

SELF-REPORTED SLEEP AND AWAKE BRUXISM AMONG UNIVERSITY STUDENTS AND THEIR ASSOCIATION WITH PERCEIVED STRESS

Alma Gavranović-Glamoč*¹, Selma Alić-Drina¹,
Lejla Kazazić¹, Sanela Strujić-Porović¹, Selma Jakupović²,
Alma Kamber¹, Emir Berhamović¹, Lejla Berhamović¹,
Amela Džonlagić¹, Alija Mehmedović³

¹ Department of Prosthodontics with Dental Implantology, University of Sarajevo, Faculty of Dentistry with Dental Clinical Center, Sarajevo, Bosnia and Herzegovina

² Department of Restorative Dentistry with Endodontics, University of Sarajevo, Faculty of Dentistry with Dental Clinical Center

³ D. Lohinja Durać, Gračanica, Bosnia and Herzegovina

*Corresponding author

Alma Gavranović-Glamoč
DDM, MSc, PhD
University of Sarajevo,
Faculty of Dentistry with
Dental Clinical Center,
Department of
Prosthodontics
with Dental Implantology,
Bolnicka 4a, 71000 Sarajevo,
Bosnia and Herzegovina
Telephone: +387 33 214-249,
+387 61 171-809,
Email: alma.glamoc@gmail.com

ABSTRACT

Introduction: Bruxism represents an oral condition of excessive teeth grinding or jaw clenching. It is important to make distinction between sleep bruxism (SB) and awake bruxism (AB) due to different manifestations and consequences for the stomatognathic system. Awake bruxism mainly consists of teeth clenching, while teeth grinding is more common in sleep bruxism.

Objectives: This study determined the frequency of awake and sleep bruxism in relation to gender, faculty type and year of study and investigate the association between awake and sleep bruxism and the level of stress in the participants.

Methodology: A total of 756 participants anonymously completed questionnaires consisting of two parts. The first part of the questionnaire contained basic information about the participant, the presence/absence of bruxism and its symptoms. The second part of the survey questionnaire was related to the perceived stress scale.

Results: Statistically significant higher frequency of teeth clenching compared to teeth grinding has been proven, indicating a higher prevalence of "awake" bruxism. Men had significantly more teeth clenching during the day, while women had it during the night. Participants in the first three years of the study had bruxism more frequently during the day, while in the fourth, fifth and sixth year, they had it more frequently during the night. The association between AB and SB with stress levels has not been proven.

Conclusion: The high prevalence of self-reported AB and SB bruxism among the student population emphasizes the importance of a definitive diagnosis through questionnaires, medical history, clinical examination and instrumental assessment. A multidimensional evaluation of the presence of bruxism, associated comorbidities, etiology and consequences of bruxism opens up the possibility of its prevention and appropriate therapy.

Keywords: Student's population, awake and sleep bruxism, stress.

Introduction

Bruxism represents an oral condition falling within the scope of interest for various disciplines, including dentistry, neurology, psychology and sleep medicine. Each of these disciplines has proposed several definitions for this condition necessitating the search for a common definition. (1)

In 2013, the International Expert Group on Bruxism proposed a consensus based on the concept that bruxism is "repetitive jaw activity" that can occur during sleep (SB) or wakefulness (AB). The experts provided separate definitions for sleep bruxism (SB) and awake bruxism (AB):

"Sleep bruxism is the activity of the masticatory muscles during sleep, characterized as rhythmic (phasic) or non-rhythmic (tonic), and it is not a movement or sleep disorder in otherwise healthy individuals."

"Awake bruxism is the activity of the masticatory muscles during wakefulness, characterized by repeated or sustained teeth contact and/or jaw clenching or thrusting, and is not a movement disorder in otherwise healthy individuals (2,3)."

Awake bruxism is commonly known as 'bruxomania' and primarily involves teeth clenching, with teeth grinding being less frequently observed. In sleep bruxism, teeth grinding is more commonly reported during various types of motor activity (4, 5).

It is estimated that bruxism occurs in 8-31% of the population with no significant gender differences (2,3,6). The prevalence of "sleep bruxism" (SB) varies from 9.3% to 15.9%, while the prevalence of "awake bruxism" (AB) ranges between 22.1% and 31% among adults (7-11).

The etiology of bruxism involves a multifactorial model with central factors considered to play a key role. In addition to central factors, psychosocial factors and peripheral factors are involved in the etiology. It is currently believed that peripheral factors play a minor role in the development of bruxism (12,13).

For SB, it is considered to be centrally mediated, with a complex interaction of all factors affecting the functioning of the autonomic system during sleep. AB is equally centrally mediated but is mainly related to psychosocial factors and behavioral changes

associated with lifestyle modifications. Ultimately, this means that the alleged etiological factors can vary depending on the circadian manifestations of bruxism (14-16).

Numerous studies have shown a connection between bruxism and specific personality traits (e.g., aggression or emotional suppression) (3, 17-21), psychosocial factors (22, 23), and psychological stress (16, 22-25).

Students represent a unique population experiencing elevated levels of stress, frustration or depression. For students, in addition to exam situations, stressors can include factors such as independence, transitioning to a more mature age group and building a new social life (26).

Stress arises due to a lack of time, the misalignment between academic and personal activities and often financial problems (27,28). Studying during the COVID-19 pandemic entailed strict adherence to epidemiological measures that significantly altered people's lives, including students. Studying shifted to online classes made students find themselves completing their academic responsibilities from the confines of their own rooms. All these changes led to shifts in lifestyle, creating additional stress and various studies have confirmed an increase in the incidence of self-reported bruxism during the pandemic (29, 30).

Some studies suggest that the influence of psychosocial factors is significant for awake bruxism, while their impact on sleep bruxism is less clear (31-33). Given the limited epidemiological data on the prevalence of AB and SB among the student population and the association of AB and SB with stress, this study was conducted.

Research Objectives:

1. Examine the frequency of awake and sleep bruxism.
2. Determine the prevalence of awake and sleep bruxism in relation to gender, faculty type and year of study.
3. Investigate the correlation between awake and sleep bruxism and the level of stress among the participants.

Methodology

In order to gather information on the frequency of awake and sleep bruxism among students from the Faculty of Dentistry with a Dental Clinical Center and the Faculty of Pharmacy at the University of Sarajevo, a cross-sectional study was conducted.

The study was carried out in April 2020 and was approved by the Ethics Committee of the Faculty of Dentistry with a Dental Clinical Center in Sarajevo (reference number: 02-3-4-19-1-7/2022).

The students participated in the survey anonymously and voluntarily, providing informed consent. The first section of the questionnaire included basic information about the participants, such as age, gender, the faculty they were attending, information about the presence/absence of bruxism and its symptoms and, as well as, the influence of specific situations on the manifestation of bruxism (34).

The second section of the questionnaire consisted of questions related to the Perceived Stress Scale (PSS), which is the most commonly used psychological instrument for measuring the perception of stress. Individual PSS scores can range from 0 to 40, with higher scores indicating a higher perceived level of stress (35).

The results were statistically analyzed and presented in tables and graphs.

Statistical data analysis methods

Statistical data analysis was conducted using IBM SPSS Statistics v.21 software. Arithmetic means and standard deviations of quotative variables, then absolute and relative frequencies of nominal variables were calculated from the descriptive statistical analysis. In the study the parametric Pearson linear correlation was used, and the chi-square test was used as a non-parametric statistical method. The research hypotheses were tested at a 95% confidence level, which equates to a 5% risk level.

Results

A total of 756 respondents participated in the study, of which 170 (22.5%) were male, and 586 (77.5%) were female. At the Faculty of Dentistry with a Dental Clinical Center, 439 respondents were surveyed, including 125 males and 314 females, while at the Faculty of Pharmacy, 317 respondents were surveyed, with 45 males and 272 females.

Students from all years of both faculties were surveyed and the distribution of participants according to their year of study at the Faculty of Dentistry and the Faculty of Pharmacy is shown in Figure 1.

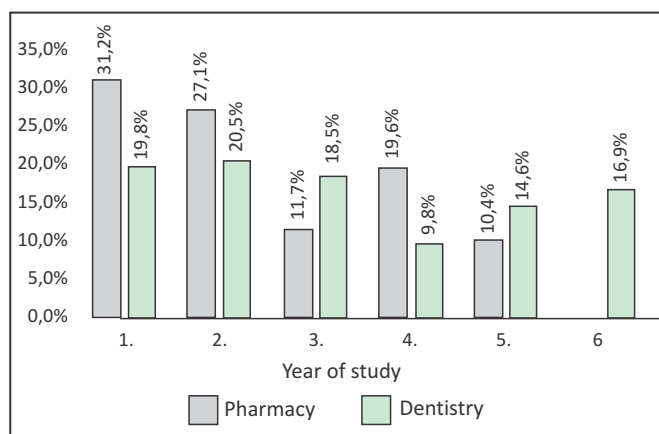


Figure 1

Distribution of participants according to their year of study at the Faculty of Dentistry and the Faculty of Pharmacy

Regarding the frequency of bruxism among the surveyed students, 53.2% of respondents did not report bruxism, while a slightly smaller percentage, 46.8%, indicated the presence of bruxism (Figure 2).

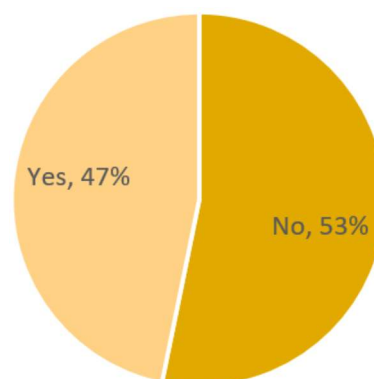


Figure 2

The presence of bruxism in student population

Regarding the frequency of awake and sleep bruxism, the largest percentage (26.6%) of surveyed students from both faculties who reported bruxism had symptoms of teeth clenching, while 4.0% of students reported symptoms of teeth grinding. A statistically significantly higher frequency of teeth clenching ($p < 0.000$) was confirmed compared to the frequency of teeth grinding. Given that teeth clenching is a characteristic of "awake" bruxism, this research demonstrated a higher prevalence of "awake" bruxism compared to "sleep" bruxism.

A comparison of the differences in the frequency of awake and sleep bruxism by gender is presented in Table 1. A statistically significant difference in frequency was only observed in response to the question "Have you noticed clenching your teeth?" where men experienced this occurrence significantly more often during the day, while women had it more frequently during the night.

		Gender				Total	
		Male		Female			
		n	%	n	%		
Have you noticed teeth clenching?	Yes, during the day	54	72.0%	147	60.5%	147	60.5%
	Yes, during the night	21	28.0%	96	39.5%	96	39.5%
Total		75	100%	243	100%	243	100%

$\chi^2 = 2,787$, $df = 1$, $p < 0,095$

Table 1. The differences in the frequency of awake and sleep bruxism by gender

By comparing the differences in the frequency of awake and sleep bruxism across different years of study, the Chi-square test revealed a statistically

		Have you noticed teeth clenching ?				Total	
		Yes, during the day		Yes, during the night			
		n	%	n	%		
Year of study	First year	46	22,9%	23	19,7%	69	21,7%
	Second year	51	25,4%	20	17,1%	71	22,3%
	Third year	27	13,4%	10	8,5%	37	11,6%
	Fourth year	34	16,9%	20	17,1%	54	17,0%
	Fifth year	29	14,4%	21	17,9%	50	15,7%
	Sixth year	14	7,0%	23	19,7%	37	11,6%
Total		201	100%	117	100%	318	100%

$\chi^2 = 14,967$, $df = 5$, $p < 0,011$

Table 2. The differences in the frequency of awake and sleep bruxism by different years of study

		Have you noticed teeth grinding? (during the day=0, during the night= 1)	Have you noticed teeth clenching? (during the day=0, during the night= 1)	Has anyone told you that you grind your teeth? (during the day=0, during the night= 1)	Has anyone told you that you clench your teeth? (during the day=0, during the night= 1)
Individual score for PSS	r	-0,039	-0,015	-0,118	-0,108
	p	0,638	0,784	0,285	0,372
	n	146	318	84	71

r- Pearson linear correlation, p- probability of rejecting the null hypothesis with a 5% risk., n-sample size

Table 3. The influence of stress level on awake/sleep bruxism

		Presence of bruxism				χ^2	P
		No		Yes			
		n	%	n	%		
Is opening your mouth painful or difficult when you wake up in the morning?	Yes	3	0,8%	47	14,1%	55,58	0,000
	No	390	99,2%	286	85,9%		
Do you experience pain in your facial muscles?	Yes	25	6,4%	92	27,1%	58,50	0,000
	No	363	93,6%	248	72,9%		
Do you experience pain in your jaw joints?	Yes	29	7,4%	99	29,1%	4,79	0,000
	No	365	92,6%	241	70,9%		
Do you have frequent headaches?	Yes	117	30,2%	130	38,1%	32,08	0,029
	No	271	69,8%	211	61,9%		
Have you noticed any teeth wear or changes in appearance?	Yes	56	14,5%	108	32,5%	13,44	0,000
	No	331	85,5%	224	67,5%		
Do you have sensitive or painful teeth when exposed to cold?	Yes	110	28,2%	140	41,4%	16,81	0,000
	No	280	71,8%	198	58,6%		
Does anyone in your family grind or clench their teeth?	Yes	81	23,4%	112	38,8%	4,62	0,000
	No	265	76,6%	177	61,2%		
Does toothache bother you at night?	Yes	3	0,7%	11	3,1%	38,49	0,032
	No	399	99,3%	340	96,9%		
Have you ever been told by a dentist that you have bruxism?	Yes	0	0,0%	34	9,9%	48,04	0,000
	No	394	100%	311	90,1%		

– sample size (number of respondents), χ^2 - chi square test value, p– probability of rejecting the null hypothesis with a 5% risk.

Table 4. The frequency of symptoms and signs of bruxism among students in relation to the presence of bruxism.

significant difference in the distribution of frequency between categories for the question "Have you noticed clenching your teeth?" The results suggest that in the first three years of study, respondents experienced this type of bruxism more frequently during the day, while in the fourth, fifth and sixth years, it was more frequent at night. For other questions regarding bruxism and years of study, no statistical significance was found. The results are presented in Table 2.

In the examination of the correlation between sleep and awake bruxism and the level of stress among the participants, the Pearson correlation coefficients are low and not statistically significant, leading to the conclusion that this type of relationship was not established (Table 3).

The frequency of symptoms and signs of bruxism among students who reported bruxism and those who did not is presented in . As observed in the table, respondents who reported bruxism significantly more often indicated the presence of various symptoms in response to all questions.

Discussion

The high prevalence of bruxism among the student population (46.8%) obtained in this study is consistent with another researches (31,32,33). Self-assessment by the participants regarding the presence of bruxism showed a higher frequency in teeth clenching (26.6%), while teeth grinding was present in a small percentage and mostly during the night (4%), which was also statistically significant. Considering that teeth clenching was identified during the day, and teeth grinding during the night, there is a higher prevalence of "awake" bruxism compared to sleep bruxism, consistent with the results of studies at the Medical Faculty in Split (34) and the University of Salerno in Italy (36).

Many studies presented a higher prevalence of awake bruxism (AB) compared to sleep bruxism (SB), with this prevalence being higher in a younger population including our respondents (7,37,38,39).

Contrary to our study, research conducted by Osses-Anguita and colleagues among dental medicine students at the University of Madrid demonstrated a higher prevalence of sleep bruxism (SB) during the pandemic (40). Students at the Faculty of Dentistry in Sarajevo mostly attended classes and practical exercises during the pandemic, which could result in an acute experience of stress arising from daily personal and social interactions, potentially increasing anxiety levels and prompting a higher level of AB. Awake bruxism has been induced in experimental situations by acute stress activities (41) or anxiety (42). It is assumed that SB among students at the University of Madrid was higher

because the lockdown caused a sense of helplessness, a lack of activity, increased levels of depression or passive coping.

A higher prevalence of sleep bruxism (SB) compared to awake bruxism (AB) has been demonstrated in studies conducted in Vietnam and the Netherlands (43,44).

The most common method used in studies on self-assessment of bruxism is a survey or interview due to its simplicity. However, this method is effective only for diagnosing symptomatic bruxism or awareness of its existence. SB is typically noiseless and unconscious in about 80% of cases. The distinction between AB and SB is difficult to discern during a clinical examination due to numerous similar signs and symptoms. For this reason, SB can be easily overlooked or inaccurately reported (45).

In the study on bruxism among Israeli adolescents (46), there is a high concordance between SB and AB, meaning that reporting SB increases the odds of reporting AB fivefold, and vice versa.

The literature has been unable to definitively establish a difference in the frequency of types of bruxism between different genders (47).

In this study, when exploring the difference in the frequency of SB and AB in relation to gender, a significant difference was observed only for the question "Have you noticed clenching your teeth?" where men experienced this occurrence significantly more often during the day, while women had it more frequently during the night.

Gałczyńska-Rusinat at all., who examined the biomechanical behavior of the masseter muscle in patients with self-reported bruxism, found increased tension and stiffness in the contracted masseter in the male gender (48). Considering its primary role in elevating the mandible and exerting force during chewing where these movements dominate during teeth clenching, this could explain the higher prevalence of AB in men in our study (45).

Findings from certain studies indicate potential disparities in response to stressful situations, with men displaying a tendency toward direct action, while women tend to favor emotion-focused coping strategies when confronted with stress-inducing circumstances (49).

Kato at all. demonstrated a higher prevalence of AB in women (50), while in other studies, differences

in the type of bruxism between genders were not found (51,52).

In this study, a statistically significant difference in the occurrence of AB and SB in relation to the type of faculty was not established. However, in relation to the year of study, it was demonstrated that in the first three years of study, respondents more frequently experienced teeth clenching during the day, while in the fourth, fifth and sixth years, it was more frequent at night. These results are not surprising, considering that student life represents an introduction to independence, financial matters, success, adherence to schedules and obligations and choosing a social environment in which an individual can comfortably integrate. The daily stressors that this population faces (psychological, emotional, and social) have negatively impact on their learning and academic achievements (53). Exposure to a range of psychosocial stressors in the initial years of study has led to a higher prevalence of awake compared to sleep bruxism.

In a study at Tel Aviv University's School of Dental Medicine, a higher frequency of awake bruxism during the 3rd and 4th years of study was reported (32). The higher prevalence of sleep bruxism among senior students in our study could be explained by their greater maturity and different ways of coping with stress. Coping modalities could include emotion-focused coping or avoidance coping, which might be present in older adolescents who try to cognitively, emotionally or behaviorally detach from stressors or their own psychological and physical stress reactions. This emotional suppression could lead to sleep problems or sleep bruxism (54).

The association between AB and SB and the level of stress was not statistically significant. However, it should be noted that a high level of stress was detected according to the PSS-10 scale (the average stress score for students at the Dental Faculty was 20, while for the Pharmacy Faculty, it was 21.3), which resulted in a high prevalence of AB. Many researchers suggest that psychological factors, stress and anxiety influence awake bruxism (12), while Carra et al. believe that anxiety and stress are risk factors for bruxism in sleep (55).

Hilgenberg-Sydney et al. in their study also did not confirm a connection between the level of anxiety obtained through a questionnaire and AB (52).

A study by Câmara-Souza et al. demonstrated a

positive and significant correlation between psychological factors and AB among students (15). Consistent with this research, many studies have not found an association between the intensity of SB and perceived stress according to self-assessment by respondents (2, 3, 32).

The belief that stress may be correlated with SB has been supported by studies that explored the relationship between sleep bruxism, perceived stress and coping strategies. Klara et al. demonstrated that a higher score of perceived stress is associated with a higher bruxism index (54). Similar findings have been shown in other studies on the relationship between stress and SB (56,57). A study that examined bruxism among students in Netherlands supports the suggestion that psychosocial stress is associated with both types of bruxism. However, this observation could also be due to the respondents' belief that they usually report an increase in bruxism symptoms during stressful life periods (58). The explanation for different claims regarding the relationship between stress and types of bruxism is likely due to the fact that it is difficult to clinically differentiate between AB and SB, especially when the diagnosis is made through questionnaires (50).

Respondents who reported the presence of bruxism in a statistically significant percentage also mentioned various associated symptoms. They experienced frequent headaches, facial muscle pain, temporomandibular joint pain, sensitivity to hot or cold, changes in tooth appearance and difficulty or painful mouth opening. We can conclude that these results are due to a significantly higher presence of parafunctional habits that have exceeded the specific structural tolerance of each component of the masticatory system, and when it is exceeded, damage occurs. All of this leads to the presence of symptoms and clinical signs that disrupt the functioning of the stomatognathic system (59).

Baad-Hansen et al. conducted a systematic review of the literature and concluded that bruxism is, to some extent, associated with musculoskeletal symptoms, although the evidence was contradictory and depended on various factors, such as age, type of bruxism and the quality of diagnosis. The literature does not support a direct linear causal relationship between bruxism and such symptoms (60,61).

The limitation of this study is that the diagnosis of bruxism was made through questionnaires without

personal history and clinical examination representing a lower level of diagnosis of "possible" bruxism according to the International Expert Group on Bruxism. The diagnosis of definitive bruxism is established with a positive self-assessment, positive clinical examination and based on instrumental assessment, i.e., information obtained through technical devices (2, 62).

Future research should consider using the standardized bruxism assessment tool (STAB), which allows multidimensional evaluation of the presence of bruxism, associated comorbidities, etiology and consequences of bruxism (63).

Conclusion

The high prevalence of self-reported AB and SB bruxism among the student population highlights the importance of a definitive diagnosis through questionnaires, anamnesis, clinical examination and, if necessary, the use of technical devices. With a detailed multidimensional evaluation of the etiology and clinical manifestations of bruxism, it is possible to access the prevention and adequate therapy of bruxism.

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Conflict of interest

The authors declare no conflict of interest related to this study of any kind.

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