

Impact of dental bullying on bruxism associated with poor sleep quality among adolescents

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Abstract: This study aimed to investigate the impact of school bullying and oral health-related verbal bullying on the occurrence of bruxism associated with poor sleep quality among adolescents. This cross-sectional study was nested in a cohort study performed with a sample of children from southern Brazil. Possible sleep bruxism was determined by the question: “Has anyone told you that you grind your teeth in your sleep?” Sleep quality was determined by answering the following question: “How would you classify the quality of your sleep?”. The outcome was created by combining occurrence of sleep bruxism and poor sleep quality. The Sense of Coherence (SOC) was assessed using the SOC-13 scale. Bullying was investigated using the victim scale of the Olweus Bullying Questionnaire and oral health-related verbal bullying using an item from the Child Perceptions Questionnaire-11-14. Demographic, socioeconomic, psychosocial, and clinical data were also collected. Poisson regression models with robust variance were used. Results were expressed as prevalence ratio (PR) and 95% confidence intervals (95% CI). A total of 429 adolescents with a mean age of 12.6 (standard deviation 1.3) years were evaluated. The prevalence of bruxism associated with poor sleep quality was 23.7%. Victims of school bullying (PR 2.06; 95%CI: 1.01-4.22) and oral health-related verbal bullying (PR 1.87; 95%CI: 1.18-2.95) presented higher prevalence of bruxism associated with poor sleep quality. Factors such as skin color and SOC were also associated with the outcome. These findings suggest an association between episodes of bullying and bruxism related to poor sleep quality.

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Introduction

The term bullying refers to a form of aggressive, violent behavior that involves intentionality, repetition, and unequal power relations.¹ According to Olweus (2013), there are different types of bullying: a) physical bullying, which involves physical aggression, stealing, destruction of the victim’s objects, and sexual exploitation; b) verbal bullying, which encompasses insults, name-calling, teasing, offensive discriminating comments, gossip, rumors, and threats; c) relational bullying, which

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includes acts of exclusion and isolation; and d) virtual bullying (cyber bullying), which involves defamation, lies, and insults spread through social media. Thus, bullying is described as an event in which an individual is repeatedly subjected to negative actions by a particular group or person.¹

There is evidence that oral conditions may be associated with episodes of moral and verbal intimidation as well as non-acceptance in groups at school.² The transition from childhood to adolescence is a time when children interact more with each other, leading frequent episodes of bullying.³ Although victims of bullying are known to experience undesirable psychological effects, such as anxiety, insecurity, depression, sleep problems and low self-esteem in adolescence,^{4,5} there is no evidence regarding the role of bullying on sleep quality and the simultaneous occurrence of sleep bruxism (SB).

Sleep is an essential physiological process and is of extreme importance for a good quality of life in children and adolescents. Scholars report that poor sleep quality in childhood and adolescence can exert a negative impact on daytime functioning, affecting cognitive, behavioral, and emotional aspects.^{6,7} Like poor sleep, SB has been associated with personality traits, anxiety, genetics, interference in sleep quality as well as psychosocial problems and behavioral health.⁸ Bruxism is defined as masticatory muscle activity that has two distinct circadian manifestations: SB and awake bruxism.^{9,10} SB occurs during sleep and is characterized by rhythmic (phasic) or non-rhythmic masticatory muscle activity (keynote).¹⁰ This condition is not considered a movement or sleep disorder in healthy individuals.¹⁰

In the assessment of bruxism, approaches can be distinguished as non-instrumental or instrumental.¹¹ Non-instrumental approaches of assessing bruxism include self-report (questionnaires, oral history) and clinical inspection, for both sleep and awake bruxism.¹² Self-reported sleep or awake bruxism remains the main assessment tool in bruxism research and clinical practice. However, instrumental approaches with electromyographic recordings during sleep also provide essential evidence of sleep bruxism.¹⁰ In this way, possible sleep/awake

bruxism is based only on positive self-report; probable sleep/awake bruxism is based on a positive clinical inspection, with or without positive self-report; definite sleep/awake bruxism is based on positive instrumental assessment, with or without positive self-report and/or positive clinical inspection.¹⁰

Thus, SB and poor sleep quality have a multifactor etiology and can be influenced by emotional factors.⁸ Among these factors is the sense of coherence (SOC), which reflects the individual's abilities and resilience to cope with stress-generating factors and illnesses.¹³ In addition, sleep-related problems can have an influence on behavior, development, academic performance, and family relationships.¹⁴ Therefore, the recognition of such problems is important to the adequate clinical management of patients.⁵ As bullying can trigger or aggravate stress and psychosocial problems, it may be related to SB and sleep quality. Therefore, the aim of the present study was to investigate the impact of school bullying and oral health-related verbal bullying on the combination of SB and poor sleep quality in adolescents. Our hypothesis is that prevalence of bruxism associated with poor sleep quality is higher in adolescents who suffer school bullying and verbal bullying related to the oral condition.

Methods

Study design and sample

This was a cross-sectional study nested in a cohort with a ten-year follow-up period conducted in Santa Maria, southern Brazil. In 2018, this city had an estimated population of 280,505 habitants, with 36,152 students from 5 to 15 years of age, according to the most recent census.¹⁵

Data collection for the cohort began in 2010 on National Children's Vaccination Day. Six hundred thirty-nine children from one to five years of age were evaluated. All primary health centers with a dental chair were included in the study ($n = 15$), which were well distributed among the neighborhoods of the city. Afterward, the children were systematically selected from the vaccination line and asked to take part in the study.¹⁶

All children examined in the first stage (cohort baseline) were considered eligible to participate in the follow-up. To locate individuals and update data, the enrollment center of the municipal education network, telephone contacts, and active searches based on the addresses of individuals recruited at baseline were consulted. In 2019, exams and questionnaires were applied in schools where students were enrolled. Due to the COVID-19 pandemic, data collection was interrupted from March to October 2020. Thereafter, data collection was restarted with all appropriate procedures and carried out in the participants' homes and was completed in January 2021, since in-person classes were still interrupted.

For the calculation of the sample size needed to determine the outcome of the present study, a sample power calculation of the cohort sample was performed. A 100% power was obtained considering the prevalence of bruxism and poor sleep quality to be 43% among the exposed (victims of bullying) and 21% among the non-exposed (not victims of bullying), with a 5% standard error and 95% confidence interval.

The sample size was calculated considering the prevalence of possible SB of 64.7% in the exposed (victims of bullying) and of 16.6% in the non-exposed (non-victims of bullying).¹⁷ The proportion of exposed and non-exposed was 1:1 and the statistical power was 90%. Considering a design effect of 1.8 and the addition of 30% to compensate for possible dropouts, the minimum sample size was 113 children.

Variables

For the assessment of school bullying, students answered the Brazilian version of the Olweus Bully/Victim Questionnaire (OBVQ), which is one of the few bullying assessment instruments whose psychometric properties are well established in different countries. The Brazilian version has been validated for adolescents aged 12 to 17 years and is known as the Olweus Bullying Questionnaire (OBQ).^{18,19} This is a self-report instrument consisting of 23 bullying items (intimidation scale) and 23 victimization items (victim scale). Only the victims scale was used in this study. Participants chose an

answer option for each of the 23 items reflecting frequency of behaviors: "never" (score 0); "Once or twice in the last month" (score 1); one or more times a week" (score 2). Thus, a higher score means a stronger statement of being a victim of bullying.¹⁹ For adolescents evaluated during the COVID-19 pandemic, the occurrence of bullying episodes was questioned about the last month of in-person classes. For the analysis, this variable was dichotomized into occurrence (score 1 and 2) or non-occurrence (score 0) of school bullying episodes.

Oral health-related verbal bullying was assessed using item 15 of the short version of the Child Perceptions Questionnaire (CPQ11-14), which was translated and validated for Brazilian children aged between 11 and 14 years.²⁰ The question was "In the past three months, how many times have the children pissed you off or called you names because of your teeth, lips or mouth?", for which the scored response options were "never" = 0; "Once or twice" = 1; "Sometimes" = 2; "Often" = 3; and "every day / almost every day" = 4. Those who answered "never" were considered not to have been verbally bullied and those who selected options 1 to 4 (once or twice to almost every day in the last three months) were considered to have suffered oral health-related verbal bullying.²¹ This question has been used in previous studies to assess the occurrence of verbal bullying related to the oral condition in children and adolescents.^{2,22} The age in our sample ranged from 11 to 15 years, with a mean of 12 years. In this sense, the individuals evaluated in our sample are considered adolescents. There are no concerns about the CPQ-11-14, as it has been considered valid for the assessment of OHRQoL in both children and adolescents.²³ A previous study has shown that this is the best questionnaire to use in these cases²⁴ and it was used in this same sample.²⁵

Possible SB was diagnosed based on self-reports of students participating in the study or parents/guardians reports of audible sounds of teeth grinding during sleep of these adolescents, following the International Consensus on Bruxism that defines "possible SB" when diagnosis is based only on a positive self-report. In the present study, the following

question was asked: "Has anyone ever told you that you grind your teeth in your sleep?", with answer options being "no" (score 0) or "yes" (score 1).²⁶ Sleep quality was investigated with the following question "How would you rate the quality of your sleep?", for which the answer options were "I sleep well / good quality" (score 0) or "I sleep poorly" (score 1).²⁷ These questions have been used in the literature.^{26,27} For the study outcome, a variable was created by combining the occurrence of SB and poor sleep quality (second option for both questions). Although the relationship between bullying and bruxism has already been widely reported in the literature,^{8,17,26} to the best of our knowledge, this association has not been investigated concomitantly with sleep quality assessment. Since both bruxism and sleep quality can be influenced by the same factors and recognition of these problems is important for adolescent health care, simultaneous evaluation of both factors can be justified.^{6,7,8}

The sense of coherence (SOC) of adolescents is seen as a personality trait that introduces comprehension of events, influencing habits that directly affect health and adaptive behavior to stress.²⁸ In the present study, this aspect was assessed using the validated Brazilian version of the SOC-13 scale, which has 13 items, each of which is scored on a five-point scale.²⁸ The total score ranges from 13 to 65 points, with higher scores indicating stronger SOC. For the present study, the terciles of the distribution of the total scores were used to categorize the SOC of the adolescents as low, intermediate, or high.²⁹

Clinical variables (dental caries, malocclusion, and traumatic dental injuries) were collected through clinical examinations performed by seven examiners who were trained and calibrated (inter-examiner and intra-examiner Kappa >0.70). The training and calibration process was conducted following the method described in the basic manual for epidemiological surveys of the World Health Organization.³⁰

Clinical examinations were performed with a flat mouth mirror and periodontal probe. Caries was evaluated using the criteria of the International Caries Detection and Assessment System (ICDAS).³¹ For data analysis, the presence of untreated dental caries was considered (ICDAS scores 3, 5 and 6).

Malocclusion was evaluated using the Dental Aesthetic Index (DAI),³⁰ which has 11 parameters of dentofacial anomalies related to clinical and esthetic aspects. The results are multiplied by a respective rounding coefficient (weight) and summed; thus, a constant of 13 was added to the result. Malocclusion was categorized based on the DAI score: (1) DAI ≤ 25 = normal occlusion or mild malocclusion/treatment unnecessary; (2) DAI 26-30 = definite malocclusion/treatment elective; (3) DAI 31-35 = severe malocclusion/treatment highly desirable; and (4) DAI ≥ 36 = disabling malocclusion/treatment mandatory. For data analysis, malocclusion was dichotomized as absent (DAI < 25) or present (DAI > 25).³⁰ Traumatic dental injuries were evaluated according to the criteria described in the United Kingdom Children's Dental Health Survey³² and categorized as absent (0) or present (scores 1 to 6).

Dental pain was evaluated with the question "Have you had toothache in the last 12 months?" with response options being "no" (scored 0) or "yes" (scored 1). This question has been used in previous studies.³²

Demographic and socioeconomic variables were collected with a questionnaire and used as adjustment variables. The demographic data were sex (male/female) and age in years (dichotomized as ≤ 12 or > 12 years).³⁰ The socioeconomic variables of interest were skin color, household income, and household crowding. Skin color was self-declared based on the categories proposed by the *Instituto Brasileiro de Geografia e Estatística* (white, brown, black, yellow or indigenous) and subsequently dichotomized as white or non-white.³⁴ Household income was reported in Brazilian currency (R\$) and categorized based on the Brazilian Minimum Wage (BMW): ≤ 1 BMW or > 1 BMW (equivalent to approximately 200 US dollars).²⁵ Household crowding was measured by the number of residents in the home divided by the number of rooms in the home and subsequently dichotomized as ≥ one person per room or < one person per room.³⁵

Ethical aspects

This study was approved by the institutional review board of Universidade Federal de Santa Maria (certificate number: 54257216.1.0000.5346)

and received authorization from the municipal and regional Secretary of Education. All guardians of the adolescents received clarifications regarding the objectives of the study and signed an informed consent authorizing the participation of the adolescents. In addition, all adolescents signed an informed assent form.

Statistical analysis

Data analysis was conducted using STATA 14.0 (StataCorp. 2014. *Stata Statistical Software: Release 14.0*. College Station, TX, USA: StataCorp LP). All analyses were performed considering sample weight. Descriptive statistics were performed to characterize the sample. The chi-square test and t-test were used for comparisons between participants followed and those lost to follow-up to confirm the representativeness of the present sample over time. A comparison was also performed between individuals evaluated before and during the COVID-19 pandemic.

The outcome was the occurrence of SB associated with poor sleep quality. Unadjusted and adjusted Poisson regression models with robust variance were used to test associations between the characteristics of the sample and the outcome. Predictors with a $p \leq 0.20$ in the unadjusted analysis were incorporated into the adjusted model. The results were expressed as prevalence ratio (PR) and respective 95% confidence intervals (CI).

Results

A total of 429 adolescents were evaluated in the present study, corresponding to 67.1% of the individuals evaluated at the cohort baseline. Of these, two individuals were excluded because they did not answer the outcome questions, for a total of 427 participants. The adolescents' age ranged from 11 to 15 years, with a mean of 12.6 (standard deviation 1.3) years. A total of 290 (67.6%) and 139 (32.4%) individuals were evaluated before and during the COVID-19 pandemic, respectively. Losses to follow-up were due to inability to find the adolescent ($n=184$), having moved out of town ($n=19$), or refusals of the adolescent or parent/guardian ($n=7$). There were no significant differences

in the sociodemographic or clinical characteristics between the individuals evaluated in the present investigation and those lost to follow-up ($p > 0.05$), nor among those evaluated before and during the COVID-19 pandemic ($p > 0.05$). In addition, there were no significant differences in the prevalence of school and dental bullying between individuals assessed before and during the pandemic scenario ($p > 0.05$). We used questionnaires previously validated for use with Brazilian adolescents. In our sample, Cronbach reliability scores were satisfactory, being 0.85 for the Olweus Bully/Victim Questionnaire (OBVQ) and 0.80 for the SOC-13 scale.

Table 1 shows the distribution of the sample according to demographic, socioeconomic, psychosocial, and oral-health related variables. The proportion of male and female adolescents was equal and most of the participants were older than 12 years (56.5%). The majority had non-white skin color, had a family income higher than the monthly minimum wage, and lived in homes with \geq one person per room. Regarding psychosocial characteristics, 48.2% had an intermediate SOC, 78% reported being victims of school bullying, and 14.3% reported being victims of verbal bullying related to the oral condition. The majority did not have untreated dental caries or dental pain. However, malocclusion was found in 56.4% of the adolescents. The prevalence of SB and poor sleep quality was 23.7%.

Table 2 displays the characteristics of the sample according to the outcome. Approximately 25% of the boys, 29% of self-declared white individuals, and 24% of those older than 12 years had SB and poor sleep quality. The prevalence of SB associated with poor sleep quality was 38.3% in adolescents with low SOC, 27.9% among those who were victims of school bullying, and 47.5% in individuals who were victims of verbal bullying related to the oral condition. The prevalence of the outcome was 21.5% among those without dental pain.

Table 3 shows the associations between predictive variables and SB associated with poor sleep quality. In the unadjusted analysis, skin color, SOC, dental pain, school bullying, and oral condition bullying were associated with the outcome ($p < 0.05$). In the adjusted analysis, the prevalence of SB associated

Table 1. Sample characteristics according to demographic, socioeconomic, psychosocial, and oral health variables in Santa Maria, Brazil (n = 429).

Variables	N (%)
<i>Demographic and socioeconomic characteristics</i>	
<i>Sex</i>	
Girls	209 (49.8)
Boys	220 (50.2)
<i>Age</i>	
< 12 years	189 (43.5)
> 12 years	240 (56.5)
<i>Skin color</i>	
White	215 (48.5)
No-white	211 (51.5)
<i>Household crowding</i>	
≥ 1 people per room	304 (74.2)
< 1 people per room	123 (25.8)
<i>Household income in BMW</i>	
< 1BMW	110 (29.2)
> 1BMW	264 (70.8)
<i>Psychosocial characteristics</i>	
<i>Sense of coherence</i>	
Low	126 (28.0)
Middle	204 (48.2)
High	99 (23.8)
<i>School bullying victim</i>	
No	105 (22.0)
Yes	324 (78.0)
<i>Victim of verbal bullying related to oral condition</i>	
No	366 (85.7)
Yes	63 (14.3)
<i>Oral health measures</i>	
<i>Toothache</i>	
Absent	297 (70.4)
Present	130 (29.6)
<i>Untreated dental caries</i>	
Absent	300 (69.4)
Present	128 (30.6)
<i>Malocclusion</i>	
Absent	157 (43.6)
Present	227 (56.4)
<i>Dental trauma</i>	
Absent	364 (86.1)
Present	64 (13.9)
<i>Outcome</i>	
<i>Bruxism associated with poor sleep quality</i>	
Absent	322 (76.3)
Present	105 (23.7)

Sample weight was taken into account. Numbers smaller than 429 are due to missing data. BMW: Brazilian monthly minimum wage.

Table 2. Sample characteristics according to bruxism associated with poor sleep quality in Santa Maria, Brazil (n = 427).

Variables	Bruxism associated with poor sleep quality*	
	Absent (n [%])	Present (n [%])
<i>Demographic and socioeconomic characteristics</i>		
Sex		
Female	160 (78.4)	48 (21.6)
Male	162 (74.2)	57 (25.8)
Age		
< 12 years	138 (77.7)	49 (22.3)
> 12 years	184 (75.1)	56 (24.9)
Skin color		
White	156 (70.4)	59 (29.6)
Non-white	164 (81.4)	45 (18.6)
Household crowding		
≥ 1 person per room	229 (75.9)	74 (24.1)
< 1 person per room	91 (77.1)	31 (22.9)
Household income		
≤ 1 BMW	76 (73.3)	33 (26.7)
> 1 BMW	199 (75.2)	64 (24.8)
<i>Psychosocial characteristics</i>		
Sense of coherence		
Low	80 (61.4)	46 (38.3)
Intermediate	159 (78.8)	43 (21.2)
High	83 (88.4)	16 (11.6)
School bullying victim		
No	94 (91.1)	11 (8.9)
Yes	228 (72.1)	94 (27.9)
Victim of verbal bullying related to oral condition		
No	287 (80.2)	78 (19.8)
Yes	35 (52.5)	27 (47.5)
<i>Oral health measures</i>		
Toothache		
Absent	232 (78.9)	64 (21.5)
Present	89 (70.5)	40 (29.5)
Untreated dental caries		
Absent	225 (76.0)	74 (24.0)
Present	96 (76.7)	31 (23.3)
Malocclusion		
Absent	186 (73.8)	67 (26.2)
Present	120 (83.3)	30 (16.7)
Dental trauma		
Absent	273 (76.1)	90 (23.9)
Present	48 (77.2)	15 (22.8)

*Sample weight was taken into account. Numbers smaller than 427 are due to missing data. BMW: Brazilian monthly minimum wage.

Table 3. Unadjusted and adjusted analysis of sample characteristics related to bruxism associated with poor sleep quality.

Variables	Unadjusted PR (95% CI)	p-value	Adjusted PR (95% CI)
<i>Demographic and socioeconomic characteristics</i>			
Sex			
Girls	1	0.455	-
Boys	1.19 (0.74-1.91)		
Age			
≤ 12 years	1	0.644	-
> 12 years	1.11 (0.69-1.78)		
Skin color			
White	1	0.051	1
Non-white	0.62 (0.39-1.00)		0.61 (0.38-0.90)*
Household crowding			
≥ 1 person per room	1	0.842	-
< 1 person per room	0.95 (0.57-1.56)		
Household income			
≤ BMW	1	0.774	-
> BMW	0.93 (0.57-1.51)		
<i>Psychosocial characteristics</i>			
Sense of coherence			
Low	1	<0.01	1
Intermediate	0.55 (0.34-0.89)		0.63 (0.39-1.00)
High	0.30 (0.15-0.56)		0.41 (0.22-0.76)*
School bullying victim			
No	1	<0.01	1
Yes	3.14 (1.57-6.28)		2.06 (1.01-4.22)*
Victim of verbal bullying related to oral condition			
No	1	<0.01	1
Yes	2.39 (1.49-3.84)		1.87 (1.18-2.95)*
<i>Oral health measures</i>			
Toothache			
Absent	1	0.167	1
Present	1.39 (0.86-2.23)		1.17 (0.91-1.82)
Untreated dental caries			
Absent	1	0.905	-
Present	0.96 (0.58-1.61)		
Malocclusion			
Absent	1	0.665	-
Present	0.89 (0.54-1.47)		
Dental trauma			
Absent	1	0.892	-
Present	0.95 (0.48-1.88)		

Sample weight was taken into account. BMW: Brazilian minimum wage; PR: prevalence ratio; CI: confidence interval. *p < 0.05.

with poor sleep quality was 2.06 times higher among victims of school bullying (PR=2.06; 95% CI: 1.01-4.22) compared to non-victims. The prevalence of the outcome was 87% higher (PR=1.87; 95% CI: 1.18-2.95) among victims of oral condition bullying compared to non-victims. Moreover, non-white skin color (PR=0.61; 95% CI: 0.38-0.90) and a high SOC (PR=0.41; 95% CI: 0.22-0.76) were protective factors for SB associated with poor sleep quality.

Discussion

These findings support the hypothesis that bullying has a negative impact on occurrence of SB associated with poor sleep quality among adolescents. The results also suggested that non-white individuals and those with a high SOC had a lower risk of presenting SB and poor sleep quality. Although previous studies have assessed bruxism in schoolchildren, associations between school/verbal oral health-related bullying and sleep bruxism/sleep quality have not been previously explored.

Bullying has long-term implications, resulting in physical and psychological symptoms.¹ It can have devastating consequences for the lives of students, and numerous social, biological and psychological factors make sleep particularly vulnerable in adolescence.³⁶ Victims of bullying can suffer from depression and anxiety and even commit suicide.³⁷ The association found in the present study can be explained by the fact that the etiology of SB combined with poor sleep quality is related to behavioral and emotional aspects. Episodes of nocturnal bruxism and school bullying can affect adolescents at the same time and this is extremely important because they influence their health conditions and quality of life.^{17,26}

Being a victim of bullying due to oral problems is often related to an unpleasant dental/facial appearance and the resulting low self-esteem and negative body image can trigger stress and anxiety.⁴ The causes of poor sleep quality and SB are multifactorial and may be associated with different emotional expressions. In this scenario of emotional factors, bullying exerts a negative impact on adolescents wellbeing and

development.³⁸ This association suggests that SB is a mechanism to release accumulated tension in individuals with high levels of stress or anxiety.⁸

However, SB itself creates uncertainties regarding the interference of this behavior in the quality of sleep. SB is characterized by rhythmic movements and not rhythms of masticatory muscles. These movements are associated with teeth grinding and/or clenching, as well as bracing or thrusting of the mandible during sleep,¹⁰ which can cause hypertrophy and fatigue of masticatory muscles, as well as pain in the temporomandibular joints.³⁹ Furthermore, poor sleep quality may be associated with oral and respiratory problems, which would explain this association. Possible bruxism can lead to tooth wear, an undesirable condition that can stigmatize the individual, make it difficult to achieve goals, create negative stereotypes, and negatively impact self-esteem and consequently sleep quality.³⁹

Individuals with high SOC had lower risk of possible SB and poor sleep quality. SOC involves the ability to adapt to stress and better manage problems,¹³ including oral problems.²⁸ As SB and poor sleep quality are associated with behaviors and stress,⁸ more resilient individuals tend to deal better with stressors and consequently, are less affected by these conditions.⁴⁰ In addition, there is evidence that SOC is a useful resource for health promotion and development of a subjectively optimistic health state.⁴¹ Therefore, individuals with a high SOC may also have a tendency to sleep better.

Individuals with non-white skin color were at lower risk for SB and poor sleep quality. Sleep disturbances are related to biological and psychosocial factors,⁴² and previous studies found that non-white skin color was associated with decreased sleep duration and quality,⁴³ which is in contrast to the present finding. One explanation for this difference is that non-white individuals tend to report fewer self-perceived health problems than whites,⁴² and the same may be true with regard to sleep quality and bruxism. However, there is little evidence on the association between skin color and sleep quality/bruxism in adolescents.⁴⁴ Future studies should further investigate these aspects.

The present investigation has limitations that must be considered. Cross-sectional data limit the determination of causal inference. However, no previous study explored the association between bullying and possible SB and sleep quality simultaneously. Future studies with a longitudinal design should be carried out to confirm this complex relationship. Another limitation concerns the measurement of SB and sleep quality, which were self-reported by adolescents and may differ from normative indices. However, self-reported oral conditions had good results in previous studies.⁴⁵ It is also known that the gold standard for measuring SB and sleep quality would be polysomnography. However, this test is unfeasible in an epidemiological survey because of its high cost.¹⁰ In addition, sleep quality may be affected by oral respiratory problems, which were not evaluated in the present study and may limit our findings.

The strength of the present study is related to the evaluation of psychosocial characteristics in the occurrence of possible SB associated with sleep quality in a period of vulnerability in the lives of individuals. The study of psychosocial issues in adolescence is very important, as this is a period of

transition characterized by psychological behaviors and social changes.⁴⁶ In the context of clinical care for adolescents, the present findings suggest that it is important to evaluate issues related to psychosocial aspects such as bullying, which may be an important predictor of the occurrence of parafunctional habits and poor sleep quality and, consequently, of poorer quality of life in this age group.

Our findings may serve as a basis for public policy strategies focused on oral health promotion and educational actions to reduce bullying in school, which impacts adolescents' well-being. In addition, dentists need to be aware of possible factors linked to the causes and consequences of bullying in this population.

Conclusion

Our findings suggest that victims of school bullying and oral condition-related verbal bullying are more likely to have bruxism associated with poor sleep quality. Moreover, SOC and skin color seem to have an impact on these outcomes. Avoiding bullying may protect adolescents from possible dental conditions such as SB that negatively affect quality of life.

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