

The Behavior of Probable Sleep Bruxism, Anxiety and Need for Orthodontic Treatment in Adolescents

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Academic Editor: Alessandro Leite Cavalcanti

Received: May 10, 2023 / Review: October 09, 2023 / Accepted: November 22, 2023

How to cite: Lima Martins MF, Piovezane FJ, Carneiro DPA, Menezes CC, Venezian GC, Vedovello SAS. The behavior of probable sleep bruxism, anxiety and need for orthodontic treatment in adolescents. *Pesqui Bras Odontopediatria Clín Integr*. 2024; 24:e230086. <https://doi.org/10.1590/pboci.2024.066>

ABSTRACT

Objective: To determine the prevalence of the need for orthodontic treatment, anxiety, and probable sleep bruxism and its association in adolescents. **Material and Methods:** A cross-sectional study was conducted with 294 adolescents aged between 11 and 16 years. Orthodontic treatment need was determined using the Dental Health Component of the Index of Orthodontic Treatment Needs (IOTN-DHC). Anxiety symptoms were assessed using the Brazilian version of the Multidimensional Anxiety Scale for Children (MASC). The probable sleep bruxism was identified based on the American Academy of Sleep Medicine (AASM) questionnaire. Descriptive data analyses were performed. Simple logistic regression models were applied between each independent variable and the outcome (anxiety score). Variables with $p < 0.20$ in the individual (raw) analyses were studied in a multiple logistic regression model, with $p \leq 0.05$ remaining in the final model. Based on the regression models, the prevalence ratios were estimated with the respective 95% confidence intervals. **Results:** 68.7% of the adolescents had probable sleep bruxism, and 35.4% had a moderate or severe normative need for orthodontic treatment. Adolescents aged up to 12 years (OR=1.82; CI: 1.10-3.02), females (OR=2.67; CI: 1.64-4.34), and with a moderate or severe need for orthodontic treatment according to the IOTN-DHC (OR=1.76; CI: 1.06-2.90), are more likely to have a higher anxiety score. The prevalence of adolescents with a moderate or severe need for normative orthodontic treatment by the IOTN-DHC is 35.4% (95%CI: 29.9-40.8%), while the perceived need for treatment by the IOTN-AC is 14.0% (95%CI: 10.0-17.9%). Adolescents with a high degree of anxiety were more likely to have probable sleep bruxism (OR=3.64; CI: 1.06-12.50). **Conclusion:** Female adolescents up to 12 years of age and with a moderate or severe need for orthodontic treatment are more likely to have higher levels of anxiety; adolescents with a high degree of anxiety are more likely to have probable sleep bruxism.

Keywords: Sleep Bruxism; Adolescent; Therapeutics; Anxiety.

Introduction

Bruxism is a rhythmic and non-rhythmic muscle activity influenced by the circadian cycle and is considered a behavior that can occur in any age group during sleep or wakefulness [1]. According to the international consensus, the etiology of sleep bruxism is biological, psychological, and external factors [2]. Where biological factors include age, genetic components, cortical awakenings, and neurotransmission, psychological factors, on the other hand, include risk factors associated with individual characteristics, such as anxiety disorders or sensitivity to emotional stress [3], while external factors are formed by caffeine consumption, smoking, alcohol intake, and drug use [4].

The literature has associated bruxism with episodes of school bullying, anxiety, high levels of responsibility, and stress [5-7]. Other studies also point to a relationship with sociodemographic aspects of the family nucleus, such as the mother's stress, lower level of maternal education, low family income, lack of definition of roles in the domestic environment, and separation from parents [8]. These conditions can cause stress that directly impacts the worsening of individuals' sleep quality, thus supporting the complex multifactorial cause model of bruxism [9]. Currently, there is no specific strategy, single treatment, or cure for sleep bruxism and different lines of treatment have been proposed: pharmacological, psychological, and dental treatments.

The search for orthodontic treatment is initially due to dental aesthetics, mainly for the functional aspects. Among the fundamental goals of this treatment is the establishment of harmony of the stomatognathic system, adequate masticatory function, and occlusal stability, in addition to aesthetic principles [10]. It is essential to create mechanisms that minimize oral factors that can worsen bruxism and, consequently, damage the health of adolescents. The consequences of a parafunctional habit can increase headaches, pain in the masticatory muscles, tooth wear, tooth mobility, trauma to soft tissues, progression of periodontal disease, damage to the temporomandibular joint (TMJ), and occlusion [11,12], impacting the individual's life. Considering that adolescence is a challenging period marked by significant transitions, the present study associated anxiety, probable sleep bruxism, and the need for orthodontic treatment in this stage of life.

Material and Methods

Sample Characteristics

A cross-sectional observational study was conducted with adolescents from public schools. The study was approved by the Ethics and Research Committee (#01795318.2.0000.5385). The sample was calculated using the EpiInfo program (Centers for Disease Control and Prevention, Atlanta, USA), considering a test power of 80% for a significance level of 5%, unexposed: exposed ratio of 1, the prevalence of 50% sleep bruxism and a minimum detectable odds ratio of 2.0, requiring the evaluation of 290 adolescents. Individuals who had undergone previous orthodontic treatment or were undergoing current treatment had systemic or neuromotor diseases or had communication difficulties were excluded. Adolescents who followed the eligibility criteria and obtained authorization from parents and/or caregivers participated. The final sample consisted of 294 adolescents of both sexes, with a mean age of 12.3 (\pm 1.2).

Non-Clinical Data

Parents were instructed to observe and record, over three days, the presence or absence of signs and symptoms of sleep bruxism in their children. The diagnosis of possible sleep bruxism was determined using the classification criteria proposed by the American Academy of Sleep Medicine (AASM), namely the occurrence of hearing teeth grinding while their children were sleeping, added to at least one of the symptoms of sleep bruxism. Pain in the face, headaches, difficulty opening and closing the mouth, and clicking configured the presence of

possible sleep bruxism [13]. For this record, a self-report questionnaire of ten questions related to the history of nocturnal audible teeth grinding, oral habits, and medical history was sent.

Anxiety symptoms were assessed using the Brazilian version of the Multidimensional Anxiety Scale for Children (MASC). The MASC was initially developed by March et al. [14], adapted and validated for the Brazilian population [15]. It is an instrument that, through self-report, can track the main anxiety symptoms in children and adolescents aged 8 to 19. Global anxiety is measured using 39 items, divided into four domains: physical symptoms, harm prevention, social anxiety, and separation/panic. The questions must be answered using a four-point Likert scale, which investigates the individual's feelings, thoughts, and actions. For each item, adolescents were instructed to indicate how often the statement was true for them: (0) it is never true about me; (1) it is rarely true about me; (2) sometimes true of me, or (3) often true of me. Higher scores represented more significant anxiety symptoms [15].

The scale of physical symptoms refers to feelings of tension, symptoms of dizziness, and changes in a heartbeat. The damage prevention scale consists of evaluating perfectionism and the need to check that things are safe. The social anxiety scale consists of questions about fear of humiliation, fear of performance, and concern about others laughing at the respondent. The panic scale refers to the preference to stay close to family members or at home and the fear of being alone or in unfamiliar situations. The total anxiety score or score reports symptoms of all scales and the higher the score, there is an indication of a higher level of anxiety [15]. The total anxiety scores were dichotomized into high and low for the statistical analysis according to the sample median. Secondly, they were dichotomized between a high degree of anxiety (total >56) and a low degree of anxiety (total < 56).

The Aesthetic Component (AC) of the Orthodontic Treatment Needs Index (IOTN) was used to assess the perception of malocclusion. The IOTN-AC used a dental attractiveness scale illustrated by ten color pictures showing a decreasing and continuous attractiveness. The first picture represents a more attractive occlusion, and the tenth is the least attractive. The adolescents themselves carried out the assessments, identifying the degree of aesthetic impairment in the pictures on the scale, considered like their smile. Adolescents who indicated pictures 1 to 4 were categorized as having little or no need for orthodontic treatment (Grades 1 and 2), while those who told pictures 5 to 10 were categorized as needing orthodontic treatment (Grades 3 to 5) [16].

Clinical Data

The Dental Health Component (DHC) of the Index of Orthodontic Treatment Needs (IOTN) was used to evaluate dental aspects of malocclusion and the normative need for orthodontic treatment [16]. Although all changes have been evaluated, only the most severe condition is used to determine the severity of the malocclusion and everyone's need for orthodontic treatment [16]. The need for orthodontic treatment was defined by a grade, where grades 1 and 2 configured little or no need for treatment, grade 3 moderate need, and grades 4 and 5 severe need.

Training and Calibration Exercise

A single calibrated evaluator performed the clinical examination of the malocclusion and participated in theoretical and clinical training exercises based on the criteria proposed by the IOTN-DHC index. Theoretical training was carried out with plaster models to discuss all the characteristics evaluated by the index. For clinical calibration, 20 adolescents were examined by the examiner to determine inter-rater agreement. Adolescents who participated in the clinical calibration were excluded from the primary sample of this study. The inter-examiner Kappa coefficient was more significant than 0.92 for malocclusion.

Statistical Analysis

Descriptive data analyses were performed. Absolute and relative frequencies described categorical variables. Quantitative variables by mean, standard deviation, and quartiles. The prevalence of bruxism and the need for orthodontic treatment were estimated, with respective 95% confidence intervals. Next, the total anxiety scores were dichotomized into high and low according to the sample median. Simple (individual) logistic regression models were applied between each independent variable and the outcome (anxiety score). Variables with $p < 0.20$ in the individual (raw) analyses were studied in a multiple logistic regression model. When analyzed in the multiple models, the final model was composed of variables that remained at $p \leq 0.05$. Crude and adjusted odds ratios (OR) were estimated from the regression models, with respective 95% confidence intervals. The Akaike Information Criterion (AIC) assessed the model's goodness of fit. All analyzes were performed using the R program (R Foundation for Statistical Computing, Vienna, Austria), with a significance level of 5%.

Results

The study involved the participation of 294 adolescents, 56.5% female, 56.5% white, aged between 11 and 16 years old (mean age 12.3 years old and standard deviation 1.2 years old).

Table 1. Descriptive analysis of the sample.

Variables	Category	N (%)
Sex	Male	128 (43.5)
	Female	166 (56.5)
Race	White	166 (56.5)
	Non white	128 (43.5)
	Mean (Standard Deviation)	Median (Minimum Value; Maximum Value)
Age (Years)	12.3 (1.2)	12.0 (11.0; 16.0)

Table 2 presents data regarding prevalence. It was possible to observe that 68.7% (95%CI: 63.4%-74.0%) of the sample had possible bruxism. In comparison, 35.4% (95%CI: 29.9%-40.8%) had a moderate or severe need for orthodontic treatment due to normative assessments (IOTN-DHC), and 14% (95%CI:10.0%-17.9%) required moderate or severe orthodontic treatment according to subjective assessments (IOTN-AC). Table 3 shows the distribution of anxiety scores of adolescents according to the MASC.

Table 2. Prevalence of possible bruxism and need for orthodontic treatment.

Variable	Prevalence	CI95%
Bruxism	68.7%	63.4%-74.0%
Moderate or Severe Treatment Need (IOTN-DHC)	35.4%	29.9%-40.8%
Moderate or Severe Treatment Need (IOTN-AC)	14.0%	10.0%-17.9%

Table 3. Descriptive analysis of anxiety scores using the Multidimensional Anxiety Scale for Children (MASC).

Variables	Minimum Value	First Quartile	Median	Third Quartile	Maximum Value
Physical symptoms	0.0	9.0	12.5	17.0	26.0
Social anxiety	0.0	6.0	10.0	13.0	23.0
Panic	0.0	7.0	11.0	15.0	26.0
Total Score	0.0	25.2	35.0	45.8	77.0

Table 4 presents the associations with the anxiety score on the MASC, where it was possible to observe that adolescents aged up to 12 years (OR=1.82; CI: 1.10-3.02), females (OR=2.67; CI: 1.64-4.34) and with a moderate or severe need for orthodontic treatment according to the IOTN-DHC (OR=1.76; CI: 1.06-2.90), are

more likely to have a higher anxiety score ($p < 0.05$). In addition, the prevalence of adolescents with a moderate or severe need for normative orthodontic treatment by the IOTN-DHC is 35.4% (95%CI: 29.9-40.8%), while the perceived need for treatment by the IOTN-AC is 14.0% (95%CI: 10.0-17.9%).

Table 4. Analysis of associations with anxiety score using the Multidimensional Anxiety Scale for Children (MASC).

Variables	Category	N (%) ¹	Anxiety Score		OR Crude (CI95%)	p-value	OR Adjusted (CI95%)	p-value
			≤35 [#]	>35 [*]				
			N (% ²)	N (% ²)				
Age (Years)	≤12 [#]	190 (64.6)	87 (45.8)	103 (54.2)	1.82 (1.12-2.96)	0.0158	1.82 (1.10-3.02)	0.0196
	>12	104 (35.4)	63 (60.6)	41 (39.4)	1		1	
Sex	Male	128 (43.5)	82 (64.1)	46 (35.9)	1		1	
	Female	166 (56.5)	68 (41.0)	98 (59.0)	2.57 (1.60-4.13)	0.0001	2.67 (1.64-4.34)	<0.0001
Race	White	166 (56.5)	85 (51.2)	81 (48.8)	1		-	-
	Non white	128 (43.5)	65 (50.8)	63 (49.2)	1.02 (0.64-1.61)	0.9426		
IOTN-DHC	Little/none	190 (64.6)	106 (55.8)	84 (44.2)	1		1	
	Moderate/severe	104 (35.4)	44 (42.3)	60 (57.7)	1.72 (1.06-2.79)	0.0276	1.76 (1.06-2.90)	0.0284
IOTN-AC	Little/none	253 (86.0)	130 (51.4)	123 (48.6)	1		-	-
	Moderate/severe	41 (14.0)	20 (48.8)	21 (51.2)	1.11 (0.57-2.15)	0.7571		
Possible Bruxism	Yes	202 (68.7)	101 (50.0)	101 (50.0)	1.14 (0.70-1.87)	0.6045	-	-
	No	92 (31.3)	49 (53.3)	43 (46.7)	1			

*Reference category for the outcome variable; 1: Reference category of independent variables; OR: Odds Ratio; CI: Confidence Interval; [#]Median of the sample; ¹Percentage in the column; ²Percentage in line. AIC (empty model)=409,45; AIC (final model)=388,95.

Table 5 shows the association with probable sleep bruxism, where it was possible to observe that patients with a high degree of anxiety were 3.64 times more likely to have probable sleep bruxism.

Table 5. Analysis of associations with possible bruxism.

Variables	Category	N (%) ¹	Possible Bruxism		OR Crude (CI95%)	p-value	OR Adjusted (CI95%)	p-value
			*Yes	No				
			N (% ²)	N (% ²)				
Age (Years)	≤12 [#]	189 (64.5)	129 (68.2)	60 (31.8)	1			
	>12	104 (35.5)	72 (69.2)	32 (30.8)	1.05 (0.62-1.76)	0.8635		
Sex	Male	128 (43.7)	82 (64.1)	46 (35.9)	1			
	Female	165 (56.3)	119 (72.1)	46 (27.9)	1.45 (0.88-2.38)	0.1412		
Race	White	166 (56.7)	108 (65.1)	58 (34.9)	1			
	Non white	127 (43.3)	93 (73.2)	34 (26.8)	1.47 (0.89-2.44)	0.1364		
Anxiety Score	Baixo (<56)	268 (91.5)	179 (66.8)	89 (33.2)	1		1	
	Alto (≥56)	25 (8.5)	22 (88.0)	3 (12.0)	3.64 (1.06-12.50)	0.0397	3.64 (1.06-12.50)	0.0397

*Reference category for the outcome variable; 1: Reference category of independent variables; OR: Odds ratio; CI: Confidence Interval; [#]Median of the sample; ¹Percentage in the column; ²Percentage in line.

Discussion

This study associated anxiety, probable sleep bruxism, and the need for orthodontic treatment in adolescents between 11 and 16. The results showed that 68.7% of the adolescents reported sleep bruxism. However, there is some contradiction in the data found in the literature on the prevalence and variables associated with probable sleep bruxism, which differs from the group in question. The prevalence of sleep bruxism has varied according to the age of the studied group; in individuals aged 17 to 47 years, a prevalence of 21.5% was observed [17]; studies with young adult individuals showed a prevalence between 20 and 32% reported in recent studies [18,19]; that is, much lower rates observed in the present study. The significant difference in prevalence can be explained by age, which suggests a tendency to decrease as age advances; however, this reinforces the need for further studies on sleep bruxism in adolescents.

Regarding malocclusion, the prevalence of the need for moderate or severe orthodontic treatment in the present study showed rates of 35.4%. In comparison, the perceived need for moderate or severe orthodontic treatment showed a rate of 14%. It was also found that female adolescents aged up to 12 years with a moderate or severe need for treatment were more likely to have a higher anxiety score.

As well as in the present study, some studies corroborate the relationship between psychological factors and sleep bruxism; a previous study that evaluated students between 19 and 30 years old found a high degree of stress and anxiety, especially in females [19], indicating that individuals with this psychological profile are more likely to have probable sleep bruxism, contrary to the results found in another study, where in their assessment of schoolchildren aged 8 to 10 years, it was not possible to establish such an association [8].







However, when evaluating adults, another study revealed significant associations between higher anxiety and stress levels with severe bruxism. Anxiety above the general mean score and severe stress were significantly more likely among frequent bruxists than those who reported mild bruxism or no bruxism [20], results that reaffirm the relationship found in this present study, where patients with a high degree of anxiety were more likely to have probable bruxism.

Knowledge about bruxism is of great interest to researchers and clinicians in several health areas, mainly due to the high prevalence of this condition, as observed in this study. Therefore, it is essential to seek more scientific evidence to bring more possibilities for intervention and consequently reduce the impact of bruxism. Psychological treatment could be a positive factor in controlling this condition [21]. Therefore, through these data, it will be possible to provide increasingly conclusive information to guide daily choices in clinical practice and guidelines.

Conclusion

Female adolescents up to 12 years of age and with a moderate or severe need for orthodontic treatment are more likely to have higher levels of anxiety; adolescents with a high degree of anxiety are more likely to have probable sleep bruxism.

Authors' Contributions

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FJP		https://orcid.org/0009-0008-5742-1961	Methodology, Investigation and Data Curation.
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CCM		https://orcid.org/0000-0002-8875-8611	Methodology, Formal Analysis and Writing - Review and Editing.
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All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

Financial Support

None.

Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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