A questionnaire-based study of sleep-wake patterns and sleep quality in a TMJ and orofacial pain clinic

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A questionnaire-based study of sleep-wake patterns and sleep quality in a TMJ and orofacial pain clinic

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부족한 저의 논문의 심사와 지도를 맡아주신 최윤정 교수님, 태일호 원장님, 조형주 교수님께도 깊은 감사를 드립니다.

아울러 수련 생활을 함께하면서 동고동락한 의국 동기 김재정 전공의를 비롯하여 의국 선배님들, 후배들, 그리고 모든 구강내과 식구들에게도 진심으로 감사드립니다

항상 저에게 무한한 사랑을 주시는 부모님, 늘 저를 먼저 위해주시는 시부모님, 그 감사의 마음을 말로 다 표현할 수 없을 것 같습니다. 그리고 먼 미국에서도 많은 조언과 아낌없는 격려를 보내준 하나뿐인 동생 희민이, 마지막으로 언제나 든든히 저를 옆에서 지켜주고 아껴주는 남편에게 진심으로 감사와 사랑을 전합니다.

2019 년 6 월

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Abstract

A questionnaire-based study of sleep-wake patterns and sleep quality in a TMJ and orofacial pain clinic

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Objective: To determine the relationships between sleep quality, perceived pain, and psychological distress among patients with TMJ and orofacial pain.

Methods: The authors examined 3276 patients with temporomandibular disorder (TMD) who visited the Orofacial Pain Clinic at Yonsei University College of Dentistry. The authors conducted a survey using the sleep-quality questionnaire and classified TMD patients into two groups based on Diagnostic Criteria for Temporomandibular Disorders. For statistical analysis, the authors calculated the correlations between pain intensity as measured using a numeric rating scale (NRS) and various factors.

Results: The statistical analysis revealed correlations between pain intensity on the NRS and some of the factors in the sleep questionnaire. The pain intensity increased with age and for lower sleep efficiency (both $p<0.05$).

Conclusion: These results imply that clinicians treating patients with orofacial pain should examine their sleep-wake patterns and sleep quality.

Keywords: Chronic pain; pain intensity; sleep deprivation; surveys and questionnaires; temporomandibular joint disorders

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I. INTRODUCTION

Sleep disorders and pain problems are among the most common complaints in the general population, which makes it unsurprising that these two conditions frequently coincide (Edwards et al., 2009; Finan et al., 2013; Smith et al., 2009). It is inevitable that any painful condition will disturb sleep and impact mood, energy, and behavior. A recent Gallup Poll suggested that 56 million Americans complain of night-time pain that interferes with them falling asleep and increases episodes of awakening during the night or early in the morning (Moldofsky, 2001). The 1991 General Social Survey by

Statistics Canada found that 44% of people with pain suffer difficulties in initiating and maintaining sleep, whereas 19% of those with such problems have no pain. These pain and sleep problems are especially prevalent among the elderly (Moldofsky, 2001).

Poor sleep quality is often reported by chronic-pain patients (Affleck, et al., 1996; Finan, et al., 2013; Maisa Soares and Rizzatti-Barbosa, 2015; Moldofsky, 2001; Peters and Schmidt, 1992; Smith and Haythornthwaite, 2004; Sutton and Opp, 2014). Patients with temporomandibular disorders (TMDs), especially those with a chronic pain condition, also frequently complain of sleep disturbances (Edwards, et al., 2009; Karibe, et al., 2014; Lei, et al., 2015; Maisa Soares and Rizzatti-Barbosa, 2015; Sanders, et al., 2013; Smith, et al., 2009). Therefore, evaluating the sleep quality may lead to effective treatments for many TMD patients (Yatani, et al., 2002).

The relationship between chronic pain and sleep disturbances is not yet fully understood, although there is considerable evidence linking them (Canivet, et al., 2008; Edwards, et al., 2009; Finan, et al., 2013; Maisa Soares and Rizzatti-Barbosa, 2015; Moldofsky, 2001; Peters and Schmidt, 1992; Smith, et al., 2007; Smith and Haythornthwaite, 2004; Smith, et al., 2009). Polysomnography (PSG) is the gold standard for assessing the sleep architecture and allows the objective diagnosis of sleep pathophysiology (Blågestad et al., 2012; Douglass et al., 1994). However, one disadvantage of PSG is that it requires advanced equipment and is both time-consuming and expensive, and expertise is required to interpret the results. In the alternative subjective methodologies, the patients themselves describe the quality and quantity of their own sleep, usually with the aid of a questionnaire (Douglass et al.,

1994; Frisk and Nordström, 2003; Karibe et al., 2014). The advantage of these methods is that data on the sleep patterns of patients can be obtained both rapidly and inexpensively (Frisk and Nordström, 2003).

TMD is a collective term comprising several clinical problems involving the masticatory musculature, the temporomandibular joints (TMJs), and/or the associated structures (Lei et al., 2016; Lei et al., 2015; Schiffman et al., 2014). TMDs are a major cause of nondental orofacial pain.

Psychological distress may be closely associated with sleep quality, although whether it is pain or the associated psychological distress that induces poor sleep is difficult to determine (Affleck et al., 1996; Castillo et al., 2013; Gerrits et al., 2014; Gureje et al., 2008; McWilliams et al., 2003; Tang et al., 2012; Tsang et al., 2008; Yatani et al., 2002). Unfortunately, the relationships between sleep quality, pain intensity, and psychological symptoms in chronic-TMD patients are currently not well understood. Therefore, the objectives of this study were to determine the relationships between sleep quality, perceived pain, and psychological distress among patients with TMJ and orofacial pain (Auvenshine, 2007; Edwards et al., 2009; Lei et al., 2016; Lei et al., 2015; Maisa Soares and Rizzatti-Barbosa, 2015; Park and Chung, 2016; Smith et al., 2009; Yatani et al., 2002).

Most previous studies of the associations of sleep disorder with TMJ and orofacial pain have involved small populations. Some studies have also carried out PSG, but they also involved small populations (Blågestad et al., 2012). Thus, the present retrospective study investigated sleep-wake patterns and sleep quality by utilizing a

sleep questionnaire and applying clinical examinations to a large number of patients in a TMJ and orofacial pain clinic.

II. MATERIALS AND METHODS

1. Study Population

The study enrolled 3276 consecutive TMD patients (992 men and 2284 women, aged 34.82 ± 16.78 years [mean ± SD], age range 8 to 88 years) who sought care at the Orofacial Pain Clinic at Yonsei University College of Dentistry from January 1, 2015 to August 31, 2016. The patients were classified according to the Diagnostic Criteria for Temporomandibular Disorders, while allowing for duplication based on the results obtained in clinical and radiographic examinations into temporomandibular joint (TMJ) disorders (45.9%: TMJ arthralgia, TMJ internal derangement, TMJ osteoarthritis, and condyle luxation), muscle disorders (40.6%: local myalgia, myofascial pain, and myospasm), and other conditions (13.5%: a broad variety of miscellaneous TMD-related diagnoses such as parafunction, clenching, bruxism, and malocclusion) (Figure 1) (Schiffman et al., 2014). The pain rating reported by the patients was 4.18 ± 1.84 on a 10-point scale ranging from 0 to 10. It was reported by 5.0% of the participants that their taking medications might have positively affected their sleep quality and architecture. Investigation procedures were approved by the authors' university, Yonsei University Dental Hospital Institutional Review Board (Approval number 2-2016-0022).

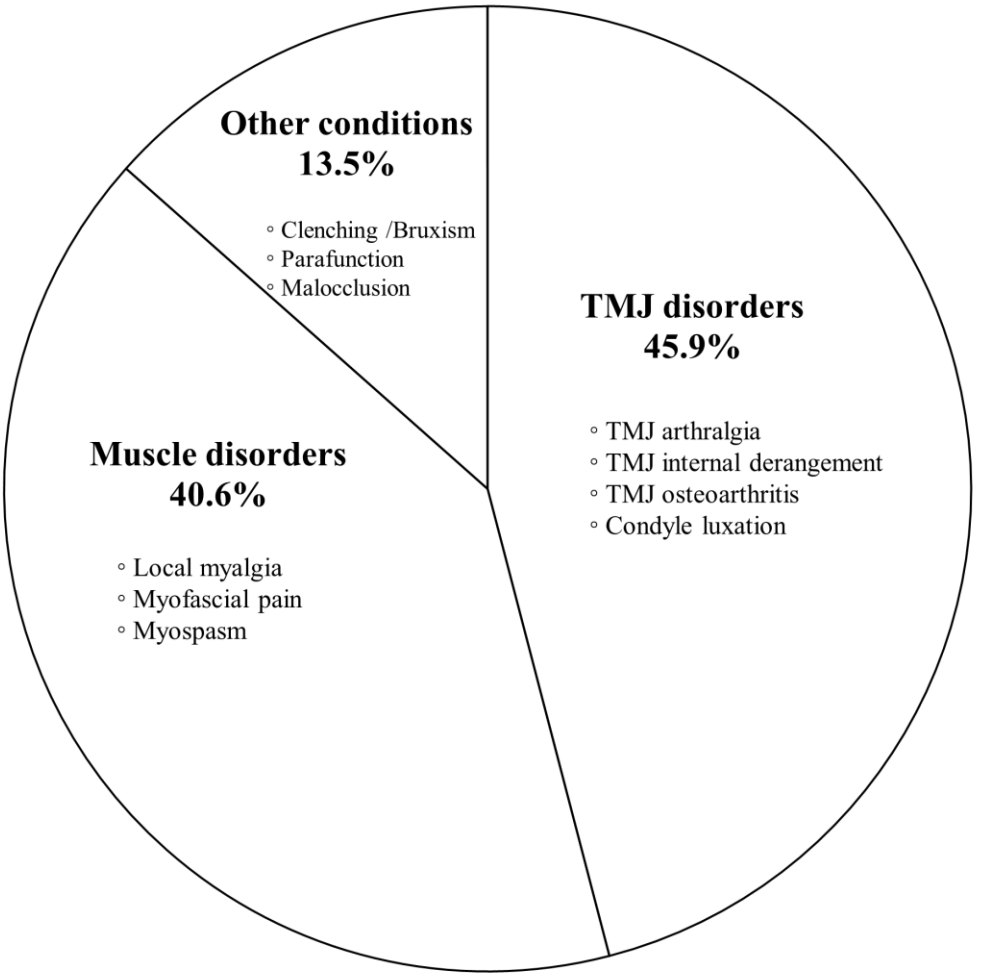


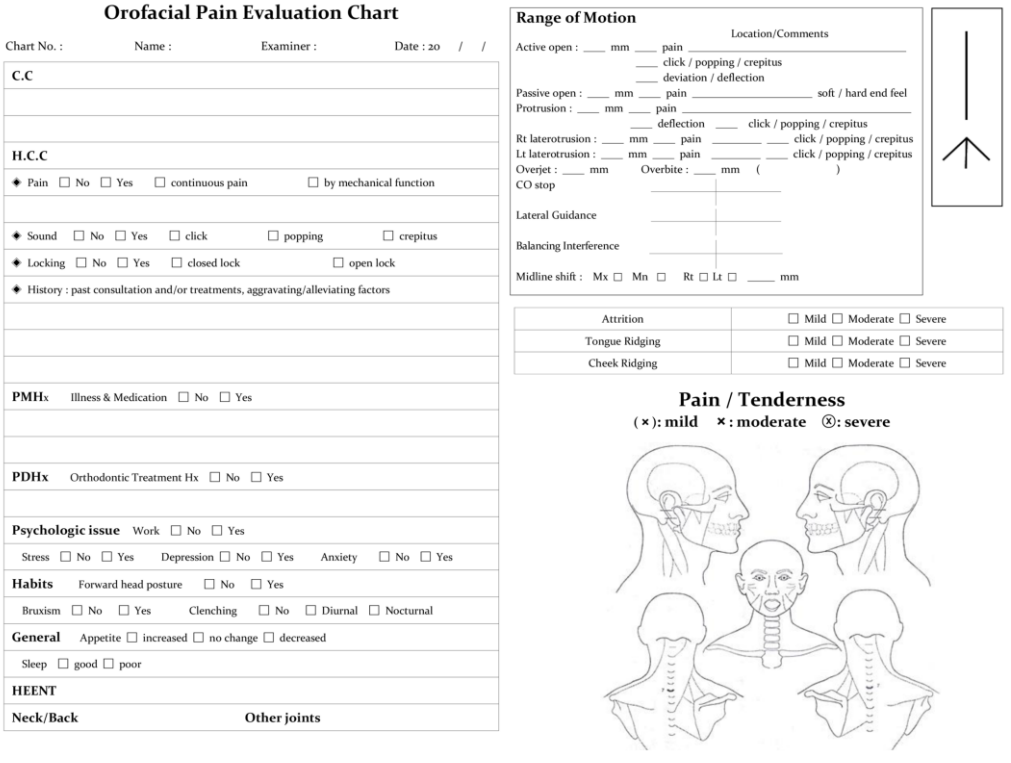
Figure 1. Classification of temporomandibular disorder in the study.

2. Measurement of clinical characteristics of the patients

Various subjective symptoms were evaluated using a sleep-quality questionnaire. The questionnaire consisted of nine questions that queried characteristics of sleep quality, including total sleep time, sleep latency, number of awakening episodes, and the taking of hypnotic medications (Table 1). The TMD symptoms were assessed based on orofacial pain charts (Figure 2) of the presence, duration, and intensity of joint and/or muscle pain, functional limitation, TMJ sounds, history of oral parafunctional habits, and history of TMJ locking. The pain intensity was assessed through a numeric rating scale (NRS) from 0 to 10, where 0 represents no pain and 10 the worst pain imaginable. The clinical diagnoses were made according to the Diagnostic Criteria for TMD (Schiffman et al., 2014). The clinical examinations were standardized and performed by specially trained examiners. Information on the following background characteristics was also obtained: sex, age, and orofacial pain intensity on the NRS.

Table 1. Sleep-quality questionnaire.

1. When do you usually go to bed? _____
2. How long (in minutes) does it take you to fall asleep each night? _____
3. When do you usually get up in the morning? _____
4. How many hours of actual sleep do you get at night? (This may differ from the number of hours you spend in bed.) _____
5. How many times do you wake up during the night?
6. Do you take medications (prescribed or “over the counter”) to help you sleep? (Yes / No)
7. How is your stress recently? (Almost none / Moderate / Severe)
8. How is your depressive mood recently? (Almost none / Moderate / Severe)
9. How are your anxiety, worry, and tension mood recently? (Almost none / Moderate / Severe)



Orofacial Pain Evaluation Chart

Chart No. : Name : Examiner : Date : 20 / /

C.C

H.C.C

◈ Pain ☐ No ☐ Yes ☐ continuous pain ☐ by mechanical function

◈ Sound ☐ No ☐ Yes ☐ click ☐ popping ☐ crepitus

◈ Locking ☐ No ☐ Yes ☐ closed lock ☐ open lock

◈ History : past consultation and/or treatments, aggravating/alleviating factors

PMHx Illness & Medication ☐ No ☐ Yes

PDHx Orthodontic Treatment Hx ☐ No ☐ Yes

Psychologic issue Work ☐ No ☐ Yes

Stress ☐ No ☐ Yes Depression ☐ No ☐ Yes Anxiety ☐ No ☐ Yes

Habits Forward head posture ☐ No ☐ Yes

Bruxism ☐ No ☐ Yes Clenching ☐ No ☐ Diurnal ☐ Nocturnal

General Appetite ☐ increased ☐ no change ☐ decreased

Sleep ☐ good ☐ poor

HEENT

Neck/Back **Other joints**

Range of Motion

Location/Comments

Active open : ____ mm ____ pain _____
____ click / popping / crepitus
____ deviation / deflection

Passive open : ____ mm ____ pain _____ soft / hard end feel

Protrusion : ____ mm ____ pain _____
____ deflection ____ click / popping / crepitus

Rt laterotrusion : ____ mm ____ pain _____ ____ click / popping / crepitus

Lt laterotrusion : ____ mm ____ pain _____ ____ click / popping / crepitus

Overjet : ____ mm Overbite : ____ mm ( )

CO stop

Lateral Guidance

Balancing Interference

Midline shift : Mx ☐ Mn ☐ Rt ☐ Lt ☐ ____ mm

Attrition	☐ Mild ☐ Moderate ☐ Severe
Tongue Ridging	☐ Mild ☐ Moderate ☐ Severe
Cheek Ridging	☐ Mild ☐ Moderate ☐ Severe

Pain / Tenderness

(×): mild × : moderate ⓧ: severe

Figure 2. Orofacial pain evaluation chart example.

3. Statistical analysis

Pearson coefficients were calculated for the linear correlations between orofacial pain intensity as measured using the NRS and various continuous variables, including age, total sleep time, sleep latency, sleep efficiency, and number of awakening episodes. Two-sample *t*-tests were performed to determine whether the NRS score differed among different groups of categorical variables, such as sex and the dose of hypnotic medications. These analyses were followed by a multiple regression analysis.

The variance inflation factor (VIF) was calculated to determine whether there was a high multicollinearity among independent variables. A VIF value greater than 10 indicates that the variable is strongly correlated with another independent variable, indicating a multicollinearity problem. In such cases, the absolute values of standardized coefficient estimates (β) were compared, and variables with large VIF values and small standardized β values were removed to produce the final regression model (Figure 3).

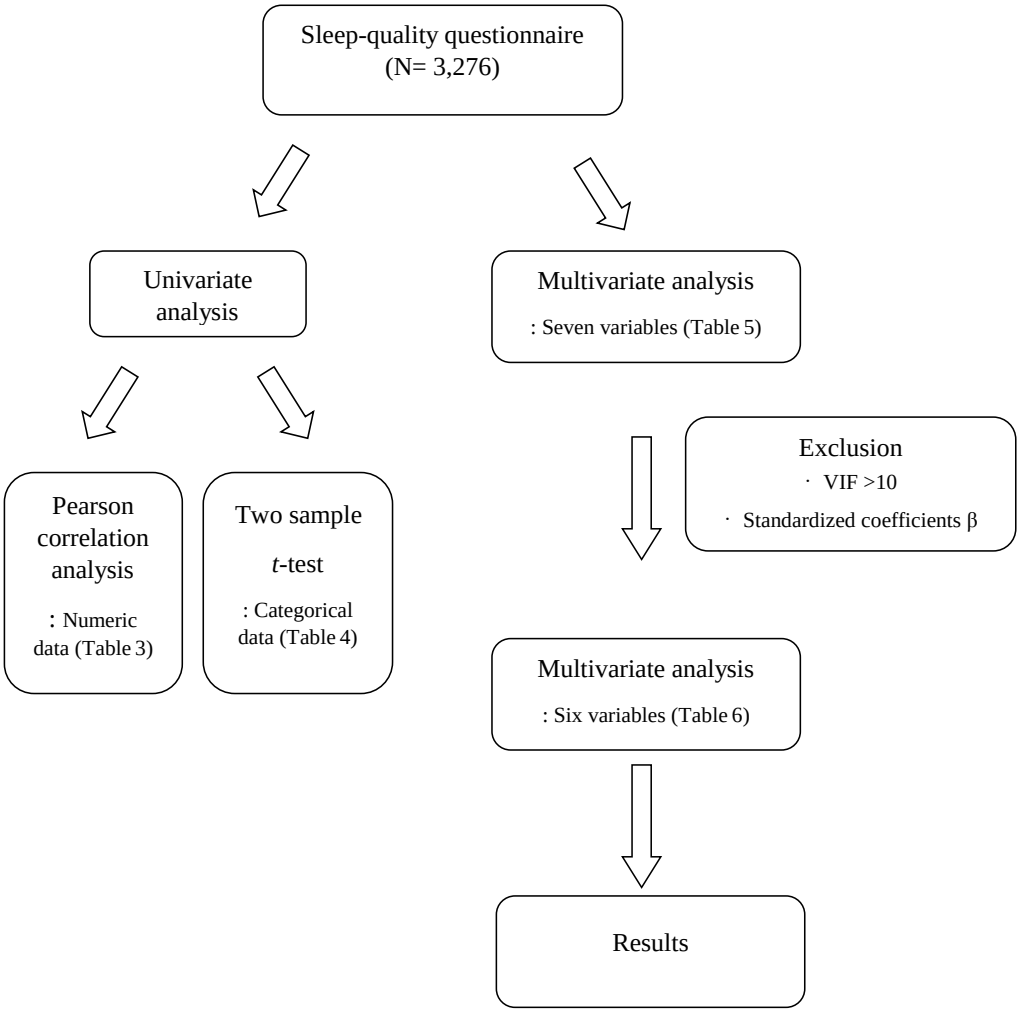


Figure 3. Flow chart of the statistical analysis. VIF: Variance inflation factor.

III. RESULTS

The demographic data of the participants are summarized in Table 2. The numeric variables are summarized as mean, standard deviation (SD), and range values, and the categorical variables are summarized as frequencies.

The statistical analysis revealed correlations between pain intensity on the NRS and some of the factors in the sleep questionnaire. In the univariate analysis, there were significant correlations (p<0.05) between pain intensity on the NRS and age, sleep latency, number of awakening episodes, and sleep efficiency, but not the total sleep time (Table 3). The two-sample t-tests revealed significant correlations between pain intensity on the NRS and sex and hypnotic medications (p<0.05) (Table 4). The pain intensity increased with age (r=0.093), longer sleep latency (r=0.053), and number of awakening episodes (r=0.067), and for lower sleep efficiency (r=-0.066), and was higher in females than males (4.22 ± 1.85 vs 4.08 ± 1.80, p<0.05) and in hypnotic-medication takers than non-takers (4.61 ± 2.00 vs 4.16 ± 1.83, p<0.05). However, there was no significant correlation between total sleep time and pain intensity (p>0.05) (Tables 3 and 4).

Sleep latency and sleep efficiency had high VIF values (11.092 and 11.940, respectively) (Table 5), as hinted by the large coefficient for the correlations between these two variables (r=-0.923) (Table 3). Sleep latency was therefore removed because the absolute value of the standardized estimated coefficient for sleep latency (β=-

0.042) was smaller than that for sleep efficiency (β=-0.095). After removing sleep latency, the final regression model with six independent variables had small VIF values of around 1 for all variables, implying that there was no multicollinearity problem (Table 6). The fit of this final model remained the same (the adjusted R^2 remained at 0.013, and the F statistic increased from 7.058 to 8.147).

In the multivariate analysis, the pain intensity seemed to increase with age (p<0.05) and for a lower sleep efficiency (p<0.05). However, no significant correlations were found for other factors, such as sex, total sleep time, number of awakening episodes, and the taking of hypnotic medications (Table 6).

In all regression analysis for each subgroup, the authors consistently found that the pain intensity increased with age and decreased with sleep efficiency (Table 7).

Table 2. Clinical characteristics of the study subjects at baseline.

Variables	Number of patients (%)	Mean	SD (Range)
Age (years)	3276	34.82	16.78 (8-88)
Sex	3276		
Male	992 (30.3)		
Female	2284 (69.7)		
Sleep indices			
Total sleep time (min)	3276	408.91	76.63 (60-780)
Sleep latency (min)	3276	23.95	21.70 (0-360)
Number of awakening episodes	3276	1.01	1.19 (0-11)
Sleep efficiency* (%)	3276	93.84	6.15 (14.29-100)
Hypnotic medications	3276		
Yes	165 (5.0)		
No	3111 (95.0)		
Pain intensity (NRS)	3276	4.18	1.84 (1-10)

SD: Standard deviation; NRS: numeric rating scale; min: minutes.

*Sleep efficiency is the percentage of time spent asleep while in bed. It is calculated by dividing the amount of time spent asleep (in minutes) by the total amount of time in bed (in minutes).

Table 3. Correlations coefficients between orofacial pain intensity measured using a numeric rating scale (NRS) and various factors.

Variables	NRS	Age	Total sleep time (min)	Sleep latency (min)	Number of awakening episodes
Age	.093 (0.00)*				
Total sleep time (min)	-.032 (.070)	-.158 (.000)*			
Sleep latency (min)	.053 (.003)*	-.019 (.287)	-.010 (.587)		
Number of awakening episodes	.067 (.000)*	.323 (.000)*	-.040 (.023)*	.141 (.000)*	
Sleep efficiency	-.066 (.000)*	-.035 (.046)*	.263 (.000)*	-.923(.000)*	-.148 (.000)*

*p<0.05 indicates statistical significance; min: minutes.

Table 4. Two-sample *t*-tests of sex and hypnotic medications using the numeric rating scale (NRS).

Variables		Mean	SD	Std. Error Mean	*t*	*p* value	95% CI
Sex	Male (n=992)	4.077	1.7985	.0571	-2.078	.038	-0.2820 to -0.0082
	Female (n=2284)	4.222	1.8519	.0388			
Hypnotic medications	Yes (n=165)	4.609	1.9871	.1547	3.096	.002	0.1663 to -0.7410
	No (n=3111)	4.155	1.8260	.0327			

Perform independent-sample *t*-test (Equal variances assumed); Dependent Variable: NRS; SD: Standard deviation; CI: Confidence Interval of the Difference.

Table 5. Multiple linear regression results for seven variables on the numeric rating scale (NRS).

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	β	Std. Error	β	*t*	*p* value	Tolerance	VIF
(Constant)	6.635	1.659		4.000	.000		
Age	.008	.002	.075	3.957	.000	.844	1.184
Total sleep time (min)	.000	.001	.008	.341	.733	.560	1.785
Sleep latency (min)	-.004	.005	-.042	-.731	.465	.090	11.092
Number of awakening episodes	.045	.029	.029	1.565	.118	.864	1.157
Sleep efficiency	-.028	.018	-.095	-1.578	.115	.084	11.940
Sex	.094	.070	.024	1.349	.178	.985	1.015
Hypnotic medications	-.203	.151	-.024	-1.339	.181	.929	1.077

(R^2=0.015, Adjusted R^2=0.013, F =7.058, p<0.001); Dependent Variable: NRS; SD: Standard deviation; VIF: variance inflation factor; min: minutes.

Table 6. Multiple linear regression results for six variables on the numeric rating scale (NRS).

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	β	Std. Error	β	*t*	*p* value	Tolerance	VIF
(Constant)	5.483	.519		10.575	.000		
Age	.008	.002	.075	3.999	.000	.846	1.181
Total sleep time (min)	-0.001	.000	-.003	-.141	.888	.906	1.104
Number of awakening episodes	.044	.029	.029	1.542	.123	.865	1.156
Sleep efficiency	-.016	.005	-.053	-2.877	.004	.890	1.124
Sex	.094	.070	.024	1.345	.179	.985	1.015
Hypnotic medications	-.205	.151	-.024	-1.354	.176	.929	1.076

(R^2=0.015, Adjusted R^2=0.013, F=8.147, <0.001); Dependent Variable: NRS; VIF: Variance inflation factor; min: minutes.

Table 7. Regression results of six variables on Numeric Rating Scale (NRS) for each subgroup.

	TMJ disorder			Muscle disorder			Other conditions		
	β (SC)	*t*	*p* value	β (SC)	*t*	*p* value	β (SC)	*t*	*p* value
(Constant)		10.549	.000		10.170	.000		5.958	.000
Age	.074	3.902	**.000***	.079	3.939	**.000***	.116	3.359	**.001***
Total sleep time (min)	.003	.141	.888	-.007	-.375	.708	.006	.167	.867
Number of awakening episodes	.027	1.459	.145	.029	1.468	.142	-.018	-0.521	.602
Sleep efficiency	-.054	-2.938	**.003***	-.055	-2.806	**.005***	-.068	-1.964	**.049***
Sex	.023	1.293	.196	.014	0.757	.449	-.013	-0.390	.697
Hypnotic medications	-.026	-1.417	.157	-.015	-0.799	.424	-.005	-0.150	.881

*p<0.05 indicates statistical significance; Dependent Variable: NRS; SC: Standardized coefficients; TMJ: temporomandibular joint; min: minutes.

IV. DISCUSSION

The present study investigated sleep-wake patterns and sleep quality by utilizing a sleep questionnaire and applying clinical examinations to a large number of patients in a TMJ and orofacial pain clinic.

Patients with TMD, especially those with a chronic pain condition, frequently also complain of sleep disturbances (Maisa Soares and Rizzatti-Barbosa, 2015; Palermo, et al., 2007; Smith and Haythornthwaite, 2004; Sutton and Opp, 2014; Tsang, et al., 2008). The sleep-wake pattern and sleep quality could affect orofacial pain in several ways (Canivet, et al., 2008; Edwards, et al., 2009; Palermo, et al., 2007; Smith, et al., 2007; Smith and Haythornthwaite, 2004; Smith, et al., 2009). The authors found that the pain becomes more severe with increasing age ($p<0.05$) and for lower sleep efficiency ($p<0.05$). The authors found statistically significant associations between sleep deprivation and orofacial pain. TMD patients with chronic pain suffer from sleep deprivation similar to other chronic-pain patients (Canivet, et al., 2008; Finan, et al., 2013; Lei, et al., 2016; Maisa Soares and Rizzatti-Barbosa, 2015; Moldofsky, 2001; Smith and Haythornthwaite, 2004; Sutton and Opp, 2014; Tsang, et al., 2008).

A previous PSG-based study comparing chronic-pain patients with healthy individuals aimed to identify differences in sleep architecture. Their chronic-pain group had a longer recording period, indicating that they spent more time in bed with the lights off, and their sleep efficiency was lower than that in the control group

(81.2% vs 89.49%), and below the normal range (>85%). The chronic-pain group in the present study showed more awakenings during the night than the control group. However, the total sleep time did not differ in this study, which is consistent with the findings of previous studies involving younger participants. Although differences in latencies, sleep efficiency, and number of awakening episodes were found between the chronic-pain and control groups, there were no significant intergroup differences in either the absolute or relative time periods spent in each sleep stage. Significantly greater difficulty initiating sleep was experienced in the chronic-pain group than in the control group (Blågestad, et al., 2012; Edwards, et al., 2009; Finan, et al., 2013; Moldofsky, 2001; Sanders, et al., 2013; Smith and Haythornthwaite, 2004).

The relationship between chronic pain and sleep disturbances remains to be elucidated; PSG is the gold standard for assessing the sleep architecture and can be used for an objective diagnosis of sleep pathophysiology (Blågestad et al., 2012; Douglass et al., 1994). Despite the wide availability of sleep disorder centers in the USA, PSG remains expensive. General practitioners are increasingly aware of sleep disorders, but they often identify more patients with suspected sleep disorders than they can reasonably refer for full sleep-laboratory investigations. There is, therefore, a need for a triage questionnaire that can be used to distinguish high-risk patients from the larger group of patients that the general practitioner believes possess some of the symptoms of sleep disorder (Douglass et al., 1994).

Compared to PSG, a sleep-questionnaire-based study has the advantages of the patients themselves describing the quality and quantity of their own sleep and the

associated small amount of time and low cost required to collect data on their sleep characteristics (Douglass et al., 1994; Frisk and Nordström, 2003; Karibe et al., 2014).

Most previous studies of the associations between sleep disorder and TMJ and orofacial pain, including those carrying out PSG, have involved only small populations (Auvenshine, 2007; Blågestad et al., 2012; Edwards et al., 2009; Lei et al., 2016; Lei et al., 2015; Maisa Soares and Rizzatti-Barbosa, 2015; Smith et al., 2009). Thus, the present study is significant in investigating sleep-wake patterns and sleep quality by utilizing a sleep questionnaire and applying clinical examinations to a large number of patients in a TMJ and orofacial pain clinic.

The present results imply that clinicians treating patients with orofacial pain should examine their sleep-wake patterns and sleep quality. The main limitations of this study are related to its inherent subjectivity, in that although a large number of patients was included, the results may have been subjective, since a questionnaire was applied rather than PSG. Future studies should include applying PSG to some patients in order to ensure that objective data are obtained.

V. CONCLUSION

The sleep-wake pattern and sleep quality are strongly associated with TMJ and orofacial pain, so sleep deprivation can cause chronic pain in the orofacial area. TMD patients with chronic pain suffer from sleep deprivation similar to other chronic-pain patients. The pain intensity increases significantly with age and for lower sleep efficiency. These results imply that clinicians treating patients with orofacial pain should examine their sleep-wake patterns and sleep quality.

Conflict of Interest

The authors have stated explicitly that there are no conflicts of interest in connection with this article.

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ABSTRACT (in Korean)

구강안면통증 클리닉에 내원한 환자들의 수면-각성 패턴과 구강안면통증과의 상관관계 연구

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이 희 진

만성 통증 환자에서는 수면의 질이 낮고 불면증이 더 흔하게 나타나는 것으로 알려져 있듯이 수면과 통증은 서로 밀접한 관련성을 가지므로 구강안면통증을 치료할 때 수면에 대한 고려가 반드시 필요하다. 만성 통증과 수면장애와의 관계에 관한 연구들이 있으나 기존 연구들은 Polysomnography (PSG)를 이용하여 수면 병태 생리학의 객관적인 진단을 수행하였다. 그러나 PSG 는 고급 장비가 필요하며, 시간이 많이 걸리고 비용이 많이 들며 결과를 해석하는 전문가가 필요하다는 한계가 존재한다. 따라서 이에 대한 대안으로써

환자의 수면 설문지를 이용하여 환자 스스로 수면의 질과 양을 기술한 결과지를 바탕으로 환자의 수면 패턴에 대한 데이터를 신속하고 저렴하게 얻을 수 있다는 장점을 바탕으로 본 연구를 수행하였다. 본 연구는 2015 년 1 월 1 일부터 2016 년 8 월 31 일까지 연세대학교 치과병원 구강내과에서 Orofacial pain charting 검사와 턱관절 질환 통증 관련 설문지를 작성한 초진 환자 3276 명을 대상으로 나이, 성별, 총 수면시간, 누워서 잠드는 데 걸리는 시간, 수면 중 깨는 횟수, 수면효율, 불면증약 복용여부와 통증평가도구(NRS)를 이용하여 수면과 통증과의 상관관계를 연구하였다.

통계 분석 결과 통증 강도와 수면 설문지의 일부 요인 간에 상관관계가 있었다. Univariate analysis 에서 통증 강도와 연령, 누워서 잠드는데 걸리는 시간, 수면 중 깨는 횟수, 수면효율 간에 유의한 상관관계 (p<0.05)가 있었지만 총 수면시간은 상관관계가 없었다. Two-sample t-tests 는 통증과 성별, 불면증약 복용 유무는 유의한 상관관계를 나타냈다(p<0.05). 즉, 나이가 증가할수록 (r=0.093), 누워서 잠드는데 걸리는 시간이 증가할수록 (r=0.053), 수면 중 깨는 횟수가 증가할수록 (r=0.067), 수면 효율이 낮을수록 (r=−0.066), 남성보다는 여성에서 (4.22 ± 1.85 vs 4.08 ± 1.80, p<0.05), 불면증 약 복용군에서 (4.61 ± 2.00 vs 4.16 ± 1.83, p<0.05) 통증강도가 유의하게 높았다. 그러나 총 수면 시간과 통증강도 사이에는 유의한 상관관계가 없었다 (p>0.05).

7 가지 요인을 대상으로 한 Multiple linear regression 에서 누워서 잠드는 데까지 걸리는 시간과 수면효율은 VIF(variance inflation factor) 값이 각각 11.092 와 11.940 으로 매우 높아, 두 변수 간 상관 계수가 큰 것으로 나타났다(r=−0.923). 따라서 누워서 잠드는 데까지 걸리는 시간 요인에 대한 Standardized Coefficients β 의 절대값(β=−0.042)이 수면효율 (β=−0.095)보다 작으므로 누워서 잠드는 데까지 걸리는 시간요인을 제거하고, Multiple linear regression 를 시행한 결과 다중 공선성 문제는 해소되었다.

그 결과, 통증 강도와 연령의 증가 (p<0.05), 통증 강도와 수면 효율의 저하는 상관관계가 있었다 (p<0.05). 그러나 성별, 총 수면 시간, 수면 중 깨는 횟수, 불면증 약 복용과 같은 다른 요인들에 대해서는 유의한 상관관계는 발견되지 않았다. 또한 DC/TMD 기준에 따라 분류한 3 가지 Subgroup – temporomandibular joint (TMJ) disorders (45.9%: TMJ arthralgia, TMJ internal derangement, TMJ osteoarthritis, and condyle luxation), muscle disorders (40.6%: local myalgia, myofascial pain, and myospasm), other conditions (13.5%: a broad variety of miscellaneous TMD–related diagnoses such as parafunction, clenching, bruxism, and malocclusion)에 대한 Multiple linear regression 에서도 마찬가지로 통증 강도는 나이의 증가, 수면 효율의 감소와 상관관계가 있음을 확인하였다.

핵심 되는 말: 만성통증, 통증강도, 수면장애, 수면연구, 측두하악장애