



Mouth Breathing and Prevalence of Sleep Bruxism among Preschoolers aged 2 to 5 years

Josiane Pezzini Soares¹, Daniele Klein¹, Marcos Ximenes², Carla Silva Pereira¹, Elis Cristina Antunes³, Loraine Dias¹, Adriano Borgatto⁴, Mariane Cardoso², Michele Bolan²

¹MSc Student, School of Dentistry, Federal University of Santa Catarina, Florianópolis, SC, Brazil.

²Associate Professor, Department of Pediatric Dentistry, School of Dentistry, University of South of Santa Catarina, Florianópolis, SC, Brazil.

³Undergraduate Student, School of Dentistry, Federal University of Santa Catarina, Florianópolis, SC, Brazil.

⁴Associate Professor, Department of Informatics and Statistics, Federal University of Santa Catarina, Florianópolis, SC, Brazil.

Author to whom correspondence should be addressed: Josiane Pezzini Soares, Universidade Federal de Santa Catarina, Centro de Ciências da Saúde, Trindade, Florianópolis, SC, Brazil. 88040-900. Phone: +55 (47) 99900-0888 / +55 (48) 3721-6132. E-mail: josipezzini@hotmail.com.

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Abstract

Objective: To determine the prevalence of bruxism, associating it with mouth breathing in preschool children in Florianópolis, Brazil. **Material and Methods:** Clinical examination and questions to parents/guardians of 429 children aged 2-5 were conducted. The clinical examination was performed by three calibrated examiners to register the presence of tooth wear on incisors and molars. The questions were related to sleep bruxism (teeth grinding) and mouth breathing. For determinate diagnosis, were “possible” bruxism by the American Academy of Sleep Medicine and “probable” bruxism, whereas the Item Response Theory was employed for mouth breathing. To determine the associations, a Chi-square test and Fisher exact test with a standard error of 5% and 95% interval confidence were applied. **Results:** The clinical examination revealed bruxism in 8.2%, whereas the parental report revealed bruxism in 17.2%. When clinical examination was associated with the parent’s report, bruxism was present in 2.1%. Among the non-clinical variables, the most prevalent changes included: child presenting a regular stuffy nose (19.6%), followed by child is always open-mouthed (16.1%). A significant statistical association between bruxism and age was obtained ($p < 0.05$), the age group with prevalence of 4 and 5 years old with 68.9%. There was no mouth breathing association with the presence of bruxism ($p > 0.05$). **Conclusion:** Bruxism was prevalent for children aged 4-5 and bruxism had no association with mouth breathing.

Keywords: Epidemiology; Bruxism; Child; Mouth Breathing.

Introduction

Bruxism is a disorder of the masticatory system, which occurs in adults and children, characterized by clenching or grinding of teeth. It may occur during the day, awake bruxism, or during sleep, sleep bruxism [1]. In children, sleep bruxism is the most common [2]. The etiology of bruxism is still undefined, but studies suggest that different factors can cause it, including local, systemic, psychological, occupational and hereditary factors [3,4].

Sleep bruxism has as risk factors presence of deleterious habits such as biting objects, children with high levels of stress, sleeping less than 8 hours/night, sleeping with light accesses or noises [5]. The prevalence of bruxism in children varies from 14% to 44.6%, and the age range of the children who suffer the most from this condition is between 5 and 7 years [2,4,6].

Currently, studies have observed an association between the presence of bruxism and oral respirators, and this association is very strong in children with respiratory disorder [7]. Mouth breathing is to stop breathing only through the nose to breathe predominantly through the mouth, and may or may not be associated with airway obstruction [8]. Sleeping with open mouth, snoring, drooling on the pillow and breathing through the mouth are associated with the presence of bruxism [2,3,6,7]. Once, sleep bruxism is a function of the central system and the child with respiratory disorders can be active de parafunction of clenching the teeth during the sleep [9]. However, other study found no association between mouth breathing and bruxism [10].

Through these differences, there is a need for further research in schoolchildren on this subject, since the presence of bruxism interferes with social interaction, behavior and school performance [5,11]. The negative impact on quality of life is unquestionable since mouth breathing is strongly associated with sleep disturbances, besides, if the mouth breathing had association with bruxism the treatment of mouth breathing can be a way to prevent and reduce the bruxism [9,12].

At present, there is no epidemiological survey data on mouth breathing and bruxism in preschool children in the city of Florianopolis. These data help clarify factors associated with bruxism, and should be investigated in front of a patient with suspected bruxism, thus helping in the correct diagnosis. The objective of this study was to determine the correlation between mouth breathers and sleep bruxism in preschoolers from 2 to 5 years.

Material and Methods

Study Design and Sampling

The present cross-sectional study population-based study involved 2 to 5-year-old preschoolers and their parents. Data collection was done in public schools in Florianopolis, Brazil, which included 6,349 students enrolled in in pre-school education in municipal public schools, which is divided into 4 sanitary districts (north, south, east, center mainland) [13].

The sample size was calculated for prevalence estimation, considering a significance level of 95% and an error of estimate of 5%. It was considered a prevalence of 35.3% [14], since the prevalence of bruxism is unknown in the population of Florianopolis, Brazil. Obtaining 350

individuals, considering 1.2 to compensate cluster effect and for eventual losses, added 20% to the calculation. It has a total of 504 participants.

For the sample selection, the stratified cluster sampling was defined according to the age of the children, considering the proportionality between the age groups. The draw was carried out in two stages, where the schools of the sanitary districts were drawn and later the classes in which the students participated.

Data Collection

Data collection included clinical examination and questionnaire to parents. The examination was performed by three calibrated examiners ($Kappa > 0.7$), with the artificial light (LED type), in the school, with children sitting in a chair facing the examiner. For this, clinical mirrors and sterile gauzes were used, following the biosafety norms recommended by the World Health Organization [15]. Children who did not have a full deciduous dentition or had a permanent tooth, were excluded.

In the clinical examination, the presence tooth wear on primary incisors and molars was recorded. It was considered tooth wear: teeth exhibiting cusps and/or flattened contour with loss of enamel and exposure of dentin [16].

The questionnaire contained questions regarding sleep bruxism and mouth breathing. The diagnosis of mouth breathing was based on the questionnaire advocated, which contained questions such as: Sleeping with an open mouth and / or drooling on the pillow, a "blocked" nose every day, mouth open, sinusitis in the past year, operated the nose, operated the throat and had more than five episodes of throat infections in the last 12 months [17]. Asked the questions related to bruxism asked if the child grinds teeth at night. The response options were not (0) and yes (1). The questionnaire was sent to the parents through the school agenda, and should be delivered to the teachers in the classroom and collected later by the researchers.

For the diagnosis of mouth breathing, the Item Response Theory (IRT) was used, which from the set of responses allowed the estimation of the parameters of items and individuals on a measurement scale. Item Response Theory takes into account the item in particular, without highlighting the total scores; therefore, the conclusions do not depend only on the test or questionnaire, but of each item that composes it. This gives us a better analysis of the questions [18].

Bruxism was diagnosed as "possible" and "probable." The possible diagnosis followed the classification of the American Academy of Sleep Medicine (AASM) where the report parents is sufficient to diagnose [19]. In the "probable" diagnosis, bruxism depends on the association of the parents' report associated with the presence of facets of dental wear on clinical examination [20].

Data Analysis

Data were analyzed using SPSS for Windows (version 17.0, SPSS Inc., Chicago, IL, USA). To determine the associations, the Chi-square test and the Fisher's exact test were performed. The following parameters were adopted: standard error of 5% and 95% confidence interval.

Ethical Aspects

This study was approved by the Ethics Committee of Human Research (Protocol No. 343/658). All parents were informed about the research and signed a free and informed consent form authorizing their participation and that of their child, the children also signed a consent form.

Results

The final sample consisted of 429 children aged 2 to 5 years attending municipal day care centers in Florianopolis / SC, the non-response rate was 15% of the sample corresponded to due to unanswered questionnaires and refusals to participate. The gender distribution was similar, but it was predominantly boys (52.9%). As for age, the majority of the children examined were between 4 and 5 years old (52.9%) (Table 1).

Table 1. Distribution of children according to sex and age.

Variables	N	%
Sex		
Male	227	52.9
Female	202	47.1
Age (Years)		
2	60	14.0
3	142	33.1
4	118	27.5
5	109	25.4

Bruxism by clinical examination was present in 8.2% (n=35); the parents report to bruxism was found in 17.2% (n=74), but when we associated clinical examination with the bruxism report by parents was present in 2.1% (n=9).

Regarding the non-clinical variables, the most prevalent alteration, according to the parents' reports, was that the child was always with a stuffy nose (19.6%), followed by the child's mouth being always open (16.1%) (Table 2).

Table 2. Distribution of children according to sleep bruxism and mouth breathing.

Variables	N	%
Have you ever had a throat?		
Yes	9	2.1
No	420	97.9
Have you ever operated the nose?		
Yes	9	2.1
No	420	97.9
Always with a stuffy nose?		
Yes	84	19.6
No	345	80.4
Always with open-mouthed?		
Yes	69	16.1
No	360	83.9
Have you had a sore throat for more than 5 times?		
Yes	53	12.4
No	376	87.6

Last year had sinusitis?		
Yes	57	13.3
No	372	86.7
Mouth Breather		
Yes	6	1.4
No	423	98.6

Boys had a higher prevalence of bruxism (19.4%) when compared to girls. When associating the age group with bruxism, a statistically significant association was found ($p < 0.05$), the age group with the most prevalence being 4 and 5 years old, with 68.9%. There was no association of mouth breathing with the presence of bruxism ($p > 0.05$) (Table 3).

Table 3. Association of bruxism with independent variables.

Variables	Bruxism		p-value
	No N (%)	Yes N (%)	
Sex			
Male	183 (80.6)	44 (19.4)	0.266
Female	172 (85.1)	30 (14.9)	
Age (Years)			
2-3	179 (88.6)	23 (11.4)	0.004*
4-5	176 (77.5)	51 (22.5)	
Dental Wear			
Absent	329 (83.5)	65 (16.5)	0.250
Present	26 (74.3)	9 (25.7)	
Mouth Breathing			
Absent	350 (82.7)	73 (17.3)	0.723
Present	5 (83.3)	1 (16.7)	

*Statistically significant.

Discussion

The present study aimed to determinate the prevalence of sleep bruxism and associate it with mouth breathing. Bruxism was diagnosis through clinical examination plus the parents' report, and correlated with the mouth breathing condition, in which these were diagnosed by the Item Response Theory.

It was observed low prevalence of bruxism and this was found predominantly in males. In similar studies, there is a variation in prevalence of bruxism, in which the lowest value is 14% [4], compared to other studies that describe higher values, ranging from 21%, 25.6%, 37.9% up to 44.6% [2,6,21,22]. Boys presented bruxism more frequently than girls, other studies had similar values in their population, it was also observed that the male gender was more susceptible to the presence of bruxism, since girls are 53% less likely to develop it, it may can be explain because boys are more agitated and aggressive than girls, also boys are greater difficulty to express their feelings, and sleep bruxism is a way to overcome their feelings [2,10,22].

There was discrepancy when comparing the values of the parents' report versus the clinical examination for the diagnosis of bruxism. Perhaps when bruxism is evaluated by the self-report of

those responsible may not be so precise, so we must be careful when considering it [23]. Some studies considered the diagnosis of bruxism just by the report of the responsible and other studies considered clinical examination plus the report of tooth clenching [2,4,21,22].

Studies that consider the association of the report with clinical examination had a lower prevalence of bruxism, this may be related to the fact that in the past the child had dental wear, and in the present, had only the clinical consequence and not bruxism at the present time. Due to the different methodologies, there are disparate values. If we consider bruxism only by parents' reports, the prevalence found in this study was low compared to another study, in which 44.6% of the children presented bruxism, according to the report of those responsible [2].

In relation to age, the highest prevalence of bruxism coincided with findings in other studies. When observed children who were between 2 and 12 years of age, and the mean age for children with bruxism was between 5-7 years [6]. Considering the findings, children aged 4 to 5 years present more bruxism when compared to younger children. This finding may be justified because, in this age group, psychological and stressful changes occur because it is an age of discovery, anxiety, increased responsibility, and may be coinciding with the coming of a sibling. These changes can trigger episodes of tooth clenching. Another factor that may be associated with the high prevalence of bruxism in this age group is that the teeth have been exposed to bruxism for a longer period of time, so that the younger children could have bruxism, but they do not show dental wear at clinical examination.

The mouth breathing is an aggravate of preexisting sleep bruxism, the relationship between these conditions may be positive because children with respiratory disorders tend to throw lower jawbone ahead in order to improve the air passage, what can stimulate superior airways receptors for intensifying the airways tonus, also leading to bruxism [12,24]. The presence of bruxism and mouth breathing can lead to craniofacial and postural changes, as well as problems with facial muscles, occlusion, chewing, swallowing, sleep, concentration and attention. Thus, studying these variables is of great importance for early diagnosis [2,6,25].

In the present study, few children with mouth breathing had bruxism, unlike on other study in which 62.5% of children with respiratory problems had bruxism [7]. Still in the same study, bruxism had a significant association with respiratory alterations, diverging from that observed in this study. A study found significant association between bruxism and mouth breathers, another study also found association, but this did not remain in the multivariate regression [3,10]. These differences may be due to variability in the number of samples.

In the current research, we investigated only respiratory changes, mouth breathing, being determined through IRT. There was no clinical examination aimed at finding children diagnosed with mouth breathers. We used questions to investigate whether the child had a nose and/or throat, if the child has a stuffy nose, is always open-mouthed, more than five times and sinusitis. After this we applied the IRT obtaining the final result of how many and which children were mouth breathers. Some authors used specific tests for respiratory changes, such as a mirror test and water retention

test [7]. Different from this can also be done just nebulization at bottom of a mirror [3]. No bruxism was associated with other potentially existing respiratory changes, once specific exams that need to be performed in a specialist's office were not done because it is an epidemiological study.

Currently the treatment of bruxism and respiratory changes are treated with health professional. The correct diagnosis, aiming at early treatment is important for the normal development of the child [3,6,7].

The methodology of the present study has some limitations due to the cross-section design as, the absence of polysomnographic for the sleep bruxism diagnoses, and the absence of exam for nasal obstruction as describable by other authors for the diagnosis of mouth breathing, making it difficult to compare with studies in the literature [3,7]. In addition, the questionnaire to parents may have generated a possible memory bias at the time of the response. Studies with similar research methodologies are recommended for better comparisons, in which the diagnosis of respiratory changes is more accurate, and thus to evaluate if there is a relation between bruxism and these alterations.

Conclusion

The prevalence of sleep bruxism found was low. The presence of bruxism and mouth breathing did not correlate. It was observed the children between 4 and 5 years of age have a higher prevalence of bruxism, being the male gender is more exposed to this condition.

References

1. Van Selms MKA, Visscher CM, Naeje M, Lobbezoo F. Bruxism and associated factors among dutch adolescents. *Community Dent Oral Epidemiol* 2013; 41(4):353-63. doi: 10.1111/cdoe.12017.
2. Serra-Negra JM, Ribeiro MB, Prado IV, Paiva SM, Pordeus IA. Association between possible sleep bruxism and sleep characteristics in children. *Cranio* 2016; 35(5):315-20. doi: 10.1080/08869634.2016.1239894.
3. Serra-Negra JM, Paiva SM, Auad SM, Ramos-Jorge ML, Pordeus IA. Signs, symptoms, parafunctions and associated factors of parent-reported sleep bruxism in children: A case-control study. *Braz Dent J* 2012; 23(6):746-52. doi: 10.1590/S0103-64402012000600020.
4. Vieira-Andrade RG, Drumond CL, Martins-Junior PA, Correa-Faria P, Gonzaga GC, Marques LS et al. Prevalence of sleep bruxism and associated factors in preschool children. *Pediatr Dent* 2014; 36(1):46-50.
5. Castroflorio T, Bargellini A, Rossini G, Cugliari G, Rainoldi A, Deregibus A. Risk factors related to sleep bruxism in children: A systematic literature review. *Arch Oral Biol* 2015; 60(11):1618-24. doi: 10.1016/j.archoralbio.2015.08.014.
6. Tachibana M, Kato T, Kato-Nishimura K, Matsuzawa S, Mohri I, Taniike M. Associations of sleep bruxism with age, sleep apnea, and daytime problematic behaviors in children. *Oral Dis* 2016; 22(6):557-65. doi: 10.1111/odi.12492.
7. Motta LJ, Bortoletto CC, Marques AJ, Ferrari RAM, Fernandes KPS, Bussadori SK. Association between respiratory problems and dental caries in children with bruxism. *Indian J Dent Res* 2014; 25(1):9-13. doi: 10.4103/0970-9290.131047.
8. Pacheco MC, Casagrande CF, Teixeira LP, Finck NS, de Araújo MT. Guidelines proposal for clinical recognition of mouth breathing children. *Dental Press J Orthod* 2015; 20(4):39-44. doi: 10.1590/2176-9451.20.4039-044.oar.
9. Guo H, Wang T, Li X, Ma Q, Niu X, Qiu J. What sleep behavior are associated with bruxism in children? A systematic review and meta-analyses. *Sleep Breath* 2017; 21(4):1013-23. doi: 10.1007/s11325-017-1496-3.

10. Castilho LS, Abreu MHNG, Oliveira RB, Silva MES, Resende VLS. Factors associated with mouth breathing in children with developmental disabilities. *Spec Care Dentist* 2016; 36(2):75-9. doi: 10.1111/scd.12157.
11. Serra-Negra JM, Tirsá-Costa D, Guimarães FH, Paiva SM, Pordeus IA. Evaluation of parents/guardian knowledge about the bruxism of their children: Family knowledge of bruxism. *J Indian Soc Pediatr Prev Dent* 2013; 31(3):153-8. doi: 10.4103/0970-4388.117965.
12. Drumond CL, Souza, DS, Serra-Negra JM, Marques LS, Ramos-Jorge ML, Ramos-Jorge J. Respiratory disorders and the prevalence of sleep bruxism among schoolchildren aged 8 to 11 years. *Sleep Breath* 2017; 21(1):203-8. doi: 10.1007/s11325-017-1466-9.
13. Instituto Brasileiro de Geografia e Estatística (IBGE). Florianópolis: ensino – matrículas, docentes e rede escolar – 2015. Available at: <https://cidades.ibge.gov.br/brasil/sc/florianopolis/pesquisa/13/5902>, 2017. [Accessed 20 June 2017].
14. Serra-Negra JM, Paiva SM, Seabra AP, Dorella C, Lemos BF, Pordeus IA. Prevalence of sleep bruxism in a group of Brazilian schoolchildren. *Eur Arch Paediatr Dent* 2010; 11(4):192-5.
15. World Health Organization (WHO). Oral health surveys: Basic methods. 5. ed. Geneva: ORH/EPID, 2013.
16. Palinkas M, de Luca Canto G, Rodrigues LA, Bataglioni C, Siéssere S, Semprini M et al. Comparative capabilities of clinical assessment, diagnostic criteria, and polysomnography in detecting sleep bruxism. *J Clin Sleep Med* 2015; 11(11):1319-25. doi: 10.5664/jcsm.5196.
17. Abreu RR, Rocha RL, Lamounier JA, Guerra AF. Etiology, clinical manifestations and concurrent findings in mouth-breathing children. *J Pediatr* 2008; 84(6):529-35. doi: 10.2223/JPED.1844.
18. Hays RD, Lipscomb J. Next steps for use of item response theory in the assessment of health outcomes. *Qual Life Res* 2007; 16(1):195-9. doi: 10.1007/s11136-007-9175-7.
19. Iber CAIS, Chesson AL, Quan SF. The AASM manual for the scoring of sleep and associated events: Rules, terminology, and technical specification. Westchester: American Academy of Sleep Medicine; 2007.
20. Lobbezoo F, Ahlberg J, Glaros A, Kato T, Koyano K, Lavigne GJ et al. Bruxism defined and graded: An international consensus. *J Oral Rehabil* 2013; 40(1):2-4. doi: 10/1111/joor.12011.
21. Ferreira NM, dos Santos JF, dos Santos MB, Marchini L. Sleep bruxism associated with obstructive sleep apnea syndrome in children. *Cranio* 2015; 33(4):251-5. doi: 10.1080/08869634.2015.1097299.
22. Souza VA, Abreu MH, Resende VL, Castilho LS. Factors associated with bruxism in children with developmental disabilities. *Braz Oral Res* 2015; 29(1):1-5. doi: 10.1590/1807-3107BOR-2015.vol29.0009.
23. Raphael KG, Janal MN, Sirois DA, Dubrovsky B, Klausner JJ, Krieger AC, Lavigne GJ. Validity of self-reported sleep bruxism among myofascial temporomandibular disorder patients and controls. *J Oral Rehabil* 2015; 42(10):751-8. doi: 10.1111/joor.12310.
24. Simões-Zenari M, Bitar ML. Factors associated to bruxism in children from 4-6 years. *Pro Fono* 2010; 22(4):465-72. doi: 10.1590/S0104-56872010000400018.
25. Alencar NA, Fernandes AB, Souza MM, Luiz RR, Fonseca-Gonçalves A, Maia LC. Lifestyle and oral facial disorders associated with sleep bruxism in children. *Cranio* 2016; 35(3):168-74. doi: 10.1080/08869634.2016.1196865.