Exploring the Complex Relationship Between Primary Headache Types and Bruxism: Patterns, Mechanisms, and Implications

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Abstract

Aim: The present study aims to explore the relationship between primary headache types and bruxism and determine how these two conditions may affect each other.

Methods: A total of 97 cases who applied to the Neurology Polyclinic of our hospital during 01.07.2023-01.08.2023 were included in the study. A comprehensive questionnaire was applied to the participants. The diagnosis of headache was established based on the International Classification of Headache Disorders criteria; the American Academy of Sleep Medicine criteria were used for the diagnosis of sleep bruxism and the Research Diagnostic Criteria for Temporomandibular Disorders were employed for the diagnosis of awake bruxism.

Results: Nineteen (19.6%) of the participants were male and 78 (80.4%) were female. Tension-type headache (TTH) was reported by 22 participants (22.7%), 30 participants had migraine-type headache (30.9%), and 45 participants (46.4%) comprised the healthy control group. Sleep bruxism was observed in 29 patients (29.9%), while 11 patients (11.3%) were diagnosed with awake bruxism. Higher rates of sleep bruxism and awake bruxism were seen in patients in the TTH group compared to those in the migraine group and the healthy control group ($p<0.001$; $p<0.001$, respectively).

Conclusions: This study provides a significant contribution to the understanding of the relationship between primary headache types and bruxism. Forming a basis for future research, our findings highlight the need for a comprehensive evaluation of these two conditions.

Keywords: *Bruxism, primary headache disorders, migraine disorders, tension-type headache*

1. Introduction

In 2013, an international group of bruxism experts held a written consensus discussion to formulate and ensure functionality of the definition of bruxism. In this context, bruxism was defined as repetitive masticatory muscle activity characterized by clenching or grinding of the teeth and/or supporting or pushing the lower jaw.[1] Following this definition, an international consensus meeting referred to as the Assessment of Bruxism Status was held in 2017 with the participation of bruxism experts across the globe to discuss the shortcomings encountered in clinical practice and studies in this field. This meeting resulted in bruxism no longer being defined under a single umbrella term, and two separate definitions were made, namely sleep bruxism and awake bruxism.

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Sleep and awake bruxism were defined as masticatory muscle activities that occur during sleep (characterized as rhythmic or non-rhythmic activity) and wakefulness (characterized by repetitive or continuous tooth contact and/or supporting or pushing the lower jaw), respectively. The meeting also concluded that bruxism in healthy subjects should not be considered a disease but a behavior that may be a potential risk factor for certain clinical outcomes.[2]

Headaches are considered a symptom of bruxism. According to a study by Costa et al. (2008), bruxism is mostly reported by patients who have headaches and 71.4% of patients with headache complaints have bruxism.[3] Headache has a significantly negative impact on quality of life. Almost all patients living with migraine and 60% of those with tension-type headache (TTH) are known to experience reduced work capacity and less participation in social activities. TTH and migraine are recognized as neurological disorders due to their high prevalence worldwide.[4] The current literature on these two types of primary headache (TTH and migraine) suggests that psychosocial factors that may behaviorally manifest as bruxism may be associated with the increased prevalence of these headaches as well as dysfunction in the masticatory and cervical muscles.[5] Alt-

hough previous studies have intensively discussed the relationship between bruxism and primary headache, these studies typically have low levels of evidence and highly different methodologies.[6]

The main purpose of the present study is to explore the relationship between headache types and bruxism in greater detail and understand the mechanisms underlying this relationship. We believe that the results of our study will provide an important contribution in improved understanding of the relationship between primary headache types and bruxism and evaluation of how these two conditions may affect each other.

2. Materials and methods

Patients between the ages of 18-50 with tension-type or migraine headache who applied to the Neurology Outpatient Clinic of our hospital during 01.07.2023-01.08.2023 and who were able to understand and answer the questionnaire questions as well as a group of healthy subjects were included in the study. Prior to the study, The Clinical Trials Ethics Committee of our hospital granted approval for the conduct of this study (approval number: 2627, date: 08.06.2023).

All subjects were asked questions about age, gender, education level, type of headache; examined for temporomandibular hypertrophy/tenderness; and a research questionnaire was applied to the participants.

The questionnaire used in this study consisted of the following questions:

1. Does another person sleep in the same room where you sleep?
2. Has anyone ever told you that you grind your teeth in your sleep?
3. Do you ever wake up to find your jaw locked or your lower jaw clenched forward?
4. Do you feel pain or stiffness in your jaw muscles when you wake up?
5. How often do you clench your teeth during sleep (is it more than 5 times a week?)
6. How often do you grind your teeth during sleep (is it more than 5 times a week?)
7. How often do you clench your teeth when you are awake (is it more than 5 times a week?)
8. How often do you grind your teeth when you are awake (is it more than 5 times a week?)

All participants answered these questions as 'yes' or 'no'. The diagnosis of sleep bruxism was made by a neurologist according to the American Academy of Sleep Medicine (AASM)[7] guideline, which has a validated Turkish translation, and the diagnosis of primary headache was made based on the International Classification of Headache Disorders (ICHD-3)[8] diagnostic criteria. The Turkish translation of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) questionnaire[9] was used for the diagnosis of wakefulness bruxism. Patients who answered 'yes' to RDC/TMD question 15d, "Do you grind or clench your teeth during the day?" were diagnosed with awake bruxism. Patients with alcohol and caffeine addiction, those with sleep disorders and psychiatric conditions, those using anti-migraine or antidepressant medication, and those using drugs that may cause bruxism were excluded from the study.

2.1. Statistical analysis

The SPSS (Statistical Package for the Social Sciences) 25.0 package program was used for statistical analysis of the data. Categorical measurements were summarized as numbers and percentages whereas continuous measurements were summarized as mean values and standard deviation (with median and minimum-maximum values where necessary). The chi-square test was used for the comparisons of categorical variables. The Shapiro-Wilk test was employed to determine whether the parameters in the study showed normal distribution. The Kruskal-Wallis test was used for parameters that did not show normal distribution. Statistical significance level was considered 0.05 in all tests.

3. Results

The mean age of the participants was 32.6±10.9 years; 19 (19.6%) were male and 78 (80.4%) were female. Twenty-eight (28.9%) of the cases had primary education, 32 (33.0%) had graduated high school and 37 (38.1%) had a bachelor's degree.

Twenty-two (22.7%) of the cases had TTH, 30 (30.9%) suffered from migraine headaches, and 45 (46.4%) were in the healthy control group. Age, gender and education status were found to be similar across the groups (p>0.05).

Sleep bruxism was observed in 29 (29.9%) of the patients, while 11 (11.3%) patients were diagnosed with awake bruxism. We observed that 29.5% of female patients had sleep bruxism and 31.6% of male patients had sleep bruxism. Awake bruxism was present in 9% of female participants and 21.1% of male participants **(Fig. 1)**. The presence of sleep bruxism and awake bruxism did not differ by gender (p=0.85; p=0.13, respectively). Higher rates of sleep bruxism and awake bruxism were seen in patients in the TTH group compared to those in the migraine group and the healthy control group (p<0.001; p<0.001, respectively).

The proportion of participants who reported teeth grinding during sleep was higher in the TTH and migraine groups than that in the healthy control group (p=0.006). The proportion of those who felt pain or stiffness in the jaw muscles upon waking up in the morning was higher in the TTH and migraine groups compared to the healthy control group (p<0.006). The rate of clenching and grinding of teeth more than 5 times a week during sleep was significantly higher in the TTH group compared to the other two groups (p=0.002; p=0.007, respectively). The rate of clenching and grinding of teeth more than 5 times a week during wakefulness was significantly higher in the TTH group compared to the other groups (p<0.001; p=0.001, respectively) (Table 1).

Figure 1

Gender distribution according to bruxism type.

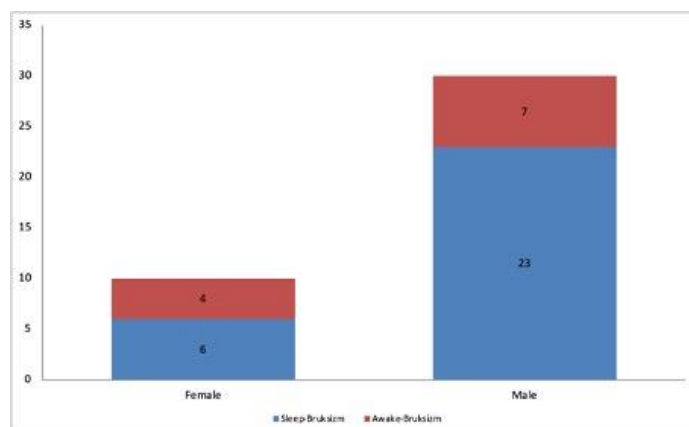

Table 1
Demographic characteristics of the groups

	TTH (n=22)	Migraine (n=30)	Healthy Controls (n=45)	p
	n (%)	n (%)	n (%)	
Age (median [IQR])	27.5 (20)	32 (13)	31 (18)	0.737‡
Gender				
• Male	6 (27.3)	2 (6.7)	11 (24.4)	0.096†
• Female	16 (72.7)	28 (93.3)	34 (75.6)	
Education status				
• Primary education	7 (31.8)	13 (43.3)	8 (17.8)	0.142†
• High school	8 (36.4)	6 (20)	18 (40)	
• University	7 (31.8)	11 (36.7)	19 (42.2)	
Pain/tenderness in the temporomandibular joint	20 (90.9)	13 (43.3)	8 (17.8)	<0.001**,†
Has anyone ever told you that you grind your teeth in your sleep?	6 (27.3)	7 (23.3)	1 (2.2)	0.006**,†
Do you ever wake up to find your jaw locked or your lower jaw clenched forward?	10 (45.5)	8 (26.7)	2 (4.4)	<0.001**,†
Do you feel pain or stiffness in your jaw muscles when you wake up?	15 (68.2)	15 (50)	7 (15.6)	<0.001**,†
How often do you clench your teeth during sleep (is it more than 5 times a week)?	6 (27.3)	4 (13.3)	-	0.002**,†
How often do you grind your teeth during sleep (is it more than 5 times a week)?	5 (22.7)	4 (13.3)	-	0.007**,†
How often do you clench your teeth when you are awake (is it more than 5 times a week)?	9 (40.9)	2 (6.7)	-	<0.001**,†
How often do you grind your teeth when you are awake (is it more than 5 times a week)?	5 (22.7)	1 (3.3)	-	0.001**,†
SB	15 (68.2)	10 (33.3)	4 (8.9)	<0.001**,†
AB	9 (40.9)	2 (6.7)	-	<0.001**,†

** p<0.05, **p<0.001, †: Chi-square test, ‡: Kruskal-Wallis test*
TTH: Tension-type headache, SB: Sleep bruxism, AB: Awake bruxism

4. Discussion

In this study, we found a significant relationship between primary headache and bruxism. The analysis by primary headache subtypes revealed a significantly higher rate of bruxism in the TTH group compared to the migraine group.

As typically seen in studies on headaches, the majority (80.4%) of our study sample consisted of females. [10,11] The fact that women often have greater health awareness and more regular access to healthcare services than men may partially explain this dominance. On the other hand, the presence of bruxism did not appear to differ by gender in our study cohort. This finding is consistent with the results reported by Melis et al. [12] and Manfredini et al. [13] The authors of a systematic review reported a higher frequency of bruxism in female patients compared to males [14], whereas Lukomska-Szymanska et al. [15] reported male predominance in a cohort of 1900 patients. These conflicting findings may be resulting from the complex etiology of bruxism as well as the involvement of various factors in the development of bruxism. Furthermore, the fact that this relationship has not been associated with gender suggests that bruxism may in fact be a common problem in the general population.

In a recent study, Mihaiu et al. (2023) reported bruxism in 86% of 67 patients with primary headache. [5] They also reported high levels of stress and anxiety in these patients, which is consistent with the relevant literature. [16,17] Similarly, we observed bruxism in 77% of 52 patients with primary headache in our study. We did not use a specific scale to determine the psychiatric comorbidities of the patients included in our study; however, the presence of a control group and the classification of primary headache syndromes and bruxism according to their subtypes are the strengths of our study. Muayqil et al. (2018) examined 3,853 patients and reported a higher rate of bruxism in 1,333 patients with migraine compared to the non-headache group. [18] Analyzing 400 medical records, Porporatti et al. (2015) showed that self-reported bruxism was not associated with the presence of primary headache (TTH or migraine). [19] Fernandes et al. (2013) [20] & Wagner et al (2018) [21] reported that sleep bruxism alone does not increase the risk of any primary headache; however, the likelihood of migraine and tension headache may increase significantly when associated with a painful temporomandibular disorder (TMD). A strong relationship between sleep bruxism and tension-type headache was reported by Mihaiu et al. (2023) in a cohort of 67 cases. They also showed that waking bruxism was associated with both TTH and migraine headaches. [5] The authors highlighted that this difference could be explained by the fact that continuous teeth clenching during the day maintains a high level of tension in masticatory muscles, leading to increased sensitivity of the nociceptors of peripheral muscles and a change in the stimulus-response function over time. In a study of 307 medical records, Silva et al. (2022) reported a 2.27-fold increased likelihood of awake bruxism (AB) in subjects suffering from headaches. In their study, participants with self-reported AB were more likely to report headache and vice versa, as participants who reported headache were more likely to have AB. [22] In our study, AB was present in 11.3% of the patients with headache and we did not observe AB in the non-headache group. A strength of our study is that the diagnosis of headache was based on the ICHD-3 criteria and not on a self-reported questionnaire such as the RDC/TMD. In a recent clinical study, Haggiag and Speciali (2020) reported a relationship between AB and chronic migraine. After treatment for AB using an intraoral appliance designed for daytime use, the patients reportedly achieved an improvement in pain severity, which was maintained at 1 year. [23]

Our study is not without limitations; firstly, we did not perform an objective evaluation of the participants in terms of temporomandibular joint disorders. However, on palpation, 63% of our patients had pain/sensitivity in the temporomandibular joint. Another limitation

is that we did not perform a polysomnographic examination for the definitive diagnosis of sleep bruxism. This would have been costly and inaccessible for such a large study sample as ours.

5. Conclusion

In conclusion, the present study provides a significant contribution to our understanding of the relationship between primary headache types and bruxism. Our results suggest that bruxism may occur through different mechanisms during the day and during sleep. This warrant further research examining the relationship between different forms of bruxism. In this context, we believe that the differences between the rates of sleep bruxism and awake bruxism need further detailed research to provide more greater insights on the potential of bruxism to trigger or exacerbate headaches. We also think that inquiring the complaints of bruxism in patients who presenting to the outpatient clinic with headache complaints and taking this into consideration in the treatment plan will increase the effectiveness of the treatment. Finally, further prospective studies on this subject may be advisable due to the conflicting literature reports on the relationship between bruxism and gender.

Statement of ethics

The study protocol was approved by the University of Health Sciences Turkey, Adana City Training and Research Hospital Clinical Research Ethics Committee (Date: 08.06.2023, Number: 2627)

Conflict of interest statement

The authors declare that they have no financial conflict of interest with regard to the content of this report.

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Author Contributions

Concept/Design: ZSŞ, EÇ; Analysis/Interpretation: ZSŞ, EÇ; Data Collection: ZSŞ, EÇ; Writer: ZSŞ; Critical Review: ZSŞ, EÇ; Approver: ZSŞ, EÇ All authors read and approved the final version of the manuscript.

Availability of data and materials

The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

References

1.Lobbezoo F, Ahlberg J, Glaros AG, et al. Bruxism defined and graded: an international consensus. J Oral Rehabil. 2013;40(1):2-4. https://doi.org/10.1111/joor.12011
2.Lobbezoo F, Ahlberg J, Raphael KG, et al. International consensus on the assessment of bruxism: Report of a work in progress. J Oral Rehabil. 2018;45(11):837-844. https://doi.org/10.1111/joor.12663
3.Costa ALF, D'Abreu A, Cendes F. Temporomandibular joint internal derangement: association with headache, joint effusion, bruxism, and joint pain. J Contemp Dent Pract. 2008;9(6):9-16.
4.De Luca Canto G, Singh V, Bigal ME, Major PW, Flores-Mir C. Association between tension-type headache and migraine with sleep bruxism: a systematic review. Headache. 2014;54(9):1460-9. https://doi.org/10.1111/head.12446
5.Mihaiu J, Debucean D, Mihancea P, Maghiar AM, Marcu OA. Primary headache management in a multidisciplinary team – a pilot study. J Med Life. 2023;16(7):1127-35. https://doi.org/10.25122/jml-2023-0259
6.Réus JC, Polmann H, Mendes Souza BD, et al. Association Between Primary Headache and Bruxism: An Updated Systematic Review. J Oral Facial Pain Headache. 2021;35(2):129-38. https://doi.org/10.11607/ofph.2745
7.Tinastepe N, İşcan İ. Uyku ve uyanıklık bruksizmi olan bireylerde uyku kalitesinin araştırılması. Selcuk Dent J. 2021;8(1):173-8. https://doi.org/10.15311/selcukdentj.607326
8.Carbaat P a. T, Couturier EGM. [Headache: classification and diagnosis]. Ned Tijdschr Tandheelkd. 2016;123(11):539-44. https://doi.org/10.5177/ntvt.2016.11.16122
9.Kurtoglu C, Gur OH, Kurkcu M, et al. Effect of Botulinum Toxin-A in Myofascial Pain Patients With or Without Functional Disc Displacement. J Oral Maxillofac Surg. 2008;66(8):1644-51. https://doi.org/10.1016/j.joms.2008.03.008
10.Sayılgan N, Domaç FM, Güleç H. Migren ve gerilim tipi baş ağrısı tanılı bireylerde psikiyatrik eştanı ve yaşam kalitesi ile ilişkisi: ön çalışma. Cukurova Med J. 2019;44(1):44-51. https://doi.org/10.17826/cumj.448419
11.Eigenbrodt AK, Ashina H, Khan S, et al. Diagnosis and management of migraine in ten steps. Nat Rev Neurol. 2021;17(8):501-14. https://doi.org/10.1038/s41582-021-00509-5
12.Melis M, Abou-Atme YS. Prevalence of bruxism awareness in a Sardinian population. Cranio J Craniomandib Pract. 2003;21(2):144-51. https://doi.org/10.1080/08869634.2003.11746243
13.Manfredini D, Restrepo C, Diaz-Serrano K, Winocur E, Lobbezoo F. Prevalence of sleep bruxism in children: a systematic review of the literature. J Oral Rehabil. 2013;40(8):631-42. https://doi.org/10.1111/joor.12069
14.Machado E, Dal-Fabbro C, Cunali PA, Kaizer OB. Prevalence of sleep bruxism in children: A systematic review. Dent Press J Orthod. 2014;19(6):54-61. https://doi.org/10.1590/2176-9451.19.6.054-061.oar
15.Brandão de Almeida A, Rodrigues RS, Simão C, de Araújo RP, Figueiredo J. Prevalence of Sleep Bruxism Reported by Parents/Caregivers in a Portuguese Pediatric Dentistry Service: A Retrospective Study. Int J Environ Res Public Health. 2022;19(13):7823. https://doi.org/10.3390/ijerph19137823
16.Lucchetti G, Peres MFP, Lucchetti ALG, et al. Generalized anxiety disorder, subthreshold anxiety and anxiety symptoms in primary headache. Psychiatry Clin Neurosci. 2013;67(1):41-9. https://doi.org/10.1111/j.1440-1819.2012.02405.x
17.Lampl C, Thomas H, Tassorelli C, et al. Headache, depression and anxiety: associations in the Eurolight project. J Headache Pain. 2016;17:59. https://doi.org/10.1186/s10194-016-0649-2
18.Muayqil T, Al-Jafen BN, Al-Saaran Z, et al. Migraine and Headache Prevalence and Associated Comorbidities in a Large Saudi Sample. Eur Neurol. 2018;79(3-4):126-34. https://doi.org/10.1159/000487317
19.Porporati AL, Costa YM, Conti PCR, Bonjardım LR, Calderon P dos S. Primary headaches interfere with the efficacy of temporomandibular disorders management. J Appl Oral Sci. 2015;23(2):129-34. https://doi.org/10.1590/1678-775720130557
20.Fernandes G, Franco AL, Gonçalves DA, Speciali JG, Bigal ME, Camparis CM. Temporomandibular disorders, sleep bruxism, and primary headaches are mutually associated. J Orofac Pain. 2013;27(1):14-20. https://doi.org/10.11607/jop.921
21.Wagner B de A, Moreira Filho PF. Painful temporomandibular disorder, sleep bruxism, anxiety symptoms and subjective sleep quality among military firefighters with frequent episodic tension-type headache. A controlled study. Arq Neuropsiquiatr. 2018;76(6):387-92. https://doi.org/10.1590/0004-282X20180043
22.Silva TB, Ortiz FR, Maracci LM, et al. Association among headache, temporomandibular disorder, and awake bruxism: A cross-sectional study. Headache J Head Face Pain. 2022;62(6):748-54. https://doi.org/10.1111/head.14322
23.Haggiag A, Speciali JG. A new biofeedback approach for the control of awake bruxism and chronic migraine headache: utilization of an awake posterior interocclusal device. Arq Neuropsiquiatr. 2020;78(7):397-402. https://doi.org/10.1590/0004-282x20200031