













ORIGINAL ARTICLE

# Relationship between stress and bruxism in university students: a cross-sectional study

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ABSTRACT

**Background:** Bruxism is defined as repetitive masticatory muscle activity characterized by clenching or grinding or grinding of the teeth and it has been related to psychological factors, such as personality traits, anxiety and stress.

**Objective:** To investigate association between stress and bruxism among university students.

**Materials and methods:** Lipp's Stress Symptoms Inventory for Adults (LSSI) was applied to 253 university students in Diamantina, Brazil. They were clinically evaluated to verify dental wear. The non-instrumental evaluation of probable bruxism was determined by the patients' reports. Sociodemographic variables and self-reported stress data were collected by using the questionnaire. The chi-square test was used, and significance level of 5% ( $p < 0.05$ ) was adopted.

**Results:** The prevalence of bruxism was 45.8% and stress, 37.9%. There was no significant association between the presence of stress diagnosed by ISSL and bruxism ( $p = 0.815$ ). Among the students diagnosed as stressed, 31.6% were in the resistance phase. Self-reported stress was associated with the habit of tooth grinding ( $p < 0.001$ ).

**Conclusions:** No association was found between stress and bruxism. Nevertheless, the prevalence of bruxism among these students was considered high.

KEYWORDS

Psychological stress; Bruxism; Dental wear; Temporomandibular disorders; Prevalence.

RESUMO

**Fundamento:** O bruxismo é definido como atividade muscular repetitiva da mastigação caracterizada pelo ranger dos dentes e tem sido relacionado a fatores psicológicos, como traços de personalidade, ansiedade e estresse.

**Objetivo:** Verificar a associação entre estresse e bruxismo em universitários.

**Materiais e métodos:** O Inventário de Sintomas de Stress para Adultos de Lipp (ISSL) foi aplicado a 253 estudantes universitários em Diamantina, Brasil. Eles foram avaliados clinicamente para verificar o desgaste dentário. A avaliação não instrumental de provável bruxismo foi determinada pelos relatos dos pacientes. Variáveis sociodemográficas e dados de estresse autorreferido foram coletados por meio do questionário. Foi utilizado o teste do qui-quadrado e adotado nível de significância de 5% ( $p < 0,05$ ).

**Resultados:** A prevalência de bruxismo foi 45,8% e estresse, 37,9%. Não houve associação significativa entre a presença de estresse diagnosticado pelo ISSL e bruxismo ( $p = 0,815$ ). Entre os alunos com diagnóstico de estresse, 31,6% encontravam-se na fase de resistência. O estresse autorreferido foi associado ao hábito de ranger os dentes ( $p < 0,001$ ).

**Conclusões:** Não foi encontrada associação entre estresse e bruxismo. Apesar disso, a prevalência de bruxismo entre esses estudantes foi considerada alta.

PALAVRAS CHAVE

Estresse psicológico; Bruxismo; Desgaste dentário; Desordens temporomandibulares; Prevalência.

## CLINICAL RELEVANCE

It is important to note that the frequency of reports of symptoms of stress, fatigue or anxiety was similar between men and women and that self-reported stress was associated with the habit of tooth grinding.

## INTRODUCTION

Bruxism is defined as repetitive masticatory muscle activity characterized by clenching or grinding of the teeth and/or by bracing or thrusting of the mandible.<sup>1</sup> It may manifest in two distinct forms: during sleep (sleep bruxism) or during wakefulness (awake bruxism).<sup>2</sup> Sleep bruxism is a masticatory muscle activity during sleep, characterized as rhythmic (phasic) or non-rhythmic (tonic) movements; otherwise, it is a masticatory muscle activity during wakefulness, characterized by repetitive or sustained tooth contact and/or by bracing or thrusting of the mandible.<sup>1</sup>

In healthy individuals, over the course of time this behavior can lead to negative oral health problems, such as sharp wear of teeth, dentin hypersensitivity, tooth mobility, and temporomandibular joint dysfunction (TMJ) promoting orofacial pain and temporal headache, affecting sleep and quality of life.<sup>1,3-5</sup>

According to Lobbezoo et al.<sup>1</sup> the diagnosis of bruxism can be assessed through possible sleep/wake bruxism, which is based on self-report only; probable sleep/wake bruxism, assessed by self-report and clinical inspection; definitive sleep bruxism, assessed through self-report, clinical inspection plus polysomnography (preferably combined with audio/video recordings); and definitive awakened bruxism, which in turn is assessed through self-report, clinical inspection plus electromyography.

The etiology of bruxism is multifactorial, however it has been related to psychological factors, such as personality traits, anxiety and stress.<sup>6,7</sup> Thus, association has been found between bruxism and stress,<sup>8</sup> assuming that stress causes changes capable of interfering in the individual's quality of life and leading to physiological changes.<sup>9-12</sup>

Some studies have indicated that the prevalence of sleep bruxism tends to decrease with age,<sup>13</sup> others have described the association between bruxism and stress, noting that individuals with a high level of sleep bruxism activity tend to feel more stressed at work and in daily life.<sup>14,15</sup> In general, the relationship between stress and bruxism is still unclear,<sup>16</sup> and some inconclusive results have been shown.<sup>8,17</sup>

Studies in this area are therefore necessary to clarify the

condition of the effects' sleep bruxism and its relationship with other medical or dental diseases, such as stress.<sup>14,17</sup> Thus, the aim of the present study was to assess the relationship between stress and bruxism in a population of university students. The prevalence of bruxism and parafunctional habits were also investigated.

## MATERIALS AND METHODS

This was a cross-sectional study with students from the Federal University of the Jequitinhonha and Mucuri Valleys (UFVJM) in Minas Gerais, Brazil. The study was approved by the Research Ethics Committee of UFVJM (protocol #20140641489) and conducted according to the Helsinki Declaration of 1975, revised in 2013. The subjects signed a term of free and informed consent before the study began.

Sample size calculation was used for prevalence studies. The following parameters were adopted: prevalence of dental wear (26.9%)<sup>18</sup>, level of significance ( $\alpha$ ) of 95%, power ( $\beta$ ) of 80%, and 1% of error margin. Thus, 253 students were included in this study. To allow an adequate representation from 25 undergraduate courses, a proportional stratified random sampling technique was used.

Inclusion criteria were volunteers who were regularly enrolled in the undergraduate courses; and students who used anxiolytic or antidepressant medications were excluded. And confounding factors for bruxism were analyzed through parafunctional habits.

Data collection began with the application of a questionnaire used to characterize the sample, to identify life habits, parafunctional habits and self-reported stress. Thus, data collection consisted of two stages: dental clinical examination and psychological evaluation.

All clinical dental examinations were performed by a single calibrated examiner ( $Kappa = 0.990$ ). This stage consisted of visual inspection of all teeth and evaluation of the incisal edges to verify the presence of dental wear, classified as: (0) no wear, (1) wear on enamel, (2) wear on dentin and (3) extensive wear on dentin. The non-instrumental evaluation of probable bruxism<sup>1</sup> was determined by the patients' reports of tooth clenching/grinding and/or supporting or displacing the jaw associated with at least one of the clinical signs/symptoms: presence of dental wear in at least one tooth, sounds associated with bruxism during sleep, discomfort felt in the mandibular musculature, according to American Academy of Sleep Medicine.<sup>19</sup>

The psychological stage consisted of evaluating the symp-

toms of stress through the Lipp's Stress Symptoms Inventory for adults (LSSI),<sup>20</sup> performed by an experienced psychologist. This questionnaire categorizes stress into four phases: alert, resistance, near-exhaustion and exhaustion. In addition, the instrument determines whether stress manifests itself through physical, psychological symptoms or in both. The LSSI consists of 37 items of somatic nature and 19 items of psychological nature. The results of this instrument were evaluated as determined by the test guidelines; consequently, each individual was classified according to the available stress categories. After defining these categories, the individuals classified as being in the alert, resistance, near-exhaustion or exhaustion phase were considered 'with stress', and those who did not fit into these categories were considered 'without stress'.

Statistical analysis was performed using the SPSS software, version 22. Descriptive statistics were used to characterize the sample. To verify the association between the variables related to the presence/absence of stress and presence of bruxism, the chi-square test was used. Kappa test was used to measure the concordance between self-reported stress and the stress diagnosed by LSSI. For all analyses, the significance level of 5% ( $P < 0.05$ ) was adopted.

## RESULTS

The sample consisted of 147 (58.1%) women and 106 (41.9%) men. The mean age was 21.5 years ( $\pm 2.7$ ), ranging from 18 to 30 years. Of the students, 40.3% were enrolled in the area of the exact sciences, 32.0% the health area and 27.7% were studying for a humanities degree. The characteristics and parafunctional habits identified by means of the questionnaire are shown in Table 1.

The prevalence of bruxism in the present sample was 45.8%, with no statistically significant difference between men (49.0%) and women (43.5%) ( $p = 0.385$ ). One hundred and thirty students (51.4%) presented some degree of dental wear. Canine teeth were the most compromised, affecting 120 students (47.4%), followed by incisors, observed in 27 students (10.7%).

Regarding the LSSI results, 157 students (62.1%) were classified as being without stress, while 5 (2.0%) were in the alert phase, 80 (31.6%), in the resistance phase, 5 (2.0%), in the near-exhaustion phase, and 3 (1.2%) were in the exhaustion phase. There was no statistically significant association between bruxism and the presence of stress ( $p=0.815$ ), and there was no association between dental wear and stress diagnosed by LSSI ( $p=0.665$ ). This asso-

**Table 1. Characteristics and habits of the participants**

	Present n (%)	Male n (%)	Female n (%)	P
<b>Grinding teeth</b>	80 (31.8)	30 (28.0)	50 (34.0)	0.335
<b>Self-perception of dental wear</b>	63 (25.0)	28 (26.4)	35 (23.8)	0.720
<b>Symptoms of stress, fatigue or anxiety</b>	193 (76.3)	75 (70.7)	118 (80.2)	0.709
<b>Sleep well</b>	163 (64.8)	66 (62.2)	97 (65.9)	0.551
<b>Nail biting</b>	92 (36.8)	46 (43.3)	46 (31.2)	0.107
<b>Habit of putting objects in the mouth</b>	92 (36.8)	44 (41.5)	48 (32.6)	0.259
<b>Temporomandibular joint noise</b>	63(24.9)	22 (20.7)	41 (27.8)	0.289
<b>Smoking habit</b>	34 (13.4)	26 (24.5)	8 (0.05)	<b>&lt;0.001*</b>
<b>Consumption of alcohol</b>	149 (58.9)	73 (68.8)	76 (51.7)	<b>0.019*</b>
<b>Gastric problems</b>	42 (16.6)	14 (13.2)	28 (19.0)	0.316
<b>Consumption of acidic foods</b>	162 (64.0)	64 (60.3)	98 (66.6)	0.121
<b>Nervousness at school test</b>	185 (73.1)	66 (62.2)	119 (80.9)	<b>0.003*</b>

Values in bold\* showing statistically significant difference ( $p<0.05$ ).

ciation was also not identified in the subgroups in relation to the area of undergraduate course (health sciences, humanities and exact sciences), and the stage of the course.

The self-reported stress was associated with the habit of grinding the teeth ( $p<0.001$ ). The consumption of acidic foods ( $p=0.003$ ) and the habit of grinding teeth ( $p<0.001$ ) were more frequently reported by the bruxers. The concordance between the presence of stress by LSSI and the self-reported stress was very low ( $K=0.113$ ). The association between stress and students' habits is presented in Table 2.

## DISCUSSION

The results of the present study revealed that the prevalence of probable bruxism in the sample was 45.8% and more than half of the sample showed some degree of tooth wear, with the most affected canines. According to the LSSI results, there was no statistically significant association between probable bruxism and the presence of stress, as well as between tooth wear and stress diagnosed by the LSSI. On the other hand, self-reported stress was associated with the habit of grinding teeth.

**Table 2. Association between stress and characteristics of participants**

	With stress (LSSI)		No stress (LSSI)		p	With stress (self-reported)		No stress (self-reported)		p
	n	%	n	%		n	%	n	%	
<b>Bruxism</b>										
Yes	42	(36.2)	74	(63.8)	0.600	102	(52.8)	91	(47.2)	0.457
No	54	(39.4)	83	(60.6)		35	(58.3)	25	(41.7)	
<b>Grinding teeth</b>										
Yes	30	(37.5)	50	(62.5)	0.921	72	(90.0)	8	(10.0)	<0.001*
No	66	(38.2)	107	(61.8)		121	(69.9)	52	(30.1)	
<b>Nail biting</b>										
Yes	35	(38.0)	57	(62.0)	0.736	71	(78.0)	21	(22.8)	0.823
No	61	(38.1)	100	(61.9)		121	(75.7)	29	(24.3)	
<b>Sleep well</b>										
Yes	68	(41.7)	95	(30.3)	0.090	111	(68.1)	52	(31.9)	<0.001*
No	28	(30.3)	62	(69.7)		82	(92.1)	7	(7.0)	
<b>Smoker</b>										
Yes	12	(35.3)	22	(64.7)	0.732	27	(79.4)	7	(20.6)	0.645
No	84	(38.4)	135	(61.6)		166	(75.8)	53	(24.2)	
<b>Alcohol consumption</b>										
Yes	57	(38.3)	92	(61.7)	0.734	116	(77.8)	33	(22.2)	0.648
No	39	(37.9)	65	(62.1)		76	(73.8)	27	(26.2)	

Values in bold\* showing statistically significant difference ( $p<0.05$ ). LSSI: Lipp's Stress Symptoms Inventory for Adults.

The association between bruxism and stress is a subject widely discussed that has presented contradictory results.<sup>21-23</sup> In the present study, this association was not observed, differing from the findings of a study conducted with a sample of 278 university students in Italy.<sup>24</sup> However, there have previously been reports on the multifactorial origin of bruxism,<sup>17</sup> which could justify the findings of the present study.

Previous studies have established that the academic environment and the functions performed by the students promote stress reactions related to physical, mental and emotional changes in these individuals.<sup>25-27</sup> In order to evaluate the presence of stress, this study used the LSSI instrument, previously validated for the Brazilian adult population.<sup>20</sup> The prevalence of stress was found in 37.1% of the students, and among them, 83.3% were in the resistance phase. Stress in university students has been approached in previous studies using several different instruments, such as the Aga Khan University Anxiety and Depression Scale (AKUADS),<sup>26</sup> Student-Life Stress Inventory (SSI),<sup>26</sup> 10-item Perceived Stress Scale (PSS-10),<sup>24,28</sup> Hospital Anxiety and Depression Scale (HADS),<sup>27</sup> Stress Vulnerability Scale (SVS),<sup>28</sup> State-Trait Anxiety Inventory<sup>28</sup> and Dental Environment Stress questionnaire (DES).<sup>26</sup> In this study, in addition to the LSSI, the students' self-reported stress data was collected. Students who reported being stressed also reported the habit of grinding their teeth, hearing noises in the TMJ, presenting muscle aches and sleeping poorly during the night. However, these associations were not found when the LSSI was used to diagnose stress.

Stress represents the discrepancy between the individual's perception of the environmental demands and the individual's capacities to meet these demands. It is indirectly measured through the evaluation of stressful factors that have occurred in the person's life in recent months. Anxiety, the psychophysiological sustained state that is triggered by stress, is also very common among undergraduate students.<sup>26</sup> Considering the two constructs, it may be suggested that in the students included in the study, the concepts may have overlapped, generating low concordance between the stress diagnosed by LSSI and the stress directly reported by the students themselves. In this sense, future studies using questionnaires that address not only stress, but also anxiety in university students, should be conducted to clarify this hypothesis.

Another point that may have contributed to the low concordance between the diagnosed and reported stress may be related to the difficulty some research participants

had with understanding the LSSI questionnaire. Specific terms of the instrument such as tachycardia, sweating, hyperventilation, transient emotive sensation seem to be difficult for them to understand. In addition, issues involving the decrease in libido and the feeling of incompetence may have imposed some restraint on reticent participants (unwilling to speak about their thoughts or feelings) in this research. Both situations may have led to underestimation of the results in relation to stress.

Although bruxism was not associated with diagnosed stress in this study, it should be noted that a high prevalence of bruxism was found among university students (45.8%), higher than 34.3% found by Dantas-Neta et al.,<sup>29</sup> and the 26.3% reported by Augusto et al.<sup>30</sup> The presence of bruxism, in turn, was associated with the presence of temporomandibular disorders in university students,<sup>30,31</sup> thus being a risk factor that can be highly debilitating in the context of oral and masticatory functions. In this study, the presence of temporomandibular disorders was not assessed. The occurrence of noise in the TMJ according to the students' report was 24.9%, similar to the 27.2% found in a study with university students in Japan.<sup>32</sup> Studies have concluded that stress is a risk factor for TMJ noise in women,<sup>32</sup> and the presence of pain in TMJ was reported by 8.7% of university students,<sup>32</sup> while in this study, pain was present in 16.9% of the students.

In the present study, the characteristics and habits of the students were presented according to gender since the literature has shown higher loads of anxiety and stress in women.<sup>33</sup> The present findings highlight that women reported more head, face and neck pain than men, in addition to showing more nervousness than men during tests. It is known that the consumption of alcoholic beverages and cigarettes can lead to an increase in dopamine release, which can influence bruxism<sup>34</sup>. A recent cohort study of young twins highlighted the association between tobacco use and bruxism<sup>35</sup>. However, a more detailed association between the association of these substances is not completely clear in the literature. In the present study, men used significantly more cigarettes and alcoholic beverages than women. However, the frequency of reporting symptoms of stress, fatigue or anxiety was similar between men and women.

Although several studies have been conducted in an endeavor to determine the risk factors for bruxism, the evidence on this subject is still inconclusive. The association between bruxism and a possible biomarker of stress and anxiety (salivary cortisol) was investigated by a systematic review, but this relationship was not proved, due

to the low number of available studies and the lack of methodological standardization<sup>36</sup>. Another systematic review investigated the etiological factors of bruxism and concluded that stress and other psychological factors such as anxiety and affective disorders seemed to have little influence on this parafunctional condition<sup>37</sup>. Thus, the findings of the present study confirmed the available evidence.

The lack of standardization in relation to valid and reproducible methods for assessing bruxism in studies<sup>38</sup>, may compromise the results of research on this subject. The present study used a non-instrumental approach, consisting of a clinical dental examination to check dental wear, and self-report on the habit of grinding teeth to define the probable diagnosis of bruxism among university students.<sup>1</sup> A study with a similar objective<sup>24</sup> determined the possible presence of bruxism only by the self-report on the act of grinding the teeth, by asking the question "do you clench or grind your teeth?" In general, studies with clinical approaches have a lower risk of bias than studies that show uncertainty with regard to exposure and outcome<sup>39</sup>.

Despite the clinical relevance of the present findings, some limitations of this study should be pointed out. As it was a cross-sectional study, no relationship of cause and effect could be established. In addition, the presence of bruxism was investigated, disregarding the types of sleep or awake bruxism, which could influence the results. In addition, although polysomnography is considered the gold standard for diagnosing definitive bruxism, in this study, in accordance with the international consensus, probable bruxism was evaluated through self-report and clinical inspection, a low-cost diagnostic option and yet an acceptable method. The sample was specific, so caution should be exercised when interpreting the results of this study. Longitudinal studies that aim to evaluate the dental wear of university students could lead to the formulation of health policies that will benefit this population. Studies with this design can determine the main risk factors for bruxism among undergraduate students, in addition to those already established in the literature<sup>37</sup>.

## CONCLUSIONS

In conclusion, this study demonstrated that there was no association between stress and bruxism among university students. Despite this, the prevalence of bruxism in this sample was high and this population should be investigated for other predisposing oral and dental changes.

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## CONFLICT OF INTEREST STATEMENT

The authors declare that there is no conflict of interests related to this study.

## FINANCING INFORMATION

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