

Sleep bruxism: population based study in people with 18 years or more in the city of Rio Grande, Brazil

Bruxismo do sono: estudo de base populacional em pessoas com 18 anos ou mais na cidade de Rio Grande, Rio Grande do Sul

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ABSTRACT: *Objective:* To evaluate the prevalence of sleep bruxism, as well as its principal signs and symptoms, in the city of Rio Grande. Evaluate the association of sleep bruxism with gender, age, education and psychological stress. *Method:* The study was cross-sectional type. A representative sample of the population (1280 people residing in the urban area of the city aged greater than or equal to 18 years old) were interviewed. The evaluation of sleep bruxism was by mean of questionnaire based on diagnostic criteria of the International Classification of Sleep Disorders. *Results:* The prevalence of sleep bruxism found in the population was 8,1% (confidence interval of 95% — 95%CI — 6,6 – 9,5). Among the signs and symptoms of dysfunction used for the diagnosis of sleep bruxism, tooth wear (70,3%) and pain in masticatory muscles (44,5%) were the most frequently reported by people who report teeth grinding during sleep. There was no significant difference in the prevalence of sleep bruxism between sexes. People older than 40 had a higher prevalence of sleep bruxism. The dysfunction was associated with a higher level of education (prevalence ratio — PR = 1.92; 95%CI 1,35 – 2,72) and psychological stress (PR 1,76; 95%CI 1,11 – 2,81). *Conclusion:* There was a significant prevalence of sleep bruxism in the general population, causing various damages to the Stomatognathic system. The psychological stress is a risk factor for this dysfunction.

Keywords: Sleep bruxism. Signs and symptoms. Risk factors. Diagnostic self evaluation. Epidemiology.

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RESUMO: *Objetivos:* Avaliar a prevalência do bruxismo do sono, bem como seus principais sinais e sintomas, na cidade de Rio Grande, Rio Grande do Sul. Avaliar a associação do bruxismo do sono com sexo, idade, escolaridade e estresse psicológico. *Método:* O estudo foi do tipo transversal. Uma amostra representativa da população (1.280 pessoas residentes na zona urbana da cidade com idade maior ou igual a 18 anos de idade) foi entrevistada. A avaliação do bruxismo do sono foi realizada por meio de questionário baseado nos critérios diagnósticos da Classificação Internacional de Distúrbios do Sono. *Resultados:* A prevalência de bruxismo do sono encontrada na população foi de 8,1% (intervalo de confiança de 95% — IC95% — 6,6 – 9,5). Entre os sinais e sintomas da disfunção utilizados para o diagnóstico de bruxismo do sono, o desgaste dentário (70,3%) e a dor nos músculos mastigatórios (44,5%) foram os mais frequentemente relatados pelas pessoas que declararam ranger os dentes durante o sono. Não houve diferença significativa na prevalência de bruxismo do sono entre os sexos. A faixa etária com mais de 40 anos teve maior prevalência de bruxismo do sono. A disfunção foi associada a um maior nível de escolaridade (razão de prevalência — RP = 1,92; IC95% 1,35 – 2,72) e de estresse psicológico (RP = 1,76; IC95% 1,11 – 2,81). *Conclusão:* O bruxismo do sono tem uma importante prevalência na população em geral, causando diversos danos ao sistema estomatognático. O estresse psicológico é um fator de risco para essa disfunção.

Palavras-chave: Bruxismo do sono. Sinais e sintomas. Fatores de risco. Autoavaliação diagnóstica. Epidemiologia.

INTRODUCTION

Sleep bruxism is an oral habit that occurs while the person sleeps and is characterized by movements of the temporomandibular muscles, forcing contact between the dental surfaces. The consequences of this disorder include excessive tooth wear, dental fractures, muscle pain, inflammation, gingival recession, temporomandibular joint pain, increased risk of periodontal problems, excess strain on dental implants, tooth loss and sleep disturbances^{1,2}.

According to the International Classification of Sleep Disorders, published by the American Academy of Sleep Medicine³, sleep bruxism is characterized by the presence of teeth grinding at night associated with at least one of the following signs and symptoms: tooth wear, pain in the muscles of the mandible, pain in the temples and / or difficulty to open the mouth upon waking up.

Sleep bruxism differs from the habit teeth grinding during the day, also called awake bruxism, because it involves different states of consciousness. Thus, awake bruxism is a semi-voluntary activity, whereas sleep bruxism is unconscious given that the individual is sleeping⁴.

Most people grind their teeth to a certain degree. Sleep bruxism is more common between the third and sixth decades of life, does not appear to be related to sex, with irreversible damage to oral structures increasing with age^{5,6}. The prevalence of sleep bruxism in the population is imprecise and underestimated, since the studies involve different populations and methodologies.

Large-scale population-based epidemiological studies were conducted internationally to assess the prevalence of sleep bruxism in the general population; these found that the number of cases of the disease in the population varies from 4.4 to 31.4%^{1,6-10}. Other studies evaluating sleep bruxism in specific populations show a higher prevalence, reaching up to 50.2%, as in studies with members of the military^{5,11-16}. The results of these studies, however, cannot be used as an estimate for the general population⁶.

Sleep bruxism is a complex and multifactorial disorder whose etiology is not fully understood. The possible etiological factors can be divided into peripheral (morphological) and central (pathological and psychological). It is currently conceived that morphological factors, related to the bone anatomy of the orofacial region and to occlusal discrepancies, play a minor role in the etiology of sleep bruxism, and pathological and psychological factors are more important^{10,17}. Thus, the following are considered to be associated with the pathogenesis of sleep bruxism: genetic factors; emotional stress; anxiety; use of drugs (caffeine, alcohol, cocaine and tobacco); some medications (selective serotonin reuptake inhibitors, amphetamines, benzodiazepines and dopaminergic drugs) and neurological diseases, such as Parkinson's disease¹⁷⁻³⁴. It is possible that factors related to depression, anxiety and psychological stress play an important role in the induction and perpetuation of sleep bruxism, as well as in the frequency and severity of the process¹².

In recent years, the number of patients suffering from sleep bruxism has attracted more attention from health professionals. Modern life style and the development of civilization seem to be determinants in the prevalence of this dysfunction³⁵. Clarification is required regarding when the teeth grinding habit becomes a dysfunction with consequences, such as tooth wear and pain, and requires intervention by the dental surgeon³⁶.

As of yet, there are no effective treatments to stop or cure sleep bruxism. The management of the patients consists of teeth protection in order to avoid tooth wear, reduction of sleep bruxism activity and pain relief³⁷. The use of oral appliances, such as myorelaxing plate, is the only option to reduce symptoms, and there is no evidence in the literature to define a standard treatment for this disease³⁸.

The objective of this study was to evaluate the prevalence of sleep bruxism, as well as its main signs and symptoms, in the city of Rio Grande, Rio Grande do Sul, Brazil. The association with sex, age, schooling and psychological stress was evaluated as an important risk factor for this pathology.

METHOD

A population-based cross-sectional study. The study population was comprised of adults and the elderly (age ≥ 18 years) from the urban area of the city of Rio Grande, Rio Grande do Sul, Brazil. Institutionalized individuals in nursing homes, hospitals or prisons were excluded from the study as well as those with physical and/or mental disabilities, which affected their ability to answer the questionnaire.

The research project was approved by the Research Ethics Committee in the Health Area (CEPAS) of the Universidade Federal do Rio Grande (FURG). All participants signed the informed consent form.

This study was part of a broader study that evaluated several aspects of the health of the population of the municipality of Rio Grande city titled "Health of the Riograndina Population". The calculation of the sample size for the evaluation of the prevalence of sleep bruxism was firstly performed considering a hypothetical frequency of sleep bruxism of 8%, margin of error of 2 percentage points, 95% confidence interval (CI) an expected sampling design effect of 1.5, totalling a sample of 1,057 people.

As this study was part of a research in which evaluated other, the final sample size was calculated so that all the projects included in the survey were considered, and the final sample size was estimated at 1,420 people. The sampling process took place in multiple stages, based on data from the municipality contained in the 2010 Demographic Census, according to the Brazilian Institute of Geography and Statistics³⁹. Initially, all households in the urban area (77,835) of the municipality were allocated in descending order, according to the average monthly income of the head of the household. The first household was randomly selected and was followed by systematic selection by means of "skipping" 1,080 households, identifying the corresponding sector and selecting 72 census sectors. The sectors resulted in 23,439 households, of which, by means "skipping" 32 residences, 711 were selected in 30 neighborhoods, and 2 sectors were excluded because they did not have selected households.

The used instrument was part of the research questionnaire "Health of the Riograndina Population" and was applied by trained interviewers. The collected variables were: sex (male and female); age (years, divided into two groups: ages 18-39 years and 40 years or more); and schooling (completed amount of study in years divided into two groups: 0 to 11 years of study and 12 years or more).

The evaluation of sleep bruxism was performed using a specific self-administered questionnaire based on the International Classification of Sleep Disorders Diagnostic criteria published by the American Academy of Sleep Medicine and without prior validation in Brazil³. According to these criteria, the presence of sleep bruxism is defined when there is a habit of grinding teeth at night associated with at least one of the following signs and symptoms: excessive tooth wear, pain in the muscles of the mandible, pain in the temples and / or difficulty opening the mouth upon waking. The questions used to evaluate sleep bruxism are transcribed below:

1. Do you grind your teeth or did anyone in your family tell you that you grind your teeth while you sleep?; (0) Never / (1) Rarely / (2) Sometimes / (3) Often / (9) Do not know
2. Do you have an impression that your teeth are more worn than they should be? (Yes No);
3. Do you feel tiredness or pain in the muscles of your mandible or mouth when you wake up? (Yes No);

4. Do you feel pain in the temples (sides of the head, above the ears) when you wake up? (Yes No);
5. Do you have difficulty opening your mouth when you wake up? (Yes No).

The presence of the teeth grinding habit at night is confirmed when the answer to the first question is “sometimes” or “often.” The presence of sleep bruxism is confirmed when teeth grinding occurs at night and is associated with at least one “yes” answer in one of the other four questions.

Stress was evaluated using the Brazilian version of the perceived stress scale, translated and validated by Luft et al.⁴⁰, adapted from the Perceived Stress Scale (PSS 14) and developed by Cohen et al.⁴¹. The scale consists of 14 questions with options ranging from 0 to 4 (0 = never, 1 = hardly never, 2 = sometimes, 3 = almost always, 4 = always). The combined score of the questions with positive connotations (4, 5, 6, 7, 9, 10 and 13) is inverted as follows: 0 = 4, 1 = 3, 2 = 2, 3 = 1 and 4 = 0. The remaining questions are negative and should be added up directly. The total of the scale is the sum of the scores of these 14 questions and the scores can vary from 0 to 56. For statistical analysis purposes, a dichotomous stress variable was created using the sample mean (= 24) as the cut-off point, with one group with stress below or equal to the mean and a second group with stress above the average.

The data were collected between April and July of 2016 and, in order to ensure their quality, a quality control was performed when the interview was redone with 10.5% of the subjects. The Kappa index, used to evaluate the agreement of the answers, was 0.80.

The analysis was conducted in the Stata[®] 14.2 / SE program. Descriptive analysis of variables and measures of the prevalence of teeth grinding during sleep and bruxism were performed; bivariate analysis using the χ^2 test between the outcome and the independent variables; and adjusted Poisson regression analysis of the exposure variables in relation to the outcome (sleep bruxism) based on a hierarchical model in which, the socio-demographic and economic characteristics were at the first level and the habits and behaviors were at the second level and referred morbidity at the third level and lastly stress. Variables with a p-value lower than 0.20 were maintained in the analysis. The effect of the sampling design was included for association calculations.

RESULTS

Among the 711 sampled households, interviews were conducted with 676, which had, on average, 1.92 resident individuals. Overall, 1,429 subjects were eligible for the study. A total of 33 losses and 99 refusals resulted in a response rate equal to 91%. Losses and refusals were more frequent in men (12 vs. 6.5% female, $p < 0.001$). In order to evaluate the teeth grinding habit and sleep bruxism, 4 subjects who did not answer the questions and 16 who answered “do not know” for the question about teeth grinding were excluded, totalling a sample of 1,280 people. The mean age of the studied individuals was 45.9 years (standard deviation - SD = 17.25) and 56.6% were women.

10% of those interviewed (95% CI 8.35-11.64) reported that they ground their teeth during sleep. The frequency of signs and symptoms proposed by the International Classification of Sleep Disorders was evaluated in relation to the grinding teeth habit during sleep (Table 1).

8.1% of the sample (95% CI 6.6-9.5) met the requirements of the International Classification of Sleep Disorders for the diagnosis of sleep bruxism, the majority were female (63.11%). Regarding age, 32.04% were between 18 and 39 years and 67.96% were 40 years or older. The effect of the sampling design for the sleep bruxism variable was 0.97 and the intraclass correlation coefficient <0.001.

Table 2 shows the association of the sex, age, schooling and stress variables with sleep bruxism. In the bivariate analysis, the schooling and stress variables were associated with sleep bruxism. In the adjusted analysis, age, schooling, and stress were associated with sleep bruxism.

DISCUSSION

The diagnosis based on the interviewee's report through an unvalidated questionnaire is one of the limitations of this research and, therefore, should be considered as a probable diagnosis.

Table 1. Frequency of signs and symptoms of the International Classification of Sleep Disorders in relation to teeth grinding teeth during sleep. Rio Grande, 2016 (n = 1280).

Signs and symptoms	N	Does not grind your teeth during sleep %	Grinds teeth during sleep %	p-value
Tooth wear				
No	796	65.8	29.7	< 0.001
Yes	484	34.2	70.3	
Tiredness/ pain in the muscles of the mandible				
No	1.127	91.7	55.5	< 0.001
Yes	153	8.3	44.5	
Pain in the temples				
No	1.123	90.1	66.4	< 0.001
Yes	157	9.9	33.6	
Difficulty to open mouth upon waking				
No	1.245	98.4	86.7	<0.001
Yes	35	1.6	13.3	

The evaluation of sleep bruxism in this study was based on the clinical diagnostic criteria established by the third version of the International Classification of Sleep Disorders published by the American Academy of Sleep Medicine. These criteria are based on the main signs and symptoms associated with the dysfunction, in addition to reporting the habit of teeth grinding at night. Thus, we can establish a better estimate of the prevalence of sleep bruxism and its consequences in the population. This was possible as in addition to obtaining the percentage of individuals who declared grinding their teeth, the consequences of this custom were jointly evaluated.

The prevalence of sleep bruxism found in the city of Rio Grande, Rio Grande do Sul, was 8.1. Population-based surveys conducted in other countries show a frequency for the dysfunction between 4.4 and 31.4%^{1,6-10}. A study by Ohayon et al., who also evaluated bruxism in the population based on the International Classification of Sleep Disorders criteria, found a 4.4% prevalence rate of bruxism¹, while other studies that evaluated this pathology based mainly on the habit of teeth grinding showed prevalence rates of 13.7 to 31.4% of the population^{7,9,10}.

Tooth wear was reported by 70.3% of the individuals who also reported teeth grinding. The association is significant in both bivariate and adjusted analysis ($p < 0.0001$). Tooth wear is one of the main consequences of the teeth grinding; it is important to note, however, that 34.2% of those who do not report teeth grinding also report tooth wear. This can be explained by several factors, since other problems such as malocclusion, tooth loss, amelogenesis imperfecta, etc. can also lead to tooth wear. Therefore, despite this deterioration being a good indicator of sleep bruxism activity, it cannot be used as the sole criterion to diagnosis and treat the dysfunction. The symptom "tiredness / pain in the muscles of the mandible / mouth" was the second most frequently reported by people who report teeth grinding (44.5%), followed by pain in the temples (33.6%) and difficulty

Table 2. Association between sex, age, schooling and psychological stress with sleep bruxism. Rio Grande, 2016 (n = 1280).

	Gross analysis			Adjusted analyse		
	PR	95%CI	p-value	PR	95% CI	p-value
Sex (female)	1.31	(0.89 – 1,93)	0.162	1.17	(0.81 – 1.68)	0.378
Age (40 years or older)	1.38	(0.92 – 2.05)	0.112	1.63	(1.07 – 2.46)	0.022
Schooling (more than 12 years of study)	1.66	(1.14 – 2.42)	0.008	1.92	(1.35 – 2.72)	< 0.0001
Psychological stress (highest level)	1.66	(1.14 – 2.42)	0.007	1.76	(1.11 – 2.81)	0.018

PR: prevalence ratio; 95% CI: 95% confidence interval.

opening the mouth upon waking (13.3%). All signs and symptoms of the International Classification of Sleep Disorders showed a statistically significant association with the teeth grinding habit during sleep.

Regarding the demographic characteristics, the prevalence of sleep bruxism in females was higher than in males in this study, however the difference was not statistically significant. Several studies do not indicate a significant difference between the sexes in the prevalence of sleep bruxism^{1,9,16,28,30} while others report a higher prevalence in females^{8,10,21,34}. Only one study performed in Japan reports a higher prevalence among males².

Regarding age, 67.96% of people with sleep bruxism were 40 years old or older; in the total population, 60.62% of the individuals were in this range. The results showed a higher prevalence in the study, not statistically significant in the bivariate and significant in the adjusted analysis (PR = 1.63, 95% CI 1.07-2.72). The prevalence gradually decreases from 60 years. In the literature, studies use different age groups to evaluate the prevalence of sleep bruxism, indicating a higher prevalence between the third and sixth decades of life^{1,7,10,28}.

Schooling was associated with sleep bruxism (PR = 1.92, 95% CI 1.35-2.72). People with more than 12 years of schooling are at greater risk of the dysfunction. In the reviewed literature, we found only one study²⁸ that crossed between these variables and there was no significant association. The sample of this study, which was done in Croatia, has, however, a greater homogeneity in the level of schooling than the population of Rio Grande, Rio Grande do Sul. One of the hypotheses to explain this association is that people with a higher level of schooling have a higher level of stress.

The psychological stress evaluation by means of the Perceived Stress Scale showed this as a risk factor for sleep bruxism (PR = 1.76, 95% CI 1.11 - 2.81). The result reinforces previous studies that highlight this association^{1,5,12,16,25-27,32}. Clarification is required regarding what mechanisms explain how stress acts on the etiology of this disease. The hypotheses that a possible reduction in the individual's stress level can aid in the management and treatment of people suffering from the disease should also be evaluated.

CONCLUSION

There is a significant prevalence of sleep bruxism in the general population. Experiencing pain in the muscles of the mandible and tooth wear associated teeth grinding during sleep are among the signs and symptoms of this dysfunction and should be evaluated in patients who present with these complaints. There is no difference in the prevalence of sleep bruxism in relation to sex. People over the age of 40 demonstrated a higher prevalence in this study. Sleep bruxism is associated with a higher level of schooling and psychological stress.

The criteria of the International Classification of Sleep Disorders seem more adequate for the evaluation of sleep bruxism than just the report teeth grinding, as the

consequences to the stomatognathic system are also evaluated. However, there is a need to standardize the questions. Tools that allow a more accurate evaluation of the problem and its intensity need to be developed for research purposes and also for the clinical evaluation of patients suffering from this dysfunction. The data obtained in this study, together with the existing scientific evidence, can aid the improvement of instruments which evaluate sleep bruxism.

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