in TMJ, clicking sound, mouth opening limitation, malocclusion, facial asymmetry, and bruxism. Other minor complaints were not included. Patients with more than one chief complaint were also included and analyzed.

2. Visual Analog Scale (VAS)

The degree of pains and discomforts of chief complaints was expressed using a scale of 1 to ten, where 10 was the highest.

3. Para-functional habits

For para-functional habits, bruxism, clenching, gum chewing, hard food favorite, nail/lips/inner cheek biting habits, tongue-thrusting, chin leaning, one sided sleeping habit, snoring and unilateral chewing habit were analyzed. Patients with more than one habit were included and analyzed.

4. Classification of arthralgia and myalgia as diagnosis results

According to the Research Diagnostic Criteria for TemporoMandibalar Disorder (RDC/TMD) [8], TMDs patients were diagnosed and then classified into patients with arthralgia, patients with myalgia, and patients with both (i.e., arthralgia + myalgia).

5. Headache and pains in neck and shoulders

Headache and pains in neck and shoulders, major common complaints in TMD patients, were analyzed.

6. Treatment period

Once diagnosed with TMDs, the treatment period was classified into less than one month, 1-3 months, 4-6 months, and more than 6 months.

7. Distribution of sleeping hours per age

The distribution of sleeping hours per age was analyzed

C. Statistical analysis

All results were analyzed via Fisher's Exact test, and the Pearson Chi-Square test using the SPSS window (version 18.0). Statistical significance was defined as $p<0.05$.

III. Results

A. Distribution of patients

Of a total of 522 patients, there were 198 male patients (37.9%) while 324 patients were female (62.1%). As depicted in the Figure 1 and Table 1, the patients with age of 10, 11, 12, 13 years old were accounted for 0.2%, 0.8%, 2.5%, and 5.7%, respectively. In addition, the patients with age of 14, 15, 16, 17, 18, and 19 years old were accounted for 7.1%, 12.6%, 15.5%, 17.8%, 18.6%, and 19.2%, respectively (Fig. 1, Table 1).

B. Relationship between chief complaints and sleeping hours

Pains and discomforts in TMJ were the most common chief complaint followed by clicking sound, and mouth opening limitation yet there was no statistical significance noted in between sleeping hours and chief complaints (Table 2).

C. Relationship between VAS and sleeping hours

Two-third of patients complained with pain less than VAS 5 yet no statistical significance was found in between VAS and sleeping hours (Table 3).

D. Relationship between para-functional habits sleeping hours

Among all analyzed para-functional habits, one sided sleeping habit was the most commonly claimed habit followed by unilateral chewing habit, chin leaning, nail/lips/inner cheek biting habits, clenching, snoring, gum chewing, hard food favorite, bruxism, and tongue-thrusting, respectively. Similarly, there was no significant relationship between para-functional habits and sleeping hours as well (Table 4).

E. Relationship between diagnosis results sleeping hours

There were more patients with muscular issues compared to those with joints or both muscle and joints. However, we were not able to find any statistical significance between diagnosis results and sleeping hours (Table 5).

F. Relationship between headache, pains in neck and shoulders and sleeping hours.

Approximately half of patients had either headache or pains in neck and shoulders; mostly patients complained pains in neck and shoulders; to note, there were more patients with both symptoms compared to those with headache only. No significant association between each symptom and sleeping hours was found (Table 6).

G. Relationship between patients' treatment period and sleeping hours

The treatment period was mostly less than 1 month yet no significant association between the treatment period and sleeping hours was found (Table 7).

H. Relationship between age and sleeping hours

As patients get older, the sleeping hours were declining; this association was statistically significant ($p<0.0001$) (Fig. 2, Table 8).

Fig. 1. Distribution of patients according to age

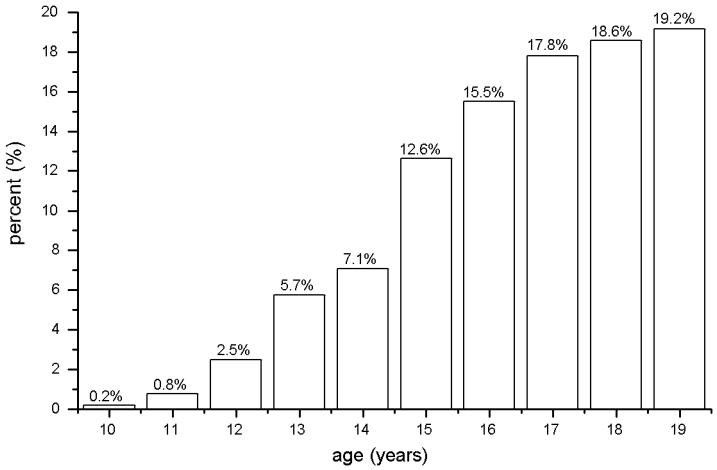


Table 1. Distribution of gender and age

Male (%)	Female (%)	Total (%)	Mean age	
			Male (yrs)	Female (yrs)
198 (37.93%)	324 (62.07%)	522 (100%)	16.74±0.126	16.41±0.117

Table 2. Distribution of chief complaint

chief complaint	sleeping hours (%)						Total	p-value*
	4↓	5	6	7	8	9↑		
TMJ discomfort, pain	41 (8.6%)	64 (13.5%)	137 (28.8%)	112 (23.6%)	81 (17.1%)	40 (8.4%)	475 (100%)	0.766
clicking sound	22 (10.1%)	33 (15.2%)	52 (24.0%)	55 (25.3%)	38 (17.5%)	17 (7.8%)	217 (100%)	
mouth opening limitation	6 (6.5%)	9 (9.7%)	26 (28.0%)	26 (28.0%)	17 (18.3%)	9 (9.7%)	93 (100%)	
malocclusion, facial asymmetry	0 (0%)	1 (7.7%)	6 (46.2%)	2 (15.4%)	4 (30.8%)	0 (0%)	13 (100%)	
bruxism	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (50%)	1 (50%)	2 (100%)	

↓ : below

↑ : above

* by Fisher's Exact Test

Table 3. Evaluation of severity of pain by Visual Analog Scale (VAS)

VAS	sleeping hours (%)						Total	p-value*
	4↓	5	6	7	8	9↑		
1	2 (6.5%)	3 (9.7%)	7 (22.6%)	12 (38.7%)	3 (9.7%)	4 (12.9%)	31 (100%)	
2	4 (8.39%)	5 (11.1%)	15 (33.3%)	13 (28.9%)	4 (8.9%)	4 (8.9%)	45 (100%)	
3	10 (9.8%)	17 (16.7%)	38 (37.3%)	17 (16.7%)	16 (15.7%)	4 (3.9%)	102 (100%)	
4	8 (10.5%)	5 (6.6%)	24 (31.6%)	14 (18.4%)	16 (21.1%)	9 (11.8%)	76 (100%)	
5	10 (8.3%)	19 (15.7%)	32 (26.4%)	28 (23.1%)	25 (20.7%)	7 (5.8%)	121 (100%)	0.293
6	5 (6.8%)	8 (10.8%)	23 (31.1%)	18 (24.3%)	13 (17.6%)	7 (9.5%)	74 (100%)	
7	2 (4.2%)	11 (22.9%)	7 (14.6%)	14 (29.2%)	7 (14.6%)	7 (14.6%)	48 (100%)	
8	2 (9.5%)	3 (14.3%)	4 (19.0%)	7 (33.3%)	3 (14.3%)	2 (9.5%)	21 (100%)	
9	0 (0%)	0 (0%)	1 (33.3%)	1 (33.3%)	1 (33.3%)	0 (0%)	3 (100%)	
10	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)	

↓ : below

↑ : above

* by Fisher's Exact Test

Table 4. Parafunctional habits according to sleeping hours

parafunctional habit	sleeping hours (%)						Total	p-value*
	4↓	5	6	7	8	9↑		
bruxism	10 (10.9%)	10 (10.9%)	25 (27.2%)	20 (21.7%)	18 (19.6%)	9 (9.8%)	92 (100%)	0.977
clenching	13 (9.6%)	20 (14.7%)	38 (27.9%)	30 (22.1%)	20 (14.7%)	15 (11.0%)	136 (100%)	
gum chewing	9 (8.3%)	10 (9.3%)	41 (38.0%)	24 (22.2%)	16 (14.8%)	8 (7.4%)	108 (100%)	
hard food favorite	10 (9.3%)	12 (11.2%)	31 (29.0%)	25 (23.4%)	14 (13.1%)	15 (14.0%)	107 (100%)	
nail/lip/cheek biting	17 (9.4%)	29 (16.0%)	50 (27.6%)	44 (24.3%)	23 (12.7%)	18 (9.9%)	181 (100%)	
tongue thrusting	4 (12.9%)	2 (6.5%)	15 (48.4%)	5 (16.1%)	3 (9.7%)	2 (6.5%)	31 (100%)	
chin leaning	21 (7.5%)	36 (12.9%)	87 (31.1%)	67 (23.9%)	43 (15.4%)	26 (9.3%)	280 (100%)	
side sleep	32 (8.5%)	46 (12.3%)	107 (28.5%)	94 (25.1%)	63 (16.8%)	33 (8.8%)	375 (100%)	
snoring	12 (10.4%)	15 (13.0%)	33 (28.7%)	21 (18.3%)	24 (20.9%)	10 (8.7%)	115 (100%)	
unilateral chewing	22 (7.7%)	38 (13.2%)	96 (33.4%)	67 (23.3%)	41 (14.3%)	23 (8.0%)	287 (100%)	

↓ : below

↑ : above

* by Pearson Chi-Square

Table 5. Distribution of arthralgia and myalgia according to sleeping hours

diagnosis	sleeping hours (%)						Total	p-value*
	4↓	5	6	7	8	9↑		
arthralgia	16 (7.0%)	32 (14.0%)	71 (31.1%)	50 (21.9%)	38 (16.7%)	21 (9.2%)	228 (100%)	0.424
myalgia	1 (2.0%)	10 (20.0%)	15 (30.0%)	12 (24.0%)	10 (20.0%)	2 (4.0%)	50 (100%)	
arthralgia+myalgia	27 (11.1%)	29 (11.9%)	65 (26.6%)	62 (25.4%)	40 (16.4%)	21 (8.6%)	244 (100%)	

↓ : below

↑ : above

* by Pearson Chi-Square

Table 6. Distribution of headache, neck and shoulder pain according to sleeping hours

	sleeping hours (%)						Total	p-value*
	4↓	5	6	7	8	9↑		
headache	5 (12.8%)	8 (20.5%)	10 (25.6%)	10 (25.6%)	2 (5.1%)	4 (10.3%)	39 (100%)	0.110
neck and shoulder pain	15 (9.2%)	21 (12.9%)	45 (27.6%)	40 (24.5%)	28 (17.2%)	14 (8.6%)	163 (100%)	
headache & neck and shoulder pain	11 (18.0%)	10 (16.4%)	11 (18.0%)	12 (19.7%)	11 (18.0%)	6 (9.8%)	61 (100%)	
none	13 (5.0%)	32 (12.4%)	85 (32.8%)	62 (23.9%)	47 (18.1%)	20 (7.7%)	259 (100%)	

↓ : below

↑ : above

* by Pearson Chi-Square

Table 7. Distribution of duration of treatment according to sleeping hours

duration of treatment	sleeping hours (%)						Total	p-value*
	4↓	5	6	7	8	9↑		
1 month ↓	39 (8.7%)	60 (13.5%)	130 (29.1%)	103 (23.1%)	75 (16.8%)	39 (8.7%)	446 (100%)	0.463
1~3 months	2 (5.6%)	7 (19.4%)	7 (19.4%)	12 (33.3%)	7 (19.4%)	1 (2.8%)	36 (100%)	
4~6 months	1 (7.1%)	0 (0%)	7 (50.0%)	1 (7.1%)	4 (28.6%)	1 (7.1%)	14 (100%)	
6 months ↑	103 (7.7%)	4 (15.4%)	7 (26.9%)	8 (30.8%)	2 (7.7%)	3 (11.5%)	26 (100%)	

↓ : below

↑ : above

* by Fisher's Exact Test

Table 8. Distribution of sleeping hours according to age

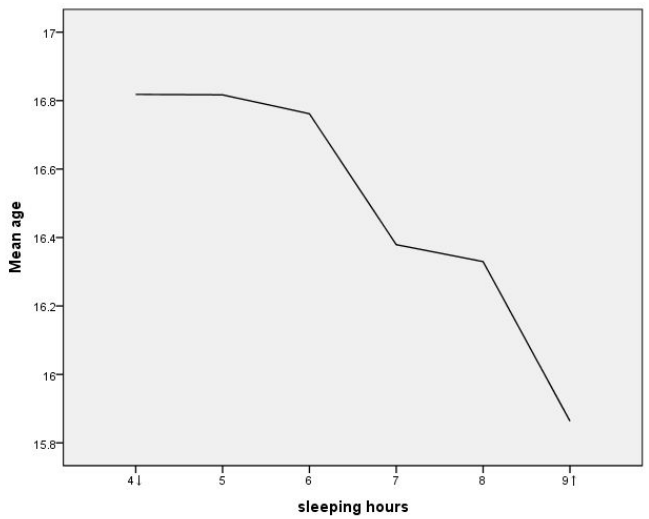
sleeping hours	age (%)										Total	p-value*
	10	11	12	13	14	15	16	17	18	19		
4↓	0 (0%)	0 (0%)	1 (2.3%)	1 (2.3%)	1 (2.3%)	4 (9.1%)	8 (18.2%)	13 (29.5%)	12 (27.3%)	4 (9.1%)	44 (100%)	2.76E-06
5	0 (0%)	0 (0%)	0 (0%)	1 (1.4%)	1 (1.4%)	9 (12.7%)	19 (26.8%)	20 (28.2%)	11 (15.5%)	10 (14.1%)	71 (100%)	
6	0 (0%)	0 (0%)	2 (1.3%)	1 (0.7%)	10 (6.6%)	21 (13.9%)	29 (19.2%)	34 (22.5%)	29 (19.2%)	25 (16.6%)	151 (100%)	
7	0 (0%)	2 (1.6%)	2 (1.6%)	15 (12.1%)	9 (7.3%)	16 (12.9%)	17 (13.7%)	13 (10.5%)	19 (15.3%)	31 (25.0%)	124 (100%)	
8	1 (1.1%)	2 (2.3%)	4 (4.5%)	6 (6.8%)	10 (11.4%)	10 (11.4%)	7 (8.0%)	8 (9.1%)	19 (21.6%)	21 (23.9%)	88 (100%)	
9↑	0 (0%)	0 (0%)	4 (9.1%)	6 (13.6%)	6 (13.6%)	6 (13.6%)	1 (2.3%)	5 (11.4%)	7 (15.9%)	9 (20.5%)	44 (100%)	

↓ : below

↑ : above

* statistically significant difference(P<0.0001) by Fisher's Exact Test

Fig.2. Comparison with sleeping hours according to age



IV. Discussion

Sleeping is a very critical process for human life and closely related with physical and mental health. The sleep cycle can be divided into the non-rapid eye movement (REM) sleep which is consisted with 4 phases, and the subsequent REM sleep. In REM sleep, there are changes in muscle twitching of extremities and facial muscle, heartbeat as well as breathing rate; further, other physiological changes including rapid movement in closed eyes are also noted. The non-REM sleeping lasts 60-90 minutes per each cycle while the REM sleeping stays for about 5-15 minutes ; these cycles are repeated about 4-6 times for an average per night. In adults, sleeping hours consist with 80% of non-REM sleep and 20% of non-REM sleep. In the non-REM sleep phase, syntheses of biomacromolecules (e.g.,proteins and RNA) are increased while the REM sleep phase plays an important role in cerebral cortex and brain stem functions. In other words, the non-REM sleep is critical in reference to physical rest while the REM sleep is responsible for psychic rests [2]. Given significant impacts of such sleeping phases, it seems obvious that long-term abnormal sleeping behaviors may results numerous effects on physical and mental health, hence warrants better understanding in reference to sleep and pains for TMDs clinicians in particular.

Recently, Korean teenagers are having inadequate sleeping hours due to increases in cyber-leisure activities, as results of rapid development of information and communication technologies and academic activities. Sleep deprivation in an adolescent period has been reported to influence on 1) normal daily life, 2) musculoskeletal disorders and 3) the prevalence rate of TMDs [1,9,10].

According to the study of Ko et al. [3], the prevalence rate of TMDs in

Korean teenagers are gradually increasing, and similarly, Ok et al. [10] also reported that numbers of patients visited for TMDs were increased when compared between the years of 2000 and 2008. In addition, Nilsson et al. [11] addressed that the incidence rate of TMDs are increasing with age and more frequently shown in female. Lee and Kim [4] reported that the prevalence rate of TMDs was highest in 10-20's while the male/female ratio for TMDs was 40:60. Likewise, in the this study, we found the similar ratio of patients (the male/female ratio = 37.9:62.1) compared to those of Lee and Kim [4] as well as Nilsson et al. [11]. Furthermore, we found that more than half TMD patients visited our clinic was high school students; the 55.6% patients were in between the age of 17 and 19 years old. In regards to the higher ratio in female patients, it might be because female patients are more sensitive to pains when compared to male while higher prevalence rate shown in the late adolescent period could be due to excessive stress and sleep deprivation considering that those patients were in the period for the university entrance examination (i.e., Korean SAT).

Most adolescent patients visited our clinic due to pains in TMJ, clicking sound and mouth opening limitation yet we were not able to find any significant relationship between such chief complaints against sleeping hours in this study which is somewhat similar results of Lee et al. [12] and Lee and Kim [4]; these results indicate that pains in TMJ, clicking sound and difficulty of mouth opening are major reasons for patients to visit dental clinics.

Sleep recovers mental and physical fatigues from daytimes hence, inadequate sleeping hours reduce the level ATP (adenosine triphosphate) stored in the brain and facilitate the secretion of adrenal stress hormones into the system thereby impairing physical and mental levels for normal life [6]. There are several sleeping disorders frequently found in patients with TMDs such as obstructive sleep apnea syndrome, snoring and bruxism and these symptoms have been pointed to decrease the quality of

sleeping and consequently result acute/chronic pains [7,13]. Various studies have been done in regards to the relationship between sleeping and pains; however most studies were dealing with post-operative pains and their associations with sleeping status because of 1) short duration for acute pains lasted and 2) unpredictability[13,14]. In contrast, when it comes to chronic pains, there are a few studies investigated in patients with headache, diabetic neuropathy, peripheral neuropathy, and musculoskeletal disorders [16-18]. In the study, the authors utilized VAS in order to assess the degree of pains in patients. As mentioned above, most patients complained with pains less than VAS 5 yet no significant relationship was found in reference to sleeping hours. Further follow up studies are warranted because 1) chronic/acute pains were not classified and 2) the quality of sleep was not assessed in the current study.

One of the most important factors for diagnosis and treatment of patients with TMDs is determining para-functional activities. The para-functional activities can be divided into either diurnal activity or nocturnal activity. The diurnal activities include unconscious activities in daytime such as clenching, bruxism, chin leaning, nail/lips/inner cheek biting habits, tongue-thrusting, habitual gum chewing and hard food favorite. On the other hand, when it comes to nocturnal activities, there are sleeping habits, snoring, and bruxism [2]. Ok et al. [10] recently addressed that para-functional activities such as clenching and chin leaning in adolescents are significantly increased due to abusive usage of mobile phones while Park [19] reported the association between contributing factors and TMDs; in this factors clenching, chin leaning and stress were found to be significantly influential. In this study, we did not found any significant association between para-functional activities and sleep, further studies would be necessary for sleeping disorders and their relationship with para-functional activities.

In TMDs pains and discomforts are shown in joints and muscles due to the properties of masticatory system. Kim et al. [1] reported that disc

displacement with reduction and masticatory muscle disorders are most frequently observed in adolescents with TMDs while Ok et al. [10] discovered that joint disorders are shown more often and osteoarthritis was significantly increased in the adolescent period. Similarly, Lee et al. [12] found that the major lesion area was joints followed by muscles and part of articulation. In this study, we did not find the significant relationship between diagnosis results and sleeping hours; however, there were more numbers of patients with either joints alone or joints and muscles compared to those of patients with muscles only. In the adolescent period, patients are more likely subjected to be influenced by stress as well as para-functional activities (e.g., clenching, and propping a chin) because of schoolwork; it seems more reasonable to consider that such factors influenced not only muscles but also joints and adjacent areas simultaneously thereby causing TMDs.

Although it is still controversial regarding effects of headache on sleeping disorders, it is possible that sleeping disorders which may impact on REM sleep, could induce orofacial pains by EMG activity of jaw muscles [20-22]. In the previous studies, such as Kim et al. [23] and Lee [6], patients with headache exhibited better subjective quality of sleeping and Pittsburgh Sleep Quality Index (PSQI global score). In contrast, in the study of Karibe et al. [24], the group with headache represented higher level of sleeping difficulty compared to those of the group without headache. In this study, we did not evaluate the quality of sleep hence it is difficult to make a direct comparison with other previous literatures. Further we were not able to find a significant association between sleeping hours and headache as well.

At this point, it is not so clear if pains induce sleeping disorder or vice versa (i.e., sleeping disorders results in pains). Tense muscles as well as trigger points from daytime activities may press nerves and then subsequently result in sleeping disorders; in this, sensitivities of pains are elevated and exacerbate sleeping disorders. Pains are further aggravated in

which either retracted positions are maintained or trigger points are pressed by body weight. Moldofsky [25] reported that patients with myofascial pains (e.g., fibromyalgia) tend to have more serious sleeping disorder. Mundt et al. [26] also demonstrated that TMDs symptoms (e.g., pains in neck and shoulders) are affected by the quality of sleep and Lee [6] showed more frequent pains of head, neck and arms in poor sleepers. In this present study, there were considerable numbers of patient complaining pains in neck and shoulders yet association against sleeping hours was not significant. Such complaints might be contributed by inappropriate posture of adolescent patients while studying.

The prevalence rate of TMDs in an adolescent period has been gradually increasing, thus making accurate diagnosis as well as pursuing appropriate treatments for their first visit are most important. However there was no significant association between the treatment period and sleeping hours was noted and most patients with TMDs completed their treatment within a month in this study. It seems likely that excessive schoolwork may impact on the treatment period thus further active treatments and educations are needed to prevent the aggravation of TMDs into chronic treatment disorders.

As the age increases, the sleeping hours were decreased in this study. Considering the significance of sleep on physical and mental health, more attentions should be given regarding sleep and disease prevention/treatments in the adolescent period.

In this study, we investigated the relationship between TMDs and sleeping hours in adolescents. Since only subjective sleeping hours were analyzed and investigated, further studies factoring the quality of sleep are warranted. In addition, it might be necessary to find other causative factors influencing decline in sleeping hours other than schoolwork.

References

1. Kim BS, Heo JY, OK SM, Kim KH, Jeong SH, Ko MY, Ahn YW: Cyber leisure activities and physical activities in adolescents with temporomandibular disorder. Korean J Oral Med 38:187-201. 2013.

2. Okeson JP: Management of temporomandibular disorders and occlusion. 7th ed, ST. Louise, 2013. p112-121.

3. Ko MY, Kim ME : Clinical features of the patients with craniomandibular disorder. Korean J Oral Med 18(2) : 29-41, 1993.

4. Lee DJ, Kim KS : Epidemiologic study on the patients visited to dept of oral medicine - in the area of choongam - , Korean J Oral Med 31(1) : 101-111, 2006.

5. Ok SM, Kim CY, Jeong SH, Ahn YW, Ko MY : Comparative analysis ; The patterns of temporomandibular disorder among adolescents. Korean J Oral Med 37(1) : 47-59, 2012.

6. Lee YM : Relationship of orofacial pain and sleep quality. Korean J oral Med 31(1) : 91-99, 2006.

7. Tae IL, Kim ST, Ahn HJ, Kwon JS, Choi JH : Interaction between pain aspect and sleep quality in patients with temporomandibular disorder. Korean J Oral Med 33(2) : 205-218, 2008.

8. Dworkin SF, LeResche L, Research diagnostic criteria for temporomandibular disorders:review, criteria, examinations and specifications, critique. J Craniomandib Disord 1992;6(4):301-355

9. Nilsson IM, Drangsholt M, List T : Impact of temporomandibular disorder pain in adolescents : differences by age and gender. J orofac pain 23(2): 115-122, 2009.

10. Ok SM, Kim CY, Jeong SH, Ahn YW, Ko MY : Comparative analysis : the patterns of temporomandibular disorder among adolescents. Korean J Oral Med 37(1) : 47-59, 2012.

11. Nilsson IM, List T, Drangsholt M : Incidence and temporal patterns of temporomandibular disorder pain among swedish adolescents. J orofac pain 21(2) : 127-132, 2007.

12. Lee JY, Kim YK, Kim SG, Yun PY : Evaluation of Korean teenagers whith temporomandibular joint disorders. J Krean Assoc Oral Macillofac Surg 39 : 231-237, 2013.

13. Bailey DR : Sleep disorders. Overview and realtionship to orofacial pain. Dent Clin North Am 41(2) : 189-209, 1997.

14. Smith MT, Haythornthwaite JA : How do sleep disturbance and chronic pain inter-relate? Insights from the longitudinal and cognitive-behavioral clinical trials literature. Sleep Med Rev 8(2): 119-132, 2004.

15. Ellis BW, Dudley HA: Some aspects of sleep research in surgical stress. J psychosom Res 20(4) : 303-308. 1996.

16. Paviva T, Farinha A, Martins A, Batista A, Guillemingult C : Chronic headaches and sleep disorders. Arch Intern Med 157(15): 1701-1705, 1997.

17. Drewes AM, Svendsen L, Tagholt SJ, Bjerregard K, Nielsen KD, Hansen B : Sleep in rheumatoid arthritis : a comparison with healthy subjects and studies of sleep/wake interactions. Br J Rheumatol 37(1) : 71-*81, 1998.

18. Moldofsky H, Scarisbrick P : Induction of neurasthenic musculoskeletal pain syndrome by selective sleep stage deprivation. Psychosom Med 38(1) : 35-474, 1976.

19. Park HS : An epidemiologic study of symptoms of temporomandibular disorders in Korean college students. Korean Oral Med 32(1) : 91-104, 2007.

20. Sahota PK, Dexter JD : Sleep and headache syndrome ; A clinical view. Headache 30 : 80-84, 1990.

21. Moss RA, McClure JT, Jackson MC : The influence of sleep duration on headache pain and frontalis EMG. J oral Rehabil 14 : 331-335, 1987.

22. Dexter JD, Weiyzman ED : The relationship of nocturnal headache to sleep stage patterns. Neurology 20 : 513-518, 1970.

23. Kim MH, Han KS, Park MS : A study on the sleep quality of the patients with temporomandibular disorders using pittsburgh sleep quality index. Korean J oral Med 27(1) : 89-105, 2002.

24. Karibe H, Goddard, Okubo M : Comparison of masticatory muscle myofascial pain in patients with and without a chief complaint of headache. Craio 32(1) : 57-62, 2014.

25. Moldofsky H : Myofascial pain and fibromyalgia. New York : Raven Press, 1990 , P. 227-240.

26. Mundt AK, Helkimo M, Magnusson T : Sleeping position and reported quality of sleep. A comparison between subjects demanding treatment for temporomandibular disorders and controls. Swed Dent J 35(4) : 187-193, 2011.