ASSOCIATION BETWEEN BULLYING AND POSSIBLE SLEEP BRUXISM AMONG SCHOOLCHILDREN: A CROSS-SECTIONAL STUDY

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Palavras-chave: bruxismo do sono. Bullying. comportamento social. Sono. epidemiologia.

RESUMO

Objetivo: investigar a associação entre bullying e possível bruxismo do sono em escolares. **Materiais e Métodos:** participaram do estudo 431 escolares de 8 a 11 anos de escolas públicas e privadas de Lavras, Minas Gerais e seus pais/responsáveis. Os responsáveis responderam a um questionário sobre a ocorrência de possível bruxismo do sono em escolares, cansaço dos escolares ao acordar e dados sociodemográficos. O diagnóstico de possível bruxismo do sono foi baseado no relato dos responsáveis sobre o ranger de dentes dos filhos durante o sono. Os escolares responderam à versão brasileira do Olweus Bully/Victim Questionnaire. A análise estatística incluiu análise descritiva e regressão de Poisson bivariada e multivariada (p<0,05). **Resultados:** a frequência de ranger de dentes entre escolares envolvidos em bullying como vítimas-intimidadores foi maior em comparação com aqueles que não estavam envolvidos em bullying (RR=1,57; IC95%=1,04–2,36; p=0,030). A frequência de ranger de dentes entre escolares cuja renda familiar mensal é igual ou inferior a um salário mínimo foi maior em comparação com aqueles cuja renda familiar era superior a dois salários mínimos mensais (RR=1,49, IC95%=1,04–2,13, p=0,027). A frequência de ranger de dentes entre os escolares que manifestaram cansaço ao acordar pela manhã foi maior em comparação aos que não manifestaram cansaço ao acordar (RR=1,33; IC95%=1,00–1,78; p=0,050). **Conclusão:** ser vítima-intimidador de comportamentos de bullying na escola está associado ao possível bruxismo do sono em escolares.

Keywords: sleep bruxism. bullying. behavior. sleep. epidemiology.

ABSTRACT

Objective: to investigate the association between bullying and possible sleep bruxism among schoolchildren. **Materials and Methods:** a total of 431 schoolchildren aged 8 to 11 years from public and private schools in Lavras, Minas Gerais, and their parents/caregivers participated in the study. Caregivers answered a questionnaire about the occurrence of possible sleep bruxism among in schoolchildren, schoolchildren's tiredness upon waking up and sociodemographic data. Diagnosis of possible sleep bruxism among was based on caregivers' reports on their children's teeth grinding during sleep. The schoolchildren answered the Brazilian version of the Olweus Bully/Victim Questionnaire. Statistical analysis included descriptive analysis and bivariate and multivariate Poisson regression (p<0.05). **Results:** the frequency of teeth grinding among schoolchildren involved in bullying as victims-bullies had higher compared to those who were not involved in bullying (RR = 1.57; 95% CI=1.04–2.36; p=0.030). The frequency of teeth grinding among schoolchildren whose family monthly income is equal to a minimum wage or less presented had higher compared to those whose family income was more than two times the monthly minimum wage (RR=1.49, 95% CI=1.04–2.13, p=0.027). The frequency of teeth grinding among schoolchildren who expressed tiredness upon waking up in the morning had higher compared to those who did not express tiredness upon waking up (RR=1.33; 95% CI=1.00–1.78; p=0.050). **Conclusion:** being a victim-bully of bullying behaviors

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INTRODUCTION

Sleep bruxism (SB) occurs when the individual is asleep and it is characterized by rhythmic (phasic) or non-rhythmic (tonic) masticatory muscle activity.[1] It can be classified as "possible SB", when the diagnosis is based only on parental report of children or on positive self-report, "probable SB", when the diagnosis is given by the presence of clinical signs, with or without a positive report or self-report and "definitive SB", when there is a positive instrumental assessment, through polysomnography and/or electromyography, with or without a positive report or self-report and/or positive clinical inspection.[1]

It is believed that the etiology of SB is multifactorial,[2] and more recent hypotheses state that this activity is mainly regulated by the central nervous system.[2] Some associated factors are: stress, sleep characteristics, personality traits, genetics, the action of neurotransmitters and exogenous factors (such as caffeine and some medications, such as selective serotonin reuptake inhibitors).[3,4]

There is a significant discrepancy in the prevalence of SB[5] in children and adolescents, ranging from 3.5% to 49.6% and this prevalence decreases with increasing age and is, therefore, lower in the adult population.[6-8]

Bruxism is related to the attenuation of emotions[9] and, in this emotional context, bullying can be a possible associated factor.[10] Bullying can be defined as an aggressive behavior in which the bully or group of bullies, through their negative actions, intends to hurt or cause discomfort to the victim.[11] Some typical characteristics of bullying are its recurrence and an imbalance of power between the victim and the bully.[11] Many studies have examined the psychosocial changes associated with bullying victimization. The most commonly reported consequences are anxiety, interpersonal struggles,[12] lower level of life satisfaction,[13] depression, low self-esteem, suicidal thoughts or suicide attempt.[12] Those who configure themselves as victim-bullies similarly have a low level of life satisfaction, and feelings of anxiety and anguish.[13,14] Bullies show depressive symptoms and social difficulties.[12-14]

This research topic is relevant since bullying is a public health issue[13] that may affect the physical and emotional well-being of children and adolescents[12] and SB can cause negative clinical consequences for the individual.[1] As bullying has psychological consequences and SB has an etiology linked to psychological factors, individuals involved in episodes of bullying may be relieving their tension through SB.[10] It is noteworthy that the identification of SB by the oral health provider and the assessment of associated factors, such as school bullying,[10] can contribute to a multidisciplinary approach, in which professionals, family, and schools work together to improve the well-being of these children and adolescents.[12]

Therefore, this study aims to investigate the association between bullying and possible SB (PSB) among schoolchildren aged 8 to 11 in the city of Lavras**,** Brazil. Our hypothesis is that schoolchildren involved in episodes of bullying will be more prone to PSB.

MATERIALS AND METHODS

This study complies with the guidelines of the Strengthening the Reporting of Observational studies in Epidemiology (STROBE Statement).[15]

ETHICAL ASPECTS

The study was approved by Human Research Ethics Committee of Human Ethical Committee of Universidade Federal de Minas Gerais (protocol #82839718400005149). The children caregivers authorized their participation by completing of the Consent Form. The children who wished to participate in the research, and were authorized by the caregivers, completed the Assent Form. Respondents' confidentiality and anonymity were guaranteed. Participation was voluntary.

STUDY DESIGN AND PARTICIPANTS

The present population-based cross-sectional study was conducted with schoolchildren aged 8 to 11, enrolled in the third to fifth year of elementary school in public and private institutions in the Brazilian city of Lavras, Minas Gerais state, from August to December 2018, with the participation of their caregivers. Lavras city had 29 schools with students aged 8-11, 18 of them were public and 11 were private. To ensure representativeness, the sample distribution respected the proportionality of schoolchildren population enrolled between the third and fifth year of public and private elementary schools. Proportionality was also performed for the total number of individuals enrolled in public and private schools. The draw was carried out in 2 stages. The schools were randomly selected in the first stage and a drawing of classrooms was conducted in the second stage. Every child from the selected classrooms in the draw were invited to participate. A total of 5 public and 7 private schools participated in this study.

The sample size was calculated based on a previous study,[16] using a prevalence of SB of 31.14% among individuals involved in bullying, a standard error of 5%, and a confidence interval of 95%. A correction factor of 1.2 was used due to the multi-stage sampling. The minimum sample size was estimated at 362 schoolchildren. A total of 20.0% was added to compensate for possible losses (n = 453).

ELIGIBILITY CRITERIA

Schoolchildren, of both sexes, between eight and eleven years old regularly enrolled in public or private schools in the city of Lavras were considered eligible for the study. Syndromic schoolchildren, with neurological alteration and schoolchildren with reading and interpretation difficulties (informed by the teacher), were excluded from the study. Schoolchildren who used antidepressant and/or anticonvulsant drugs (based on the report of caregivers and/or data on the student's health provided by the school) were also excluded.

DATA COLLECTION

A written study explanation was sent to caregivers requesting their children´s participation. Caregivers filled in a home environment out the Consent Form and a self-applied *'paper-and-pencil'* questionnaire about SB, tiredness of student when waking up and socioeconomic and sociodemographic information.[6,17]

On a properly scheduled day, the schoolchildren back brought to school the signed terms and the questionnaire filled out by their caregivers. In a reserved classroom, without the teacher presence to ensure confidentiality, the students authorized by caregivers willingly filled in the Assent Form and the Brazilian version of Olweus Bully/Victim Questionnaire (OBVQ).[18] The *'paper-and-pencil'* questionnaire was self-applied, however, to minimize any comprehension hassle, the researcher read all the questions in an audible voice and answered questions regarding its comprehension. In cases where the student was absent on the day the instruments was applied, the researcher returned to the school again.

EVALUATION OF THE PSB: VARIABLE DEPENDENT

The caregivers' report was used to verify PSB in the children, and it considered the detection of teeth grinding during sleep.[1,19] In order to achieve a better response rate about SB in schoolchildren, two literature-based questions were directed to caregivers:[1,20] (1) Have you observed if your child gnashes their teeth during sleep? Answer options: "no" (score 0); "yes", "sometimes" (score 1); "yes, often" (score 2). Another question was: Have you observed, in the previous two weeks, if your child has gnashed their teeth during sleep? Answer options: "no" (score 0); "yes", "sometimes" (score 1); "yes, often" (score 2). These two questions were combined to form a variable where the highest score of the report was taken into account. For the evaluation and diagnosis of SB in children and adolescents, studies show the important role of caregivers.[6,21] Caregivers answered these questions in your homes.

ASSESSMENT OF BULLYING IN A SCHOOL ENVIRONMENT: MAIN INDEPENDENT VARIABLE

The validated Brazilian version of OBVQ was used to identify bullying.[18] The questionnaire contains 46 items, 23 to identify the bully profile and 23 to identify the victim profile. Each item describes a situation in which the child may have been involved in a school setting, and the participant was instructed to tell the frequency of that situation in the previous month (response options: not once; once or twice a month; once or more times a week).[18]

Those who reported having performed at least one of the aggressive bullying behaviors "once or more times a week" were classified as bullies. Those who reported having undergone at least one of the bullying behaviors "once or more times a week" were classified as victims. Those who reported having performed and undergone at least one of the bullying behaviors "once or more times a week" were classified as victim-bullies.[18]

EVALUATION OF COVARIATES

The socioeconomic and sociodemographic conditions were evaluated based on sex (female and male), age (8 to 11 years), type of school (public and private), family income (categorized as equal to a minimum wage or less; more than 1 to two minimum wages; more than two minimum wages), guardian's education (categorized as < than eight years of study; nine to eleven years of study; > twelve years of study), and if the parents live in the same house (yes and no). Information on schoolchildren's tiredness when waking up in the morning during the week was obtained through the report of the schoochildren to the guardian and was dichotomized. Students who woke up tired in the morning at least once a week were categorized as "yes" and those who reported that they woke a little tired or did not wake up tired were categorized as "no".

PILOT STUDY

A pilot study was conducted with 45 schoolchildren from a public school in Lavras to evaluate the methodology. Participants were chosen for convenience and were not included in the main study. During the pilot study, it was observed the need for the researcher to read the questions in an audible voice to the schoolchildren and to be available to answer any questions. In the OBVQ, synonyms could be provided by the researcher for a better understanding of the schoolchildren. The doubts were answered by the researcher and this clarification reading was adopted in the main study.

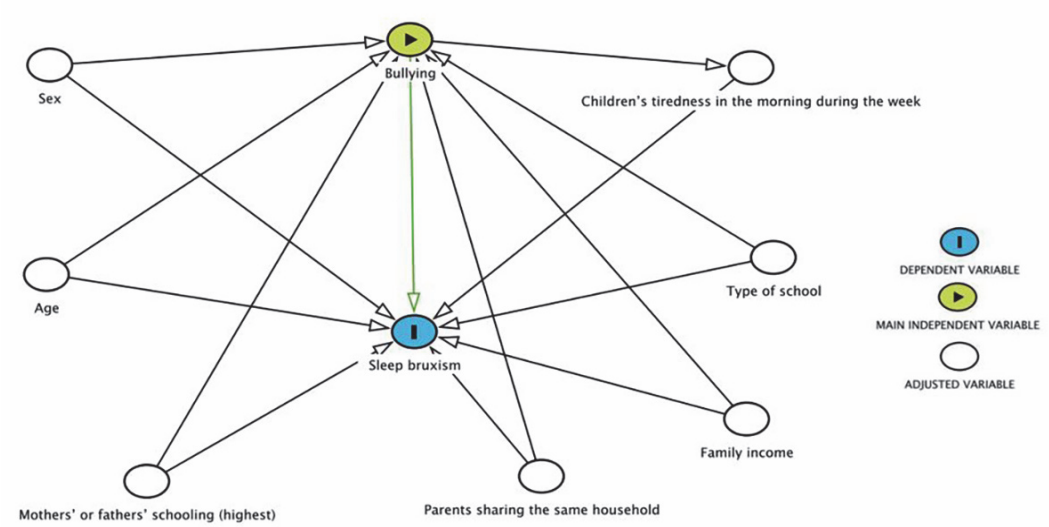

Figure 1: *Directed Acyclic Graph (DAG) to assess the association between the presence of possible sleep bruxism an bullying.*

STATISTICAL ANALYSIS

The statistical analysis was conducted with the *Statistical Package for the Social Sciences* (SPSS, SPSS Inc*., version* 21.0, Armonk, USA). Descriptive analysis was performed and used absolute frequency (N) and relative frequency (%). The association between PSB and bullying (the main independent variable) was assessed using bivariate and multivariate Poisson regression with robust variance. In order to list confounding variables for the association of PSB and bullying, a Directed Acyclic Graph was developed (Figure 1). The Directed Acyclic Graph (DAG) is a graph that presents a relationship between variables and expresses hypotheses about the processes of causal relationships.[22-24] This element can be used to define which variables should be included in traditional statistical approaches,[24] minimizing bias in studies.[23] Poisson regression results were provided with rate ratio (RR), 95% confidence interval (CI) and probability values (p). Statistical significance was considered when $p<0.05$. The unadjusted model was provided to demonstrate the bivariate association of the independent variables (confounders + bullying) with the outcome variable. Based on the following literature,[6,19,25-29] the inclusion of independent variables into the adjusted model was not based on the statistical significance, but rather due to epidemiological relevance of the variables in the association between bruxism and bullying. Therefore, all these confounders along with bullying were incorporated in the adjusted model because those confounders were expected to have an influence on the dependent variable.[6,19,25-29]

RESULTS

Of the 453 schoolchildren who were invited to participate in the study, 22 were excluded for loss of information. Then, the participants were 431 schoolchildren aged 8 to 11 enrolled from third to fifth year of elementary school from public and private institutions. Table 1 shows the sample characteristics. The participants' mean age was 9.14 years old (± 1.01) and their majority was female (n = 223; 51.7%). As for income, 37.9% had a monthly income of 1 to 2 times the Brazilian minimum wage (~US$242.13 to US$484.26). Concerning schoolchildren's tiredness in the morning during the week, 19.7% reported to their guardians that they woke up tired. As to the involvement in bullying, 66 (15.3%) reported having been victims of bullying, 25 (5.8%) victim-bullies, 9 (2.1%) bullies and 331 (76.8%) reported not being involved in episodes of bullying at school.

Most schoolchildren (31.8%) reported the PSB sometimes (score 1) and 7% reported PSB often (score 2). Table 2 shows the non-adjusted and the adjusted results of Poisson regression. All variables from the unadjusted analysis were included in the adjusted model, regardless of the p-value, due to the influence on the dependent variable,[6,19,25-29] as explained by the DAG. In the adjusted analysis, the frequence of gnashing teeth among schoolchildren were victims-bullies had 1.57 times higher than those who were not involved in bullying episodes (RR = 1.57, 95%CI = 1.04-2.36, p=0.030). At the end, we guaranteed that bullying was associated with PSB, regardless of any confounder. The frequence of gnashing teeth among schoolchildren whose family monthly income was equal to a minimum wage or less was 1.49 times higher compared to those whose family income was more than twice the minimum wage per month (RR=1.49, 95%CI= 1.04-2.13, p=0.027). The frequence of gnashing teeth among schoolchildren who reported waking up tired in the morning at least once a week was 1.33 times higher in relation to those who did not report tiredness (RR = 1.33, 95%CI = 1.00-1.78, p=0.050).

Table 1 *– Individual, socioeconomic characteristics of the family, report of school bullying and possible sleep bruxism. Lavras, Brazil.*

Variable	N[b] (%)
Gender	
Male	208 (48.3%)
Female	223 (51.7%)
Respondents caregiver	
Mother	367 (86.2%)
Father	36 (8.5%)
Other	14 (3.3%)
Parent/caregiver education level	
≤8 years	56 (13.0%)
9 – 11 years	234 (54.3%)
≥12 years	141 (32.7%)
Parents sharing the same household	
Yes	306 (71.2%)
No	124 (28.8%)
Type of school	
Public	316 (73.3%)
Private	115 (26.7%)
Family income (BMMW)[c]	
≤1 BMMW	118 (28.3%)
>1 to ≤2 BMMWs	158 (37.9%)
>2 BMMWs	141 (33.8%)
Bullying	
Victim	66 (15.3%)
Bully-victim	25 (5.8%)
Bully	9 (2.1%)
Not involved in bullying	331 (76.8%)
Schoolchildren's tiredness in the morning during the week	
Yes	82 (19.7%)
No	335 (80.3%)
Possible sleep bruxism	
Score 0 (No)	264 (61.3%)
Score 1 (Sometimes)	137 (31.8%)
Score 2 (Often)	30 (7.0%)

*Note: *Not all participants answered all questions. N = absolute number. BMMW, Brazilian Monthly Minimum Wage – 1 BMMW = US$ 242,13.*

Table 2: *Poisson regression evaluating association among possible sleep bruxism, bullying, sociodemographic characteristics and sleep behavior in 8-11-year-old schoolchildren. Lavras, Brazil.*

	RR[a] (95% CI[b]) Non-adjusted	*p* value*	RR[a] (95% CI[b])Adjusted	*p* value*
Children's sex				
Female	0.92 (0.71 – 1.19)	0.543	0.95 (0.73 - 1.25)	0.759
Male	1		1	
Children's age	0.93 (0.81 – 1.05)	0.258	0.89 (0.78 – 1.01)	0.085
Type of school				
Public	0.94 (0.70 – 1.24)	0.666	0.81 (0.56 - 1.18)	0.279
Private	1		1	
Mothers' or fathers' schooling (highest)				
≤8 years	0.91 (0.59 – 1.39)	0.670	0.79 (0.46 – 1.35)	0.402
9 – 11 years	0.89 (0.68 – 1.18)	0.454	0.89 (0.63 – 1.27)	0.539
≥12 years	1		1	
Parents sharing the same household				
No	1.27 (0.97 – 1.65)	0.074	1.23 (0.94 – 1.61)	0.130
Yes	1		1	
Family income (BMMW[c])				
≤1 BMMW	1.46 (1.06 – 2.01)	**0.021**	1.49 (1.04 – 2.13)	**0.027**
>1 to ≤2 BMMWs	0.90 (0.65 – 1.26)	0.566	0.97 (0.68 – 1.37)	0.867
>2 BMMWs	1		1	
Bullying				
Bully-victim	1.43 (0.95 – 2.15)	0.087	1.57 (1.04 – 2.36)	**0.030**
Bully	1.49 (0.66 – 3.36)	0.336	1.44 (0.75 – 2.78)	0.267
Victim Not involved in	0.91 (0.61 – 1.36)	0.662	0.96 (0.64 – 1.43)	0.846
bullying	1		1	
Children's tiredness in the morning during the week				
Report of tiredness	1.35 (1.00-1.81)	0.053	1.33 (1.00 – 1.78)	**0.050**
No report	1		1	

*Note: *RR=rate ratio. CI=confidence interval. *Significance level at p=0.05. Bold means statistical significance. [c]BMMW, Brazilian Monthly Minimum Wage – 1 BMMW = US$ 242.13.*

DISCUSSION

The total prevalence (38.8%) of PSB of this study was similar to a previous study conducted in the southeast region of Brazil, Belo Horizonte city, with schoolchildren aged 7 to 10 whose prevalence was found to be 35.3%.[6] The prevalence of PSB in this study also corroborates with other study, conducted in northeastern Brazil, with children aged 3 to 12, which found a prevalence of 32.4%.[21] On the other hand, the present results diverged from other previous studies, such as one conducted at the Orthodontic Clinic of the University of Montreal, with individuals of 7-17 years old that found a prevalence of 15% of sleep-related bruxism being this circadian manifestation more common in the group of children (67.3% were < 12 years old),[29] and the work carried out in the Netherlands and Indonesia with 7- to 12-year-old children that found a prevalence of PSB reported by parents of 19.5% and 24.2% respectively.[8] These prevalence discrepancies may be due to differences in the method of bruxism diagnosis, in the methodologies adopted in the studies[30] and age of individuals.

The results of this research showed that schoolchildren involved bullying episodes as victim-bullies, that is, those who fit both the profile of victims and the profile

of bullies, presented a higher frequence of gnashing teeth. Two other studies with schoolchildren showed that episodes of verbal bullying were associated with PSB,[10,16] being more common in bullying victims, as well as in victims-bullies.[10,16] One hypothesis to explain this association is the fact that bullying episodes in a school environment cause emotional pressures on the involved individuals, and such consequences are associated with SB.[3,31]

Literature shows that personality traits, anxiety, stress, tension and antisocial disorders are associated with the etiology of SB.[3,31] It is known that victim-bullies have both internalizing and externalizing consequences, and may have frequent repercussions on their mental health.[32] These individuals tend to have low life satisfaction, anxiety, distress and to have fewer friends.[13,14,33] In addition, schoolchildren engaged in bullying episodes as victim-bullies present greater mismatches, as they experience various forms of bullying attacks more frequently compared to those who are only victims.[33] It is also noteworthy that victim-bullies may experience a recurring pattern of involvement in bullying as both victim and bully, permeating, therefore, various pathways to anxiety and other negative health outcomes.[34] The anxiety is related to the etiology of sleep bruxism, however, given the different stages of child development, this condition is underdiagnosed due to the diverse symptoms.[4] This study did not evaluate anxiety and other negative health outcomes, we cannot say that this fact applies to this group of individuals, but it shows that it should be a factor to be studied in more depth. Nonetheless, it can be assumed, but not asserted, that victim-bullies will be more subject to health-related risks, such as SB, compared to other individuals involved in bullying, such as victims only or bullies only. Taking these aspects into account, the PSB can be a way to relieve tensions.[10]

A higher prevalence of PSB in subjects who reported fatigue when waking up in the morning at least once a week was found in this study. This can be enlightened by the fact that poor sleep quality is associated with psychological conditions such as anxiety,[35] and this condition is associated with the etiology of SB.[3,31] A previous study reported that greater psychosocial well-being is related to longer sleep duration and lower levels of sleep disorders.[36]

The present study demonstrated that low income is associated with a higher prevalence of PSB. This result goes against the findings of a previous study conducted in Brazil that found that high family income was associated with high prevalence of SB in children in the Brazilian city of São Luís (Maranhão state).[28] Further studies on the influence of family income on bruxism are recommended.[31] A possible explanation for the association between low income and PSB in this study can be explained by the relationship between socioeconomic status and health-related quality of life. There is an association between objective social status and quality of life related to psychosocial health.[37] The average and low family income is an associated factor for the low quality of psychological life, mood and emotions,[38] and children in low-income families are more introverted and anxious.[39] One hypothesis for the present finding is that the psychosocial factors involved in low-income situations may be associated with the etiology of SB.

This study has some limitations. The first one concerns the design of the study. The results of this study should be evaluated with caution since its design does not allow us to establish a relationship of causality between bullying and PSB. For more substantive conclusions, longitudinal studies should be performed. Other limitation is related to the OBVQ instrument, that students should answer regarding the involvement in bullying episodes in the previous month and, therefore, may have become subject to memory bias. Bullies are subject to response bias, as can be do not want to tell about their actions. In addition, caregivers could also be subjected to memory bias when answering about the PBS in the last two weeks or the student's life. It is also noteworthy that the interpretation of each caregiver about the SB was individual. Thus, it is a limitation of our study that we did not measure the interpretation of caregivers about teeth grinding during sleep. Another limitation of the study was that information on psychological aspects related to bullying was not collected in the sample assessed. However, it is already recognized bullying is a psychosocial problem.[13] The diagnosis of probable or definitive SB was not performed in this study. However, it should be noted that there is still no defined tool with standardized clinical criteria for the measurement of probable SB. In addition, for epidemiological studies, polysomnography becomes unfeasible due to the high costs.[40] Furthermore, this study did not evaluate any systemic changes that could influence sleep quality, and future studies are encouraged to carry out this analysis.

This study contributed to providing evidence of some factors associated with PBS among schoolchildren from 8 to 11 years old from a representative sample. This study obtained a high response rate. In addition, the use of a validated questionnaire with multiple questions to identify bullying occurrences among schoolchildren is a differential of the present work.

Given a framework of PSB in schoolchildren, it is important to investigate several factors that are associated with SB and, among them, ask about bullying and sleep-related aspects. Pediatric dentists can play a significant role in this identification of bullying.[10] The oral health practitioner can suggest strategies aiming to support young individuals and their parents/caregivers in issues that might take place

in schools and family nuclei.[41] During the patients' anamnesis, the occurrence of bullying should be questioned through questions about the general psychosocial environment of the students in a space where the child or adolescent feels safe to report their experiences,[42] since many young people avoid expressing themselves for fear of retaliation, shame or guilt.[12] The approach of psychosocial issues in the dental office should be restricted to the identification of such problems and the dentist should be concerned in instructing the caregivers and referring the young individual to appropriate psychological surveillance.

In addition, it is imperative that the dentist be attentive to children and adolescents with SB who have sleep related complaints.[29] The role of the professional is to refer, when necessary, the patient to a specialist, such as a sleep professional, who can indicate the use of specific tools to diagnose sleep problems, such as polysomnography, in addition to proposing a therapeutic approach for the case.[29]

CONCLUSION

In conclusion, being a victim-bully of bullying behaviors at school is associated with possible sleep bruxism in schoolchildren.

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