



Dental occlusion characteristics in subjects with bruxism

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Abstract

Background and aims. Bruxism is associated with a variety of factors, some of which are oral (occlusion, joint, face shape) while others are of a systemic nature (respiratory, cardiac, neurotransmitters, stress). The relationship between bruxism and occlusion has received great attention, but it still has a lot of ambiguity. This study aimed at investigating the parameters that may affect bruxism: dental interferences or premature contacts, vicious habits, temporomandibular joint (TMJ) pain, TMJ noises, TMJ morning fatigue, snoring, obstructive sleep apnea, which may occur before bruxism, or because of chronic parafunction.

Methods. We conducted an observational, analytical case-control study to determine the association between bruxism and oral cavity factors as well as general factors. Participants were chosen from a group of middle-aged Romanian population. An online questionnaire was used for data collection. A total of one hundred subjects were included in the sample. Fifty cases with bruxism were chosen as a study group, and another fifty persons of similar ages were chosen as a control group. Statistical analysis was performed using the MedCalc version 20.110 software.

Results. The study comprised subjects between 18 and 42 years old. The most prevalent age range was between 20-25 years. The female-male ratio was almost similar; 62% of the participants had sleep bruxism, 10% had awake bruxism and 28% had a combined form. The arithmetic means of the daily stress levels for both research groups' scores were 3.0 for the bruxism group and 3.24 for the control group, while the work stress was 3.04 for the bruxism group and 3.41 for the control group. Dental interferences or premature contacts, vicious habits, TMJ pain, TMJ noises, TMJ morning fatigue, snoring, and obstructive sleep apnea were evaluated. The majority of subjects received an oral splint (n=26).

Conclusions. Bruxism was associated with stress, occlusal parameters (premature contacts and occlusion interferences), and joint pathologies. Bruxism was not found to be positively correlated with obstructive sleep apnea syndrome. There was a moderately significant association between bruxism and snoring. There was no evidence of an association between bruxism and vicious habits, dental aesthetics, or obstructive sleep apnea. Treatment significantly improved the quality of life, the masticatory and joint functions.

Keywords: bruxism, dental occlusion, questionnaire, quality of life

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Background and aims

The definition of bruxism has evolved from dysfunction to motor activity, with physiological and protective implications [1]. One definition considers bruxism as an involuntarily executed parafunctional behavior in which the jaw muscles force the teeth against one other horizontally [2]. The International Classification of Sleep Disorders-Third Edition classifies sleep bruxism (SB) as a repetitive jaw muscular activity characterized by clenching or grinding of the teeth [3].

The relationship between bruxism and occlusion is one of the dental topics that have received great attention, but it still has a lot of ambiguity. Bruxism is related to unique abnormalities in the neural circuits controlling the jaw-closing muscles [4].

It is well known that bruxism is associated with a variety of factors, some of which are oral (occlusion, joint, face shape) while others are of a systemic nature (respiratory, cardiac, neurotransmitters, stress). As evidence is scarce on the relationship between bruxism and the aforementioned factors, more research is needed.

This study aimed at investigating the parameters that can affect bruxism: dental interferences or premature contacts, vicious habits, temporomandibular joint (TMJ) pain, TMJ noises, TMJ morning fatigue, snoring, obstructive sleep apnea, which may occur before bruxism or because of chronic parafunction. The study further sought to ascertain the extent to which the aforementioned characteristics can cause bruxism or make it worse, as well as the post-therapeutic progression in some individuals.

Methods

The research was performed at the Iuliu Hațieganu University of Medicine and Pharmacy in Cluj-Napoca, Romania, at the Faculty of Dental Medicine. We performed an observational, cross-sectional survey study to identify the relationships between bruxism and both specific and general characteristics. A non-validated questionnaire was distributed. The questionnaire was created by a single author with more than 15 years of knowledge and experience in the field. Each participant received the 26-question survey, which they were all asked to complete. The entire questionnaire is available as a Supplementary file. The questionnaire consisted of several sections: a demographic section, a perceived stress assessment section, the assessment of bruxism (its presence, its type, confirmation by a physician, accompanying signs and symptoms, presence of treatment, treatment type, treatment effects), parafunction and habits. The survey was self-administered and voluntary and responses were confidential. Using Google forms, the survey was made available online on Facebook, the information was gathered, by a snowball sampling. The data were collected between the 15th of June and the 15th of July 2019. Inclusion criteria were: Romanian citizens, originating from a variety of geographical areas (rural and

urban), aged between 18 and 44 years, who provided an informed consent for participation. The majority of them were students/trainees from different universities or recent graduates with stable or no employment. Exclusion criteria were considered to be subjects who refused to complete the questionnaire for ethical reasons, even though it was completely anonymously. A total of 100 participants from Romania responded. Out of the received responses, based on the answers, we identified a study group consisting of fifty bruxism patients, and a control group consisting of the other individuals without this complaint.

Questionnaire to identify the relationships between bruxism and both specific (oral cavity-related) and general characteristics

1. Could you please provide your age range (in years)?
 - a) under 20
 - b) 20-25
 - c) 25-30
 - d) over 30
2. What is your gender?
 - a) male
 - b) female
3. What is your employment status? (Occupation is valid if it was stable in the last 3 months)
 - a) Student
 - b) Unemployed
 - c) Employed
 - d) Without a stable job
4. Please define your main field of activity.
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.....
5. Please choose on a scale from 1 to 5 an answer to the following: (1 meaning totally agree while 5 meaning totally disagree)
I work every day in a stressful environment
I have a stressful life in general
6. Do you know the meaning of the term bruxism?
 - a) Yes
 - b) No
7. Have you ever had signs of bruxism?
 - a) Yes
 - b) No
8. Have you been diagnosed with bruxism?
 - a) Yes
 - b) No

9. Where did you first realize you have bruxism?

- a) Home
- b) Dental office

- a) Yes
- b) No

10. If you first discovered bruxism signs at home, please describe what exactly you felt or if someone told you about this situation. (clenching sounds during sleep; feeling of tooth clenching, or grinding, joint fatigue; muscle or joint pain)

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11. When did the bruxism occur?

- a) During daytime
- b) During nighttime
- c) During both, daytime and nighttime

20. Have you undergone any bruxism treatment? If yes, which one?

.....

21. Have you noticed any increase in the quality of life after bruxism treatment?

- a) Yes
- b) No

22. Have you noticed an increase in the masticatory efficiency after treating bruxism?

- a) Yes
- b) No

12. During a casual bite, do you feel that all teeth touch simultaneously?

.....

23. Have you noticed any increase in dental esthetics after treating bruxism?

- a) Yes
- b) No

13. Do you have some of the following habits: placing non-chewable objects between teeth (pen/pip smoking); breaking hard food with toots (nuts); nail biting, finger sucking, opening bottles with teeth, or others?

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24. Have you noticed any pain/fatigue decrease in the temporomandibular joint after treating bruxism?

- a) Yes
- b) No

14. Do you feel pain at the temporomandibular joint?

- a) Yes
- b) No

25. After the bruxism treatment, if performed, did you snore less?

- a) Yes
- b) No

15. Do you hear joint sounds (coming from your joint next to the ear) when you speak or eat?

- a) Yes
- b) No

26. After bruxism treatment, if performed, did you feel that the episodes of sleep apnea have reduced?

- a) Yes
- b) No

16. Do you feel temporomandibular joint fatigue or pain in the morning, after you wake up?

- a) Yes
- b) No

17. Do you have any respiratory issues? If yes, which ones?

.....

18. During nighttime, do you snore?

- a) Yes
- b) No

19. Do you have moments during sleep when you feel you stop breathing?

The methodology survey was designed to collect data for this investigation. Questionnaires were distributed to be completed online using “Google forms,” a free Google tool. These questionnaires yielded data, which were subsequently entered into an Excel spreadsheet, which was used to create data descriptions and analyses. To determine if there was a link between bruxism and stress, subjects rated their stress levels on a scale of 1 to 5, with 1 indicating a very high degree of stress and 5 indicating a low level of stress, both at home and at work.

Statistical analysis was performed using the MedCalc version 20.110 software. To determine the relationship between bruxism and dental interferences or premature contacts, vicious habits, TMJ pain, TMJ noises, TMJ morning fatigue, snoring, obstructive sleep apnea, chi-square tests were used. The chi-square test was utilized for

data analysis since the evaluated variables were qualitative dichotomous variables. If the difference was higher than 3.84 (value crucial for 1 degree of freedom and 95 percent confidence interval), it was considered statistically significant. The test results were rated significantly at a p-value below 0.05. When it was necessary to evaluate the significance of this association, OR (odds rate) as a point estimator was determined.

Results

The study comprised subjects between 18 and 42 years of age. The prevalent age range was between 20-25 years (50%); followed by the 25-30 age range (30%), whereas 12% of the subjects were over 30 years and 8% below 20 years. The female-male ratio was almost equal (51% of the subjects were females).

The majority of participants had a steady field of activity: 61 were students, 23 employees, while only 10 were unemployed and 6 lacked a stable revenue. The majority of

participants were familiar with the term “bruxism” (75%).

The investigated factors related to bruxism, dental interferences or premature contacts, vicious habits, TMJ pain, TMJ noises, TMJ morning fatigue, snoring, and obstructive sleep apnea are shown in table I.

The majority of subjects received an oral splint (n=26), an oral splint and drugs (n=4), and orthodontic treatment (n=2), whereas a considerable number of subjects with bruxism had no treatment (n=18).

Of all the subjects from study group, 62% had sleep bruxism, 10% had awake bruxism and 28% had a combined form (awake and sleep bruxism). The arithmetic means of the daily stress levels for both research groups’ scores were 3.0 for the bruxism group and 3.24 for the control group, whilst the work stress was 3.04 for the bruxism group and 3.41 for the control group.

TMJ pain, masticatory efficiency, quality of life, and snoring have been improved, whereas dental aesthetics and obstructive sleep apnea encountered no change.

Table I. The relationship between bruxism and the investigated factors.

	yes (%)	no (%)	chi square test	OR	p-value
Dental interferences or premature contacts	50	50	23.4	8.1	<0.001
Vicious habits	48	52	2.56		0.110
TMJ pain	42	58	36.95	18.85	<0.001
TMJ noises	45	55	29.45	11.71	<0.001
TMJ morning fatigue	52	48	46.31	27.98	<0.001
Snoring	34	66	13.07	5.25	<0.001
Obstructive sleep apnea	23	77	2.62		0.106

TMJ – temporomandibular joint; OR – odds ratio

Discussion

After evaluating the assumptions, we have found that the majority of the subjects (25%) had no concept of the meaning of bruxism. As a result, measures of raising awareness should be more consistent, as the presence of such a parafunction may impair the dental-maxillary apparatus in the long term. The findings of our study are in accordance with other research, which also showed a clear separation between self-reported bruxism (i.e., bruxism detected at home due to symptoms) and bruxism diagnosed in the clinic. A large number of subjects are not aware of the presence of bruxism or having clinical signs. Ohlmann et al., have shown that self-report questionnaires and clinical indicators have modest sensitivity, specificity, and accuracy for diagnosing bruxism in comparison to an ambulatory device for bruxism detection [5]. The highest percentage of our investigated subjects discovered the presence of bruxism at home, due to several symptoms: teeth grinding, clenching, snoring, temporomandibular

joint pain or morning fatigue, muscle fatigue, and dental wear. The remaining 33% of the respondents were diagnosed in the dental office by anamnesis and evaluation of clinical signs. The most prevalent bruxism type was the sleep bruxism (62%), awake bruxism was found only in 10% of the respondents, while Kirarslan Karagoz et al., in a questionnaire study reported the frequency of self-reported sleep bruxism as being 25.2% and of awake bruxism as being 28.9% [6].

Sleep bruxism is usually diagnosed using polysomnography and/or electromyography [7]; our investigated subjects did not report polysomnography as being a diagnosis method.

In our study small discrepancies in the averages of the stress thresholds recorded were found, ranging from 3.24 to 3 in the case of daily stressors and from 3.41 to 3.04 in terms of job stress. For evaluating stress at a psychological level, more extensive data gathering and calculating procedures should be used. Polmann et al., have

observed some associations in adults between possible sleep bruxism and self-reported stress symptoms and stress biomarkers [8].

In our study we have found a positive connection between bruxism and the existence of premature contacts or interferences (chi-square = 23.4, > 3.84). The odds rate (OR) was 8.1, indicating that there were 8 times more patients with bruxism and interferences or premature contacts, the findings being statistically significant. The relevance of occlusal variables in the occurrence of parafunction is currently a source of much debate. In clinical terms, the OR confidence interval was wide (3.3-19.7), indicating that more cases are needed to support the correlation. The results of the statistical analysis of the association between bruxism with the existence of other vicious habits were not significant (chi-square = 2.56).

In terms of temporomandibular joint pathology, bruxism was associated with joint sounds (chi-square = 29.45; OR = 11.71), joint pain (chi-square = 36.95; OR = 18.85), and, most notably, joint and muscle tiredness in the morning after waking up (chi-square = 46.31; OR = 27.98). We can say with 95 percent certainty that the OR in all three situations varied between 6.5-51 for noises, 4.5-30 for pain, and 9.5-82.1 for joint fatigue in the investigated subjects. Each point estimator's intervals were quite large, and the level of correlation and test values were significantly higher, which describes some degree of association but not a high threshold.

Group distribution analysis (chi-square) indicated significant associations between bruxism and dental interferences or premature contacts, TMJ pain, noises, and morning fatigue and snoring. Our results are in line with the ones reported by Turcio et al., who found a positive correlation between bruxism and muscle and facial pain indicating a decreased quality of life in subjects with bruxism [9]. Conducting a thorough anamnesis to discover all of these probable predisposing factors or outcomes is recommended.

Poluha et al., have studied the association between specific oral behaviors, sleep bruxism, awake bruxism, and painful temporomandibular joint clicking and showed that patients with painful TMJ clicking had a higher frequency of some specific harmful behaviors and awake bruxism [10].

Huhtela et al. showed that self-reported symptoms of bruxism included psychological stress and generalized pain [11], whereas in our study we found TMJ pain, TMJ noises, and TMJ morning fatigue.

In this study, we aimed to see if there was an association between bruxism and the occurrence of snoring or sleep apnea syndrome. The results were statistically significant in the case of snoring (chi-square = 13.07; OR = 5.25), but only in the situations when only 34% of the 100 individuals snored. As a result, the degree of the association remains an essential topic. Subjects with

bruxism were shown to be 5 times more likely to snore in our study. The findings were not statistically significant in the case of obstructive sleep apnea syndrome (chi-square = 2.62). However, only 23 occurrences of sleep apnea were found among the 100 individuals, indicating the difficulty of establishing an association.

In terms of treatment, bruxism was treated in the majority of cases with oral splints, which were worn especially during nighttime, but not exclusively, to neutralize the direction of the loads, and their intensity, and decrease the surfaces of abrasion. Our results are in accordance with the ones reported by Bargellini et al., who showed that resin and metal splints could reduce sleep bruxism rate, while resin bites could decrease phasic spasms caused by sleep bruxism [12]. Abe et al., have stated that oral appliances appear to minimize grinding noise and protect against tooth injuries, but they do not affect sleep bruxism origin [13]. It has been shown that there is an association between using an oral splint and a decrease in bruxism symptoms [14,15].

The major changes among those mentioned by patients were in terms of improving the quality of life, increasing masticatory efficiency, and decreasing joint discomfort. Some subjects reported a reduction in snoring episodes, which cannot be clinically proven due to the low number of participants. In terms of dental aesthetics and obstructive sleep apnea syndrome, several treatments or combinations of treatments are required to monitor the condition.

This study endorses a few hypotheses that have been found in the literature that bruxism does have a role in a variety of chronic conditions. The most significant limitations are the small number of participants (n = 100) and the type of the chosen study (case-control). Untreated bruxism can cause the dental apparatus to collapse, both at the occlusal level (facets of abrasion, interferences, premature contacts during mandibular movements, alteration of static occlusion), and at the temporomandibular joint and muscle level (neglecting physiological tonicity and decreasing or intensifying contraction force during unexpected times). It can cause potential pain in the orofacial area in complex areas. Being mostly active at night, it involves developing in life partners or parents a sense of awareness concerning a variety of factors.

Conclusions

Bruxism is associated with stress on a daily and work-related basis. It is also related to occlusal parameters (premature contacts and occlusion interferences). Bruxism has been associated with joint pathologies such as joint pain, joint noise, and discomfort upon waking. Bruxism was not found to be positively correlated with obstructive sleep apnea syndrome; however, there was a moderately significant association between bruxism and snoring. There was no evidence of an association between bruxism and

vicious habits, dental aesthetics, or obstructive sleep apnea. Treatment significantly improved the quality of life, the masticatory and joint function.

In addition to the above, several clinical conclusions can be drawn, including the need to better understand the complexity of bruxism and the need for new, modern techniques of analyzing symptoms and their relationship to the cause.

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