



## Original Article

# Environmental factors, sleep duration, and sleep bruxism in Brazilian schoolchildren: a case-control study



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## ABSTRACT

**Objective:** The purpose of our study was to evaluate the association between environmental factors, sleep duration, and sleep bruxism (SB) in schoolchildren.

**Methods:** A case-control study was performed. Individuals participating in the study were randomly chosen from public and private schools in Belo Horizonte, Brazil. A total of 120 children with bruxism and 240 without bruxism (mean age, 8 years) participated in our study. A questionnaire for parents was used to collect data based on criteria taken from the American Academy of Sleep Medicine. Conditional binary logistic regression statistical tests and  $\chi^2$  tests were used for analysis.

**Results:** The final logistical model found that children with a median sleep time  $\leq 8$  h per night (odds ratio [OR], 2.561 [95% confidence interval {CI}, 1.480–4.433]), who did not enjoy a good night's sleep (OR, 3.253 [95% CI, 1.600–6.615]), who slept with noise in the room (OR, 2.699 [95% CI, 1.645–4.429]), and who had the light on (OR, 2.370 [95% CI, 1.446–3.884]), were more likely to have SB.

**Conclusion:** Children who sleep for less than 8 h a night are more likely to have SB. Light and noise in the room were two predisposing factors for the occurrence of SB.

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## 1. Introduction

Sleep bruxism (SB) is defined as a stereotypic movement disorder characterized by the grinding or clenching of teeth during sleep and it usually is associated with arousal in sleep. SB was recently classified as a sleep-related movement disorder according to a review of the classification of sleep disorders [1]. SB is a sleep disorder with multifactorial etiology described as an unusual orofacial parafunctional activity [2–5]. The sleep–wake cycle changes throughout life. From the age of 5 years nocturnal sleep should be fully consolidated, without nocturnal awakenings or the need for daytime naps [6]. Sleep disturbances are among the most common medical concerns during the childhood period [7,8], in which several schoolchildren report sleep problems [9,10].

Some evidence suggests that psychologic factors may play a role in SB [5,11–13], and the presence of SB in children seems to be related to the use of some medications, restless sleep, anxiety, allergies, and headaches [14]. The most common signs and symptoms are tooth wear, disorder of the dental arch support structures, pulpal hypersensitivity, tooth mobility, fractured cusps and

restorations, pain, temporomandibular disorder, hypertrophy of the masseter muscle, and headaches [13–16]. Several studies have linked sleep problems with behavioral problems [17,18] and school performance [19], and medical professionals working with children should undertake a detailed anamnesis of sleep habits. The aim of our study was to evaluate the effect of environmental factors and sleep duration on the occurrence of SB in children.

## 2. Methods

### 2.1. Study design and sample

Our study is a case-control study nested in a population-based cross-sectional study performed in the city of Belo Horizonte, Brazil, with 652 schoolchildren between the ages of 7–10 years. The city is the capital of the state of Minas Gerais and has considerable economic, social, and cultural disparities. It has 2,375,151 inhabitants, including 341,710 children in the elementary school system ([www.censo2010.ibge.gov.br](http://www.censo2010.ibge.gov.br)) and is geographically divided into nine administrative districts.

### 2.2. Sample size calculation

A 95% confidence interval (CI), a 5% margin error, and a 35% prevalence of SB [13] were used to calculate the sample size. A 1

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to 2 matched-pairs case-control study of 8-year-old schoolchildren was performed in the city of Belo Horizonte. A total of 120 children with SB reported by parents and 240 children without SB were included in the study. The children were paired for age, gender, and social vulnerability. The children were selected from six public and three private schools. Subjects were selected from the elementary schools by a process of randomization. The school units comprised one randomly selected public and private elementary school in each administrative district in Belo Horizonte. Written consent and ethical approval were obtained.

### 2.3. Inclusion criteria

Children who were included in the study had parental authorization, had the responsibility to complete questionnaires, had no other medical or mental disorders (e.g., sleep-related epilepsy, accounts of abnormal movements during sleep) [1], and had no other sleep disorders (e.g., obstructive sleep apnea syndrome).

### 2.4. Parent questionnaire

Information regarding the presence or absence of SB was provided by parents. The questionnaire was developed based on the criteria of the American Academy of Sleep Medicine. The internal consistency of the instrument was measured using Cronbach  $\alpha$  coefficient and ranged from .75 to .96, which shows a strong reliability. This instrument was previously used in other studies [13,14]. Data were collected using parent-completed questionnaires [13]. The questionnaire included a total of 10 questions, eliciting information on the child's history of audible nocturnal teeth grinding, sleep environment (e.g., with lights turned on or with noise), sleep duration, medical history, and sociodemographic data. To ensure the relevance of the family sleeping arrangements to the reporting of bruxism, the survey asked for the following information: the number of times a parent checked on a child during the night, the proximity of parents' and children's bedrooms, and the instance of doors of the parents' and children's rooms remaining open or closed. Over a 3-day period, all parents were instructed to observe and record indicators of the presence or absence of SB among their children in the questionnaire. The children's school delivered the questionnaire together with a reminder to the parents that it should be completed within 3 days.

### 2.5. Sleep duration

The median number of hours that children slept, or sleep time, during the 3-day period was estimated. The median sleep time per night was 8 h and the sample was dichotomized into equal, less than 8 h, or more than 8 h. A systematic meta-analysis review showed that there was considerable discrepancy in the literature regarding children's sleep duration, being that the ideal time of sleep for children ranged from 5 to 10 h per night [20]. We used a cutoff point of 8 h median sleep duration to transform this continuous variable into a dichotomous variable.

### 2.6. Environmental factors

Light stimuli included lights turned on in the room where the children slept and situations in which children slept with the door open and the light in the corridor provided indirect light into the children's room. Sound stimuli in the children's room included traffic noise; noise from bars and restaurants near the window; and television, radio, or computers turned on in the room during sleep.

### 2.7. Diagnosis of SB

Diagnosis followed the classification criteria proposed by the American Academy of Sleep Medicine [1]. These criteria included: parents indicating an occurrence of audible nocturnal teeth grinding in which there were no drugs, no other medical or mental disorders (e.g., sleep-related epilepsy, accounts of abnormal movements during sleep); and absence of other sleep disorders (e.g., obstructive sleep apnea syndrome) [1].

### 2.8. Social classification

The Social Vulnerability Index (SVI), developed by the Belo Horizonte city council, was used to analyze the exposure of the family to social influence factors [13]. The index measures social exclusion and was developed based on the cultural, social, and demographic context of the local population. It measures the vulnerability of a population through the classification of neighborhood infrastructure, work access, income, sanitation services, healthcare services, education status, legal assistance, and public transportation [21]. Area-based measures of deprivation present a number of advantages, accounting for their increasing importance in healthcare planning and policies. Socially homogenous neighborhoods do not commonly differ in social welfare, attitudes, and behavior [21]. Therefore, the SVI encompasses over 20 variables that quantify the population's access to housing, schooling, income, jobs, legal assistance, health, and nutrition. Likewise, the SVI measures social access and determines to what extent a population is vulnerable to social exclusion. Our study used the city council database of SVI scores for each region based on the address of each participant. This variable was important for matching groups with and without SB.

### 2.9. Statistical analysis

Results were entered into a database and organized using SPSS for Windows (version 17.0, SPSS Inc., Chicago, IL, USA). Normality of the variable distribution was assessed using the Kolmogorov–Smirnov test, which showed that the assumption of normal distribution could not be confirmed. The  $\chi^2$  test with a 95% CI was used to test associations between bruxism, environmental factors, and sleep time. To estimate the probability of the occurrence of bruxism, data were analyzed using binary conditional logistic regression. All variables with *P* values of less than or equal to .05 were included in the final logistic model.

## 3. Results

Of the 360 children who participated in the study, 120 had SB and 240 did not. The children also were paired for age, gender, and social vulnerability. The sleep duration reported by parents ranged from 5 to 11 h with a median of 8 h per night, showing that we did not have severe sleep-deprived children in our sample.

Parents reported that 79.1% of children with less than or equal to 8 h of sleep time per night were in the group with SB (*P* < .001) (Table 1). In the case group, 73.3% of children with SB did not have a good night's sleep (*P* < .001) (Table 1). More than half of the children with SB slept with the light turned on (52.5%) and their parents reported noise in the room where the children slept (53.4%) (*P* < .001). Children without SB who slept in environments with no noise or with no light in the bedroom corresponded to 70.8% and 72.1% of the sample, respectively (*P* < .001) (Table 1).

The final logistical model demonstrated that children who had a median sleep time per night equal to or less than 8 h (odds ratio [OR], 2.561 [95% CI, 1.480–4.433]), who did not have an adequate

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