ORIGINAL ARTICLES

Self-assessment questionnaire and clinical evaluation of bruxism in correlation with perceived stress

Solene Chanteux[1], Manuela Taut[2], Cecilia Bacali[2], Andrea Kui[2], Mona Zeinab Zuaiter[3], Oana Almasan[2], Smaranda Buduru[2]

[1]Faculty of Dental Medicine, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca Romania
[2]Prosthetic Dentistry and Dental Materials Department, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania
[3]Department of Cell Biology, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

ABSTRACT

Bruxism is a parafunctional behavior that involves clenching and grinding of the teeth, as well as increased masseters activity with or without contact with the teeth. It can happen during the day or at night. Diagnostic tools for bruxism include self-assessment questionnaires, clinical evaluation forms and polysomnography. Stress and anxiety represent two psychological factors that have been frequently related to bruxism. Twenty students in dental medicine were included in this study and a self-assessment questionnaire together with a clinical evaluation form were used as diagnostic tools for bruxism. Consequently, two groups developed: group A or non-bruxers and group B or bruxers. A questionnaire of perceived stress and anxiety levels was applied for both groups. The average score for group A was 20.8 and for group B was 31.8 with a statistically significant difference (p=0.0062, T-test). Higher perceived stress level was associated with a higher risk of bruxism, along with higher anxiety level, parafunctions, and poor sleep quality. In order to accurately diagnose bruxism, a comprehensive clinical examination and, if feasible, a polysomnography ought to be performed after completing a self-assessment questionnaire.

Keywords: bruxism, stress, anxiety, sleep quality

INTRODUCTION

Bruxism is a common phenomenon that can have detrimental effects on both local and general health. The term "bruxism" originates from the Greek word "brukein (bryco)," which means "grinding of teeth" [1]. For many years, various authors have attempted to provide the most accurate definition of the term "bruxism," but there are still divergent opinions regarding the correct definition. Several definitions have been proposed:

1. the Glossary of Prosthodontic Terms (GTP-8), bruxism is defined as the "parafunctional grinding of teeth, and as an oral habit involving grinding, involuntary clenching of teeth, rhythmic or spasmodic, non-functional, other than the chewing movements of the mandible." The term rhythmic refers to activity at regular intervals [2]; this definition does not consider the awake or asleep state and only takes into account positions with teeth-to-teeth contact.

2. the International Classification of Sleep Disorders, 2nd Edition (ICSD-2) defines sleep bruxism as an "oral parafunctional activity characterized by repetitive and rhythmic activity of the masticatory muscles, with grinding or clenching of teeth during sleep, in relation to micro-arousals." It is thus a movement disorder related to sleep [3]; the limitation of this definition is that it is restricted to sleep.

Regarding the classification, there are two main types of bruxism according to the circadian cycle: awake bruxism which manifests as tonic and continuous contractions of the masseter and temporal muscles, leading to clenching of the teeth while the

patient is awake. It is strongly correlated and influenced by our psychosocial state, such as stress [4], and, sleep bruxism or nocturnal bruxism which manifests as a complex response of the central nervous system excitement, expressed through body movements during changes in sleep phases [5].

Another classification is based on clinical evaluation of the patient during bruxism: first type, teeth clenching or centric bruxism which involves the isometric clenching of teeth, accompanied by contraction of the jaw elevator muscles without lateral jaw movement. It is a silent parafunctional activity often performed in maximum intercuspation occlusion. The forces applied of the elevator muscles can be significant [6]. Second type is represented by eccentric bruxism. It is characterized by phasic contractions of the jaw elevator muscles and it involves lateral movement of the jaw. Unlike clenching, grinding or eccentric bruxism can be noisy due to teeth friction and may wake the bruxer or a third party. This form is more harmful as the periodontium is less tolerant of para-axial forces than axial forces. Grinding is more common during sleep [7].

The etiology of bruxism remains elusive as it does not seem to be linked to peripheral mechanistic factors (such as occlusal factors) and cannot be attributed to a singular cause. Thus, there is a strong consensus to emphasize the multifactorial nature involving psychosocial and pathophysiological factors. Kuhn et al. [8] highlighted four major categories of risk factors for bruxism identified in adults: psychological stress, consumption of tobacco, alcohol, caffeine, sleep apnea syndrome and anxiety disorders. These factors contribute to the complexity of bruxism, suggesting an interplay between psychological and physiological aspects. Stress is a sensation of a threat to the physiological or psychological integrity of an individual (negative stress). However, it can also be perceived as a factor that stimulates the individual (positive stress) [1]. The response to stress is complex and influenced by various factors, including the nature of the stressor, its duration, and the individual's inherent characteristics [9]. This variability highlights the intricate relationship between stress and bruxism, emphasizing the need for a comprehensive understanding of the individual's stress experience in the context of bruxism management.

The diagnosis of bruxism involves several methods, each with its advantages and disadvantages [10].

Questionnaires are widely utilized due to their ease of implementation. However, their drawback lies in their subjectivity and reliance on patient memory (memorization bias, risk of over- and underestimation). Nevertheless, self-evaluation remains the initial step in bruxism diagnosis, enabling patients to become aware of their parafunctions

and address them [11]. The BRUXiq questionnaire is commonly employed for this purpose.

Another diagnostic method is polysomnography, the gold standard for sleep bruxism diagnosis, but its applicability is limited to small samples due to high costs, restricted availability, the need for multiple nights of observation for reliable results, a dedicated laboratory, analytical expertise, and patient cooperation, making it challenging, especially with children [12].

Clinical examination is widely utilized due to their ease of implementation, but it should be systematic. It relies on observable signs such as visible tooth wear, fractures, fissures, cusp narrowing, or tooth mobility. However, these clinical signs may correspond to various diagnoses. [13-15].

The aim of this study was to assess the presence or the absence of bruxism by using two different methods: a self-assessment questionnaire and a clinical evaluation form. The study also attempted to assess whether individuals who bruxed differed from those who did not in terms of elevated stress levels.

MATERIALS AND METHODS

A diagnostic cross-sectional analytical study was conducted at "Iuliu Hatieganu" University of Medicine and Pharmacy in Cluj-Napoca, Romania, during April 2022, involving students from the university only after obtaining the Ethics Committee's approval.

Inclusion criteria were:
– volunteers willing to participate in the study and filled the questionnaire coherently and lucidly;
– individuals with Class I, II, or III skeletal patterns;

Exclusion criteria were:
– individuals not willing to participate in the study;
– individuals who did not correctly complete the questionnaire or appeared too uncertain in their responses;
– individuals with denture-borne restorations such as bridges, crowns, or supra-implant restorations or previous orthodontic treatments.

All the participants willing to participate in this study completed a self-assessment questionnaire regarding bruxism, resulting in the BRUXIq index (Annex 1). The questionnaire consisted of 25 questions related to parafunction during the day (clenching, biting nails or objects, chewing gum), oral breathing, quality of the sleep, morning headaches or mouth opening restrictions, level of stress, teeth hypersensibility. The BRUXiq index was calculated and a maximum score of 75 could have been obtained. A score lower than 15 was considered a normal and above 15 was considered as a risk factor for bruxism [16]. Individuals who did not correctly complete

the questionnaire or appeared too uncertain in their responses were excluded from the study.

Remaining participants were included in the study. Subsequently, they went through a clinical examination for signs of bruxism consisting in 21 items (Annex 2). A calibrated experienced examiner performed a systematic clinical examination regarding abrasion, attrition, abfraction and erosion of the teeth, masticatory muscles hypertrophy and hypertony, oral breathing or lips parafunction. The BRUXiex index was calculated and a maximum score of 63 could have been obtained. A score lower than 10 was considered as normal and above 11 was considered as a risk factor for bruxism [16].

By summing the BRUXiq index and the BRUXiex index, the BRUXI index was determined. A score lower than 25 corresponded to a non-bruxer and a score higher than 20 corresponded to a bruxer [16] (Table 1).

TABLE 1. BRUXiq, BRUXiex and BRUXI index. Diagnostic index of bruxism

BRUXiq < 15	No risk factor for bruxism
15 < BRUXiq < 75	Risk factor for bruxism
BRUXiex < 10	No risk factor for bruxism
10 < BRUXiex < 63	Risk factor for bruxism
BRUXiq + BRUXiex = BRUXI	
BRUXI < 25	Non-bruxer
25 < BRUXI < 144	Bruxer

The participants divided in the bruxer and non-bruxer groups filled a separate self-assessment stress questionnaire consisting in 11 items regarding self-evaluation of stress and anxiety levels, responses at stressful situations consisting in sweating palms, trembling, or an accelerated heart rate, and general health issues as high blood pressure, hypercholesterolemia or gastric problems (Annex 3). The score was calculated with a maximum score of 66 that could have been obtained. The scores were divided into four categories as following: lower than 15, between 15-32, 33-45 and 46-66.

RESULTS

Twenty-seven students, aged between 21 to 27 years, completed the self-assessment questionnaire regarding risk factors for bruxism, resulting in the BRUXIq index. Seven students were excluded from this study because they answered the questionnaire incorrectly or with excessive uncertainty. Therefore, twenty students were included in this study and the BRUXiq and BRUXiex indexes were calculated for each subject. The BRUXI index was calculated by adding the BRUXiq and BRUXiex indexes resulting in 10 subjects with a score lower than 25 (group

A, non-bruxers) and 10 subjects with a score higher than 25 (group B, bruxers).

The stress-related self-assessment questionnaire was then accurately completed by each participant. A maximum value of 66 that could have been obtained. 33 was the average score. The scores were averaged for each group: in group A, the average value obtained on the stress questionnaire was 20.8 +/- 4.01 and for group B this average value was 31.8 +/- 6.94 (Table 2).

TABLE 2. Scores obtained on the self-assessment stress questionnaire among bruxers and non-bruxers

Bruxer	Score of self-assessment stress questionnaire	Average score
no	19	
no	16	
no	26	
no	21	
no	10	20.8
no	30	
no	24	
no	24	
no	18	
no	20	
yes	15	
yes	35	
yes	28	
yes	25	
yes	37	31.8
yes	24	
yes	43	
yes	27	
yes	37	
yes	47	

The values were categorized into four groups: under 15, between 15 and 32, 33 and 45, and 46 and 66. Among the 20 subjects, 14 obtained a score between 15 and 32 points. In group A (non-bruxers) one person had a score strictly lower than 15, while in group B (bruxers), all subjects had a score at least equal to or greater than 15. No subject in group A (non-bruxers) had a score above average, i.e. 33 points. In group B (bruxer), 5 subjects had a score higher than 33, including one person higher with 46 points out of 66 (Table 3 and Fig. 1).

TABLE 3. Distribution of scores obtained on the stress questionnaire according to their group (bruxer and non-bruxer)

bruxer	Score obtained on the stress questionnaire				
	<15	15-32	33-45	46-66	total
No	1	9	0	0	10
yes	0	5	4	1	10
total	1	14	4	1	20
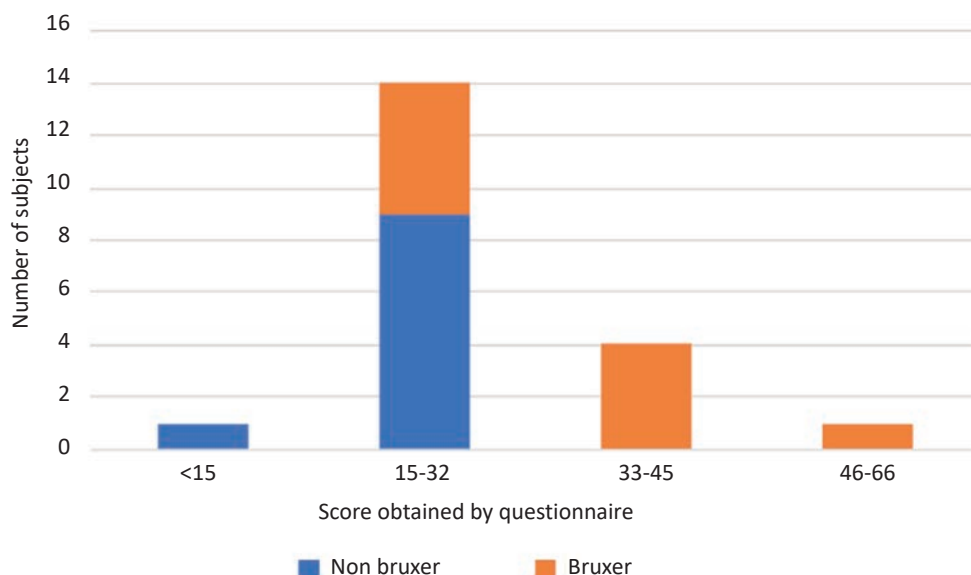
FIGURE 1. Score obtained by stress questionnaire for non-bruxers and bruxers groups

The T-test used revealed a p=0.0062 (p<=0.05). The difference is therefore significant between the two groups, with a higher stress rate in group B than in group A.

DISCUSSION

According to a meta-analysis [17], questionnaires exhibit high sensitivity but low specificity. Hence, they are effective in identifying individuals with bruxism but lack reliability in excluding those without it, as they tend to overestimate the actual number of affected patients.

The link between bruxism and stress was demonstrated in this study. It appears that individuals affected by bruxism experience higher stress levels compared to non-bruxers. This conclusion aligns with the findings of Polmann et al. [18]. However, it would have been interesting to investigate whether, during periods of intense stress (such as exam periods for students), individuals exhibit more temporomandibular and muscular symptoms than during periods of rest. This would strengthen the idea that stress has an impact on bruxism. According to the research by Manfredini et al. [19], bruxers frequently exhibit the following psychological characteristics: stress, anxiety, lack of confidence, manic and depressive symptoms. A study conducted by Ribeiro-Lages et al. [20], stated that occlusion plays a significant role in the ethology of bruxism, therefore malocclusion could be a predictive factor for substantial dental wear in adulthood. Early treatment of occlusal conditions in children in order to prevent development of bruxism should be considered [20].

The sample size required to highlight a significant difference was not calculated, and the sample was relatively small. It is noted that certain parameters, although not statistically significant, show differences between the two groups. Increasing the sample size might have revealed specific characteristics for each group and reflected the features of the general population.

Criticism of the study population: The study was easily managed because all of the participants were dental surgery students; the subjects were young and had a fairly restricted age range; and the patients had only natural teeth and no prosthetic restorations.

Therefore, neither the clinical characteristics of the general population nor those of those with bruxism were fully represented in these two groups. More individuals who are typical of the broader community should ideally be included in future research.

CONCLUSION

Self-assessment questionnaires with questions on parafunctions, stress and anxiety levels, and sleep quality should be utilised as screening tools for early detection and intervention in bruxism, as patient-perceived stress is a high-risk factor for the development of bruxism.

For a reliable diagnosis of bruxism, such subjective approaches must constantly be followed by a thorough clinical examination and, if feasible, by a polysomnography.

In the event that bruxism is positively diagnosed, early therapy such as occlusal equilibration, the use of a nocturnal occlusal splint, orthodontic treatment, or stress-reduction strategies can to be taken into account.

Annex 1. BRUXISM EVALUATION – BRUXiq QUESTIONNAIRE

Surname: First name: Date:

To be completed by the patient: circle the numbers "0" for NO, "1" for Yes slightly, "2" for moderately, "3" for Yes a lot

1	Do you think you grind your teeth while sleeping?	0	1	2	3
2	When awake, do you tend to grind your teeth?	0	1	2	3
3	When awake, do you tend to contract your jaw muscles and clench your teeth?	0	1	2	3
4	When you are awake, do you tend to move your teeth by clenching them?	0	1	2	3
5	Do you tend to bite your nails?	0	1	2	3
6	Do you have a habit of chewing gum?	0	1	2	3
7	Do you tend to chew your cheek, lip, or an object?	0	1	2	3
8	Do you tend to press your tongue, or lips, against your teeth?	0	1	2	3
9	Do you tend to breathe through your mouth?	0	1	2	3
10	Do you ever wake up at night realizing that you were clenching your teeth?	0	1	2	3
11	Do you feel tired in your jaw muscles when you wake up?	0	1	2	3
12	When you wake up in the morning, do you feel like your teeth are sore or "cardboard" as if you have been anesthetized?	0	1	2	3
13	Do you have difficulty sleeping?	0	1	2	3
14	Do you think you snore while sleeping?	0	1	2	3
15	Do you tend to have a dry mouth when you wake up?	0	1	2	3
16	Do you tend to be tired when you wake up or sleepy during the day?	0	1	2	3
17	Do you tend to experience your psycho-social environment as stressful?	0	1	2	3
18	Do you feel that you are rather emotionally sensitive?	0	1	2	3
19	Do you tend to often consume exciting products (tobacco, coffee drugs, etc.)?	0	1	2	3
20	Do you have problems with oral acidity (acidic food or drinks, nausea, reflux, etc.)?	0	1	2	3
21	Do you feel any general sensitivity in your teeth?	0	1	2	3
22	Do you feel headaches in the morning when you wake up?	0	1	2	3
23	Do you suffer from neurological disorders?	0	1	2	3
24	When you wake up, do you sometimes have difficulty opening your mouth?	0	1	2	3
25	Has anyone ever heard you grind your teeth at night?	0	1	2	3
	Total = BRUXiq				

Annex 2. ASSESSMENT OF BRUXISM – BRUXiex CLINICAL evaluation form

To be completed by the examiner, circle the numbers "0" for NO, "1" for Yes slightly, "2" for moderately, "3" for Yes a lot

1	Occlusal wear, overall index (abrasion, attrition, erosion, etc.)?	0	1	2	3
2	Attrition (bruxism)	0	1	2	3
3	Abrasion	0	1	2	3
4	Erosion (chemical)	0	1	2	3
5	Abfraction	0	1	2	3
6	Shiny wear facets	0	1	2	3
7	Clear density of the elevator muscles	0	1	2	3
8	Do Hypertrophy of the elevator muscles	0	1	2	3
9	Thick alveolar bone, alveolar exostosis…	0	1	2	3
10	Gonial exostosis, peri mandibular calcifications?	0	1	2	3
11	Lingual dysfunction	0	1	2	3
12	Lingual hypertrophy	0	1	2	3
13	Teeth marks on the edges of the tongue	0	1	2	3
14	Oral ventilation	0	1	2	3
15	Traces of biting, sucking (inner side of cheeks, lips)	0	1	2	3
16	Abnormal wedging	0	1	2	3
17	Over guidance: right canine, left canine, or incisor locking	0	1	2	3
18	Non-functional canine	0	1	2	3
19	Group function of more than 2 teeth per side	0	1	2	3
20	Limitation of opening movement (<40 mm): value ?	0	1	2	3
21	Neuropathic dyskinesia	0	1	2	3
	Total = BRUXieq				

Annex 3. STRESS SELF-ASSESSMENT QUESTIONNAIRE

0 = not at all; 1 = barely; 2 = weakly; 3 = a little; 4 = enough; 5 = a lot; 6 = extremely

		0	1	2	3	4	5	6
1	Am I emotional, sensitive to remarks, criticism from others?							
2	Am I short-tempered or quickly irritable?							
3	Am I a perfectionist, do I tend to be dissatisfied with what I have done or what others have done?							
4	Do I have a fast heartbeat, sweating tremors, muscle twitches, for example in my face or eyelids?							
5	Do I feel tense in my muscles, do I have a feeling of tightness in my jaws, of the face, of the body in general?							
6	Do I have sleeping problems?							
7	Am I anxious, do I worry often?							
8	Do I have bodily symptoms such as digestive problems, pain, headaches, allergies or eczema?							
9	Am I tired?							
10	Do I have more serious health problems such as a stomach ulcer, a skin disease, a cholesterol problem, high blood pressure, a cardiovascular disorder?							
11	Do I smoke or drink alcohol to stimulate or calm me down? Do I use other products or medications for this purpose?							
Total per column								
Grand total								

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