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RESEARCH ARTICLE

Evaluation of the Prevalence of Temporomandibular Joint Disorder and Bruxism in Individuals with Obstructive Sleep Apnea Syndrome

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Abstract

Objective: To evaluate the possible association between obstructive sleep apnea syndrome (OSAS) and temporomandibular disorder (TMD) and bruxism.

Materials-Methods: This study was performed in a group patients with and without OSAS suffering from myofacial pain. All patients were evaluated for TMD with Fonseca Anamnestic Index. The diagnosis of bruxism was made by clinical examination of all patients and in accordance with their anamnesis. Statistical analyses were performed with IBM SPSS statistics (24.0 Version; SPSS Inc, Chicago, IL).The level of significance was set at p←0.05. Descriptive data were calculated for all variables. Chi square test was used to compare categorical variables.

Results: There were a total of 54 patients suffering from myofacial pain and 28 (51.9%) of the patients were also associated with OSAS. It was observed that the prevalence of bruxism in individuals with OSAS (82%) was significantly higher than individuals without OSAS (15.4%) (p ←0.001). Moderate or severe TMD incidence in non-OSAS cases was 15.4%, and all of the cases with OSAS had moderate or severe TMD, and this difference between groups was statistically significant (p←0.001).

Conclusion: As a result of this study, it was seen that there is a strong relationship between OSAS and TMD and bruxism. Although the cause and effect relationship between OSAS and TMD or bruxism has not been proven, in the literature there is a considerably high prevalence for the correlation of these disorders. Additional studies are required in the future, using objective methods and analyzing more patient groups.

Keywords: obstructive sleep apnea syndrome, temporomandibular joint disease, bruxism,

Introduction

Obstructive sleep apnea syndrome (OSAS) constitutes the most important group among sleep-related breathing disorders (1) The American Sleep Academy defines OSAS as a disease characterized by recurrent apnea or hypopnea during the sleep period, followed by a decrease in blood oxygen saturation and arousols (1). According to the apnea-hypopnea index (AHI), values below 5 are seen as normal, while AHI is categorized as mild OSAS between 5-15, moderate OSAS between 16-30, and severe OSAS when it is greater than 31 (1). It is stated that OSAS, which is seen as an important public health problem worldwide, is seen in 9% of males and 4% in females. In the literature, there are many studies regarding effect of OSAS on the stomatognathic system, especially its relationship with temporomandibular joint disorders (TMD) and bruxism.

TMD is an umbrella term that includes all pathological conditions related to temporomandibular joint internal structure, masticatory muscles and related anatomical structures (2,3). It is defined as the main cause of non-odontogenic pain of the orofacial region and can seriously affect the quality of life (4,5). The most common clinical symptoms of TMD are osteoarthritis, click-crepitation, mandibular deviation and pain. Etiological factors include trauma, genetic factors and parafunctional habits.

Bruxism is a second title associated with OSAS, and it is also stated to be effective on the stomatognathic system. There are different definitions of bruxism in the current literature. The generally accepted view is that bruxism is a parafunctional habit characterized by rhythmic or irregular nonfunctional clenching and/or grinding. Types of bruxism can be evaluated under two headings as awake bruxism (AD) and sleep bruxism

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(SB) due to etiopathogenesis (6).

Although there are many studies in the literature evaluating the relationship between OSAS and TMD or between OSAS and bruxism, to the the authors' knowledge there are only a few studies evaluating the relationship between OSAS and TMD and bruxism in the same study. The aim of this study was to evaluate the relationship between OSAS and TMD and bruxism. The first null hypothesis was that there would be a significant relationship between the severity of OSAS and severity of TMD and the second null hypothesis was that there would be a relation between OSAS and bruxism.

Materials and Methods

Patients aged 18 years and over who applied to the Uşak University Dentistry Faculty Department of Oral and Maxillofacial Surgery between 2019-2021 with the complaint of myofascial pain were included in this study. Ethical approval was obtained by the Non-Interventional Medicine Ethics Committee of Uşak University Faculty of Medicine (06-01-17). The exclusion criterias included a history of TMJ surgery, TMJ local pathology, trauma, or orthognathic surgery, oral appliance using for OSAS treatment, a history of bruxism treatment.

The patients included in the study were evaluated under 2 groups as OSAS and healthy. Participants who were registered in the Sleep Center of the Uşak University Training and Research Hospital Chest Diseases Clinic and were diagnosed with OSAS were included in the OSAS group.

All of the patients included in the study were evaluated for the diagnosis of TMD using the Turkish version of the Fonseca Anamnestic Index (FAI). A questionnaire was used to categorize the severity of TMD. The participants were asked to answer questions without any time restrictions. The value of each answer being "yes = 10," "no = 0," and "sometimes = 5." As a result of the sum of the scores, each patient was classified with an absence of TMD (0–15) and presence of TMD (mild-TMD: 20–45; moderate-TMD: 50–65; severe-TMD: 70–100) (Figure-1) (7-9).

All of the patients were evaluated for the diagnosis of bruxism. According to international consensus recommendations, the diagnosis of 'probable bruxism' was based on self-reports and clinical examination findings (10,11).

Self-reported bruxism questionnaire items were as follows:
(1) Are you aware that you grind your teeth during sleep?
(2) Has anyone ever told you that you grind your teeth during sleep?
(3) Upon awakening in the morning or during the night, do you have your jaws thrust or braced?
(4) Do you clench your teeth while awake?
(5) Do you grind your teeth while awake?.

The responses to all questions were yes/no.

During the intraoral examination of grinding, the following characteristics were recorded:

1) Clenching reported by sleep partners or roommates
2) Hyperkeratosis of the cheek mucosa (linea alba)
3) Indented tongue
4) Unilateral masseter muscle hypertrophy
5) Tooth wear
6) Hypersensitivity, pain, and morning or daytime fatigue in the chewing muscles

Statistical Analysis

Statistical analysis were performed with IBM SPSS statistics (24.0 Version; SPSS Inc, Chicago, IL). The level of significance was set at $p \leq 0.05$. Descriptive data were calculated for all variables. Chi square test was used to compare categorical variables.

Results

Among the 54 total patients included in this study, 28 (51.9%) were female, 26 (48.1%) were male. The control group comprised 26 (48.1%) patients without OSAS while, the OSAS group included 28 (51.9%) patients who were diagnosed with OSAS. The average age was 30.2 (±5.6).

Questiones	Yes	No	Sometimes
1. Is it hard for you to open your mouth?			
2. Is it hard for you to move your mandible from side to side?			
3. Do you get tired /muscular pain while chewing?			
4. Do you have frequent headaches?			
5. Do you have pain on the nape or stiff neck?			
6. Do you have earaches or pain in craniomandibular joints?			
7. Have you noticed any TMJ clicking while chewing or when you open your mouth?			
8. Do you clench or grind your teeth ?			
9. Do your feel your teeth do not articulate well?			
10. Do you consider yourself a tense (nervous) person?			

Figure-1: Fonseca Anamnestic Index (FAI) questionnaire

According to the OSAS level classification; moderate OSAS was observed in 17 (31.5%) patients, and severe OSAS was observed in 11 (20.4%) patients. Table-1 shows the relationship between OSAS level and genders and there was no statistically significant difference in the incidence of OSAS between the genders (p→0.05).

TMD was absent or mild TMD was observed in 22 (40.7%) patients included in the study, while moderate or severe TMD was observed in 32 (59.2%) patients. TMD was absent or mild in 22 (84.6%) of the cases without OSAS, while moderate or severe TMD was found in 4 (15.4%) patients. Moderate or severe TMD was observed in all patients with OSAS. There was a statistically significant correlation between OSAS severity and TMD level (p ←0.001) (Table-2).

According to Table-3, 27 (50%) patients included in the study had bruxism, while the other 27 (50%) patients did not have bruxism. While bruxism was observed in 4 (15.4%) patients without OSAS, bruxism could not be diagnosed in 22 (84.6%) patients. While 13 (76.5%) patients with moderate OSAS diagnosed with bruxism and 4 (23.5%) patients did not have bruxism, 10 (90.9%) patients diagnosed with bruxism with severe OSAS, 1 (9.1%) patient did not have bruxism. There was a statistically significant correlation between the severity of OSAS and the incidence of bruxism (p←0.001).

Table-1: Comparison of OSAS presence/severity with gender

Female Male			Genders		Total	*P-VALUE
OSAS	Absent		14_a	12_a	26	0,526
		%	53,8%	46,2%	100,0%	
	Moderate		10_a	7_a	17	
		%	58,8%	41,2%	100,0%	
	Severe		4_a	7_a	11	
		%	36,4%	63,6%	100,0%	
Total			28	26	54	
%		51,9%	48,1%	100,0%		

*Chi square test

Table-2: Comparison of OSAS presence/severity with TMD presence/severity

Absent/ Mild Moderate Severe			TMD		Total	*P-VALUE
OSAS	Absent		22_a	4_b	26	<0.001
		%	84,6%	15,4%	100,0%	
	Moderate		0_a	17_b	17	
		%	0,0%	100,0%	100,0%	
	Severe		0_a	11_b	11	
		%	0,0%	100,0%	100,0%	
Total			22	32	54	
%		40,7%	59,3%	100,0%		

*Chi square test

Table-3: Comparison of OSAS presence/severity with bruxism

	Bruxism	Present	Absent	TOTAL	*P-VALUE
OSAS	Absent	4_a	22_b	26	<0.001
		15,4%	84,6%	100,0%	
	Moderate	13_a	4_b	17	
		76,5%	23,5%	100,0%	
	Severe	10_a	1_b	11	
		90,9%	9,1%	100,0%	
TOTAL		27	27	54	
50,0%		50,0%	100,0%		

*Chi square test

Discussion

OSAS, which has an important place among sleep disorders, is considered as a major health problem due to its incidence and consequences (12-14). OSAS can be diagnosed using clinical, medical history and polysomnography (PSG). OSAS can be diagnosed with the help of some questions, as well as by evaluating skeletal and soft tissue abnormalities with cephalometric x-rays taken from the patient (15-17). In addition, PSG is considered the 'gold standard' for OSAS diagnosis. Due to the retrospective nature of this study, patients diagnosed with OSAS through PSG were included while selecting the patients.

Even though OSAS is associated with many systemic diseases, there is no definite consensus in the literature about its effect on the stomatognathic system. TMD is a broad term used in the definition of pathological conditions seen on the stomatognathic system, which is frequently seen in the population and can adversely affect quality of life by affecting functions such as chewing and speaking (16). Research diagnostic criteria for temporomandibular disorders (RDC/TMD) scale is generally preferred in the diagnosis of TMD. Even though this scale has a high validity and reliability rate in the diagnosis of TMD, it is not often preferred due to its difficult and time-consuming application protocol, and the fact that it needs to be performed by people with expertise and experience in the field. FAI, on the other hand, was preferred for the diagnosis of TMD in this study because it is fast and easy to perform, does not require expertise or experience, and its validity and reliability in the diagnosis of TMD has been proven by studies conducted (18,19).

Studies have generally stated that there is a relationship between OSAS and TMD regardless of the technique, and there is no definite consensus in the literature on the cause/effect relationship (16). Smith et al. (20) and Edwards et al. (21) emphasize that this situation causes pain amplification by acting on the central sensitization of the sleep problem. On the other hand, Sander et al. (22) argued that the resistance to inspiration developed during OSAS leads to the development of TMD by causing a decrease in the sensitivity of baroreceptors and deterioration. The general opinion in the literature is that there is a relationship between OSAS and TMD, since both conditions are frequently seen in the population (17). Smith et al. (20) reported in their study that one third of the patients with TMD had OSAS. The diagnosis of OSAS was made using PSG, as in this study, and the investigators emphasized that in the clinic, the evaluation of TMD patients as potential OSAS patients should be considered. Zwiri et al. (17) reported that 2% of 100 cases in their clinical study had clear signs and symptoms. Cunali et al. (23) reported that in their study, 52% of the mild to moderate OSAS cases were diagnosed with TMD with RDC/TMD. In this study, TMD was found in all cases (n=28) with moderate and severe OSAS, and in 15.4% (n=4) of cases without OSAS. In other words, the incidence of TMD increases as the severity of OSAS increases, and the findings are consistent with the literature.

Another view on the relationship between OSAS and TMD is stated by Sanders et al. (22) and the authors reported that bruxism is a bridge between OSAS and TMD. The relationship between TMD and bruxism was not examined in this study, and it cannot be said that the study is supported in terms of this hypothesis. Although it is still unclear in the literature that bruxism is a trigger for TMD, it has been reported that the incidence of TMD is significantly higher in individuals with bruxism in recent studies (3). In addition to this, studies in the literature indicate that another effect of OSAS on the stomatognathic system is through bruxism (24). In the diagnosis of bruxism, the grading system is grouped under three categories as 'possible', 'probable' and 'definite' (10). Probable bruxism is established by self-reported intraoral examination. Although PSG is considered the gold standard for the diagnosis of bruxism, it may not always be possible to use pPSG due to limited number of patients, it being an expensive method, and the lack of opportunity to perform it. In addition, since the study was planned retrospectively, bruxism was diagnosed based on the clinical examination and anamnesis of the patients (24). Additionally, it was stated that it is difficult to distinguish between SB and AB in the diagnosis of bruxism based on clinical examination and anamnesis. Therefore, in this study, cases were evaluated as bruxism without separating them as SB or AB.

In the literature, there is a relationship between OSAS and bruxism, but in terms of cause and effect 2 opinions prevail in the literature; 1- SB usually occurs together with micro-

aurosal that occurs during apnea-hypopnea events or 2-SB is triggered concurrently when the AH events end, but there is no definite consensus on the issue (24).

Jokubauskas and Baltrusaityte was (24) evaluated the relationship between OSAS and SB and reported that there is a strong correlation between SB and OSAS. Saito et al. (25) on the other hand, evaluated the relationship between SB and OSAS in their study in 2013 and reported a weak correlation between them. However, there are limitations in this study, such as the lack of a control group, the small number of cases included, and the low mean age. In this study, the incidence of bruxism was observed to be 76.5% (n=13) and 90.9% (n=10) in cases with moderate and severe OSAS respectively, and 15.4% (n=4) in cases without OSAS. In other words, as the severity of OSAS increases, the incidence of bruxism increases significantly and it can be stated that these findings are consistent with the literature.

Although there are many studies in the literature evaluating the relationship between OSAS and TMD or between OSAS and bruxism, there are only a few studies evaluating the relationship between OSAS and both TMD and bruxism. With this study, the relationship between OSAS and both TMD and bruxism was evaluated albeit with some limitations.

One of the limitations is the fact that PSG is not used in the diagnosis of bruxism due to the retrospective nature of the study. Accordingly, the relationship between SB, AB and OSAS could not be evaluated, which is the second limitation.

Conclusion

With this study, it was concluded that TMD and bruxism are seen significantly more in cases where OSAS severity is moderate or severe. In the light of this finding, the authors believe that a prognosis to consider the potential possibility of OSAS in patients diagnosed with TMD and/or bruxism should be taken into consideration in the clinic. Additionally, in the following years, there will be a need for studies in which the relationship between OSAS, TMD and bruxism is evaluated with more patient populations and using more objective methods.

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References

1. Taş E., Bilazer M., Şahin E., Gürsel A.O. Obstrüktif uyku apne sendromlu hastalarda sefalometrik analiz sonuçları. KBB-Forum 2007; 6(2): 49-56.
2. Abbott M.B., Donnelly L.F., Dardzinski B.J., Poe S.S., Chini B.A., Amin R.S. Obstructive sleep apnea: MR imaging volume segmentation analysis. Pediatric Imaging 2004; 232: 889-895.
3. Koca C.G., Gümrükçü Z., Bilgir E. Does clinical findings correlate with magnetic resonance imaging (MRI) findings in patients with temporomandibular joint (TMJ) pain? A cross sectional study. Med Oral Patol Oral Cir Bucal 2020; 25(4): 495-501.
4. Odabaş B., Gündüz Arslan S. Temporomandibular eklem anatomisi ve rahatsızlıkları. Dicle Tıp Dergisi. 2008; 35(1): 77-85.
5. Bonato L.L., Quinelato V., De Felipe Cordeiro P.C., De Sousa E.B., Tesch R., Casado P.L. Association between temporomandibular disorders and pain in other regions of the body. Journal of Oral Rehabilitation 2016; 44(1): 9-15.
6. Koca C.G., Yıldırım B., Bilgir E. Effects of bruxism on temporomandibular joint internal derangement in patients with unilateral temporomandibular joint pain: The role of magnetic resonance imaging diagnostics. CRANIO 2021 DOI: 10.1080/08869634.2021.1918959.
7. Pires PF, Castro EM, Pelai EB, de Arruda ABC, Bigaton DR. Analysis of the accuracy and reliability of the short-form Fonseca Anamnestic Index in the diagnosis of the myogenous temporomandibular disorder in women. Braz J Phys Ther. 2018; 22: 276-282.
8. Kheirabadi GR, Maracy MR, Akbaripour S, Masaeli N. Psychometric properties and diagnostic accuracy of the Edinburgh Postnatal Depression Scale in a sample of Iranian women. Iran J Med Sci. 2012, 37: 32-38.
9. Yazıcı E, Yazıcı AB. Gebelik ve postpartum döneminde psikiyatrik bozukluklar klinik ve tedavi başvuru kitabı. Bölüm adı: Postpartum depresyon Editör: Prof. Dr. Faruk Uğuz. Birinci basım, 2017; sfy 31-49. Vizyon basımevi, İstanbul, Türkiye
10. Lobbezoo F., Ahlberg J., Glaros A.G., Kato T., Koyano K., Lavigne G.J., de Leeuw R., Manfredini D., Svensson P., Winocur E. Bruxism defined and graded: an international consensus. Journal of Oral Rehabilitation 2013; 40(1): 2-4.
11. Paesani D.A., Lobbezoo F., Gelos C., Guarda-Nardini L., Ahlberg J., Manfredini D. Correlation between self-reported and clinically based diagnoses of bruxism in temporomandibular disorders patients. Journal of Oral Rehabilitation 2013 DOI: 10.1111/joor.12101.
12. Zimmerman M., Aloia M. Sleep-disordered breathing and cognition in older adults. Curr Neurol Neurosci Rep 2012; 12: 537-546.
13. Tahrani A., Somers V., Caples S. Obstructive sleep apnea, cardiovascular disease, and diabetes. CurrrbOpin Pulm Med 2013; 19: 631-638.
14. LeResche L., saunders K., Von Korff MR., Barlow W., Dworkin S.F. Use of exogenous hormones and risk of temporomandibular disorder pain. Pain 1997; 69: 153-160.
15. Young T., Peppard P.E., Taheri S. Excess weight and sleep-disordered breathing. J Appl physiol 2005; 99: 1592-1599.
16. Veiga D.M., Cunali R., Bonotto D., Cunali P.A. Sleep quality in patients with temporomandibular disorder: a systematic review. Sleep Science 2013; 6(3): 120-124.
17. Zwiri A.M.A., Ghani Z.A., Husein A., Phaik K.S., Kassim N.K., Zainal S.A., Samsudin A.R. Obstructive sleep apnea and its relation with temporomandibular disorders: a narrative review. Journal of International Oral Health 2020; 12: 8-14.
18. Pires PF, Castro EM, Pelai EB, de Arruda ABC, Bigaton DR. Analysis of the accuracy and reliability of the short-form Fonseca Anamnestic Index in the diagnosis of the myogenous temporomandibular disorder in women. Braz J Phys Ther. 2018; 22: 276-282.
19. dos Santos Berni KC, Dibai-Filho AB, Rodrigues-Bigaton D. Accuracy of the Fonseca anamnestic index in the ıdintification of myogenous temporomandibular disorder in femalen community cases. J Bodywork & Movement Therapies. 2015; 19(3): 405-409.
20. Smith M.T., Wickwire E.M., Grace E.G., Edwards R.R., Buenaver L.F., Peterson S., Klick B., Haythornthwaite J.A. Sleep disorders and their association with laboratory pain sensitivity in temporomandibular joint disorder. Sleep 2009; 32(6): 779-790.
21. Edwards R.R., Grace E., Peterson S., Klick B., Haythornthwaite J.A., Smith M.T. Sleep continuity and architecture: associations with paim-inhibitory processes in patients with temporomandibular joint disorder. Eur J Pain 2009; 13(10): 1043-1047.

22. Sanders A.E., Essick G.K., Fillingim R., Knott C., Ohrbach R., greenspan J.D., Diatchenko L., Maixner W., Dubner R., Bair E., Miller W.E., Slade G.D. Sleep apnea symptoms and risk of temporomandibular disorder: OPPERA cohort JDR Clin Res Supp 2013; 92(1): 70-77.
23. Cunali P.A., Almeida F.R., Santos C.D., Valdrighi N.Y., Nascimento N.S., Dal'Fabbro C., Tufik S., Bittencourt L., R., A. Prevalence of temporomandibular disorders in obstructive sleep apnea patients referred for oral appliance therapy. J orofac pain 2009; 23: 339-344.
24. Jokubauskas J., Baltrusaityte A. Relationship between obstructive sleep apnoea syndrome and sleep bruxism: a systematic review. Journal of Oral Rehabilitation 2017; 44: 144-153.
25. Saito M., Yamaguchi T., Mikami S., Watanabe K., Gotouda A., Okada K., Hishikawa R., Shibuya E., Lavigne G. Temporal association between sleep apnea-hypopnea and sleep bruxism events. J Sleep Res 2013; 23: 196-203.