

Assessment of the association between the prevalence of Bruxism and Orofacial Factors in children from Santos, Brazil: A cross-sectional study

Avaliação da associação entre a prevalência de Bruxismo e Fatores Orofaciais em crianças de Santos, Brasil: Um estudo transversal

Evaluación de la asociación entre la prevalencia de Bruxismo y Factores Orofaciales en niños en Santos, Brasil: Un estudio transversal

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Abstract

Objective: The aim of the present study to assess the association between the prevalence of probable bruxism and orofacial factors in children three to nine years of age. **Material and Methods:** A cross-sectional study was conducted with 120 children who sought treatment at the paediatric dental clinic of the Metropolitan University of Santos in 2017. The guardians filled out a questionnaire designed using the criteria of the American Association of Sleep Medicine for the diagnosis of bruxism. The participants were also submitted to a clinical examination for the

evaluation of malocclusion. Results: The obtained results were computed and statistical analysis was carried out adopting a level of significance of 95%. Results: The prevalence of bruxism among the children was 39,2%; 17.5% in the primary dentition and 21.6% in the mixed dentition. The analysis revealed that bruxism was associated with headache (OR=2.63; 95 CI:1.1-5.8) and open bite (OR=3.23; 95CI:1.16-8.94). Conclusion: There is a strong association between bruxism and headache, and bruxism and open bite in children.

Keywords: Bruxism; Child; Headache; Pediatric Dentistry.

Resumo

Objetivo: Avaliar a associação entre a prevalência de provável bruxismo e fatores orofaciais em crianças de três a nove anos de idade. Material e Métodos: Foi realizado um estudo transversal com 120 crianças que procuraram atendimento na clínica odontológica pediátrica da Universidade Metropolitana de Santos em 2017. Os responsáveis responderam a um questionário elaborado segundo os critérios da American Association of Sleep Medicine para diagnóstico de bruxismo. Os participantes também foram submetidos a exame clínico para avaliação de maloclusões. Resultados: Os resultados obtidos foram computados e a análise estatística foi realizada adotando-se um nível de significância de 95%. Resultados: A prevalência de bruxismo nas crianças foi de 39,2%; 17,5% na dentição decídua e 21,6% na dentição mista. A análise revelou que o bruxismo estava associado a cefaleia (OR = 2,63; IC95: 1,1-5,8) e mordida aberta (OR = 3,23; IC95: 1,16-8,94). Conclusão: Existe uma forte associação entre bruxismo e cefaleia e também entre bruxismo e mordida aberta em crianças.

Palavras-chave: Bruxismo; Criança; Cefaleia; Odontopediatria.

Resumen

Objetivo: Evaluar la asociación entre la prevalencia de probable bruxismo y factores orofaciales en niños de tres a nueve años. Material y métodos: se realizó un estudio transversal con 120 niños que acudieron a la clínica odontológica pediátrica de la Universidad Metropolitana de Santos en 2017. Los responsables respondieron un cuestionario elaborado según los criterios de la Asociación Americana de Medicina del Sueño para el diagnóstico de bruxismo. Los participantes también se sometieron a un examen clínico para evaluar las maloclusiones. Resultados: Se computaron los resultados obtenidos y se realizó el análisis estadístico adoptando un nivel de significancia del 95%. Resultados: La prevalencia de bruxismo en niños fue 39,2%; 17,5% en dentición temporal y 21,6% en dentición mixta. El análisis reveló que el bruxismo se asoció con dolor de cabeza (OR = 2,63; IC del 95%: 1,1-5,8) y mordida abierta (OR = 3,23; IC del 95%: 1,16-8,94). Conclusión: Existe una fuerte asociación entre bruxismo y dolor de cabeza y también entre bruxismo y mordida abierta en niños.

Palabras clave: Bruxismo; Niño; Cefalea; Odontología Pediátrica.

1. Introduction

According to the international consensus, bruxism is defined as a repetitive masticatory muscle activity that is characterised by grinding or clenching of the teeth and/or by bracing or thrusting of the mandible, and it is identified as either sleep or awake bruxism, depending on its circadian phenotype (Lobbezoo et al., 2013). Tooth grinding that usually occurs during sleep named nocturnal bruxism is linked to cranio-mandibular disorders including headaches, temporomandibular joint discomfort, muscular pain, premature loss of teeth due to excessive attrition and mobility, and sleep disruption of the individual (Aromaa et al., 1998; Koriotoh et al., 1998). It is generally believed that sleep bruxism is more common during childhood (Koyano et al., 2015).

In recent years, bruxism has become an increasing concern in children due to its negative effects on life quality and also for being considered an important risk factor for temporomandibular dysfunctions (Polat et al., 2000; de Souza Barbosa et al., 2008). Some researchers showed the prevalence of this habit in children ranges from 7 to 88% (Fonseca et al., 2011; Insana et al., 2013; Ferreira et al., 2015; Rodrigues et al., 2020).

Xavier et al. (2020) showed that anxiety is a factor that may be related to the involvement of Childhood Bruxism. Most bruxers users of technological devices had a habit of grinding their teeth and poor sleep quality than those the nonbruxers.

Different methods are used to diagnose bruxism, including the use of optical reading, the analysis of models, polysomnography, the assessment of masseter muscle contraction through bite strip electrodes, and self-reports/parental reports (Castroflorio et al., 2015; Restrepo et al., 2006; Ioachimescu et al., 2014; Association ASD, 1997). It is noteworthy that the

American Academy of Sleep Medicine (AASM) considers the reports of parents/caregivers to be quite reliable (Medicine AAoS, 2005). and sufficiently objective for use in epidemiological studies. Due to differing methodologies in subsequent studies, the precise prevalence of bruxism is not known (Cheifetz et al., 2005).

Several studies have assessed the relationship between bruxism and malocclusion among children, with reports of the significant relationship between bruxism and some occlusal factors (Wigdorowicz-Makowerowa et al., 1979; Sari et al., 2001; Nilner, 1983). However, some of the occlusal factors were not seemingly involved in the development of bruxism (Orthlieb et al., 2016; Demir et al., 2004). It would be useful, therefore, to know whether the relationship between malocclusion and bruxism is strong enough to prevent bruxism development by early treatment of occlusal conditions. Sleep bruxism in young children can also be associated with fatigue of the masticatory musculature, noisy breathing during sleep and headaches (Carra et al., 2011). However, an association between bruxism, malocclusion and migraine headaches in children does not yield sufficient evidence based on the available data.

Thus, the aim of this cross-section study was to evaluate the prevalence of bruxism in children among 3 and 9 years old that sought treatment in the clinic of pediatric dentistry of the Metropolitana University of Santos in 2017. The possible association between bruxism and associated factors as headache and malocclusion were also evaluated as secondary outcome.

2. Methodology

The purpose of this cross-sectional study in a convenience sample was to assess the association between the prevalence of probable bruxism and orofacial factors in children three to nine years of age. Data collection involved the clinical examination and application of questionnaire. The cross-sectional study produces a picture of the health situation of a population through a sample, evaluating the presence or absence of exposure and disease (Haddad, 2004). The questionnaire is a widely used instrument for data collection, has a low cost, allowing use in a large number of participants (Pereira et al, 2018; Gil, 2008).

2.1 Ethics approval and protocol registration

This clinical investigation was approved (protocol number 2.063.100) by the Committee of Ethics in Research of *Metropolitana of Santos University - UNIMES* (Santos, SP, Brazil). This clinical report follows the protocol established by the **STrengthening the Reporting of OBservational studies in Epidemiology - STROBE**.

2.2 Trial design, settings and locations of data collection

A population-based cross-sectional study was conducted involving schoolchildren aged 3-9 years of both sexes who sought treatment at the pediatric dentistry clinic of UNIMES (Metropolitan University of Santos), it is located in Santos, in the state of São Paulo, where is the most import port of the country. This study was performed from 05/2017 to 12/2017.

2.3 Training and calibration exercise

A specialist in pediatric dentistry coordinated the theoretical step, involving a discussion of the criteria for diagnosis of the bruxism. Before the main study began, a pilot study was conducted, and the questionnaire was tested with 10 selected guardians who were not included in the main sample. In the clinical step, two dentists examined 10 previously selected children at the pediatric dentistry clinic of the UNIMES chosen by convenience.

For the analysis of internal consistency of the questionnaires applied to the pilot study, a Cronbach's Alpha test ($\alpha = 0.979$) was performed. Interexaminer agreement was tested by comparing each examiner with an experienced oral health

professional. The interexaminer Kappa coefficient was calculated for malocclusion ($K = 0.86$ to 0.91). Values between 0.61 and 0.80 are considered good, and values between 0.81 and 1.00 are considered very good (Altman, 1990).

2.4 Eligibility criteria and methods of selection of participants

The inclusion criteria were aged between 3 and 9 years and who sought treatment at the pediatric dentistry clinic of the UNIMES, were selected with or without self-reported bruxism and with the free and informed consent form signed. To be included in the study, guardians had to be with their children at the first dental visit. Those who could not read or write, or who had any commitments that would not make their participation possible in the study were excluded. The exclusion criteria were children currently undergoing orthodontic and orthopaedic treatment, those that had early loss of deciduous teeth a complete permanent dentition, systemic diseases (based on parents'/caregivers' reports), such as cerebral palsy or Down syndrome, in addition to children had a history of psychological treatment.

2.5 Data collection

2.5.1 Bruxism diagnostic

The diagnosis of probable bruxism was based on reports of a questionnaire adapted and previously used by Serra-Negra et al. (2013) was given to the guardians of the patients. This questionnaire was prepared within the criteria of the American Association of Sleep Medicine (AASM) (Buysse et al., 2003; Serra-Negra et al., 2010). The assessment instrument contained 15 questions; eleven were close ended and four open ended. The questionnaire was used to collect information only about the children. Data collected about the children included: their age, sleep characteristics, type of sleep, if they slept alone, hours of sleep on average per night, and the question: "Does your child grit his/her teeth while he/she sleeps?". The guardians answered the questionnaires individually without consultation or discussion with companions or family.

Once completed, they immediately delivered the questionnaire to the investigator. The confidentiality of the data was confirmed to the participants. The investigators did not affect the participant's answers in any way. All participants signed a free and informed consent form before completing the questionnaire.

2.5.2 Bruxism and Associated Factors

Participants who were eligible to participate in the study were submitted to a clinical examination performed by previously calibrated one evaluator who verified the presence of malocclusion. Then, an evaluation was made of intraoral occlusal factors: increased overbite (> 2 mm), increased overjet (> 2 mm), anterior open bite, anterior crossbit, molar relationship (mesial step, distal step, flash terminal plane) and sagittal relationship Class I, II e III (Ghafournia & Ghafournia, 2012).

Following the clinical examinations, a fluoride varnish was applied to all the children's teeth as a preventive and therapeutic measure for dental caries. If necessary, a letter was sent to all the parents informing them of the oral diagnosis of the preschool children and explaining the need for dental care.

The examinations were performed with the aid of dental gauze, mouth mirrors (PRISMA, São Paulo, SP, Brazil), a headlamp (PETZL, Tikka XP, Crolles, France), and WHO probes (Golgran Ind. e Com. Ltda., São Paulo, SP, Brazil). In the questionnaire had a question "Have the children reported headache? If the children answer: Yes, I have, the answer was used as associated factors too.

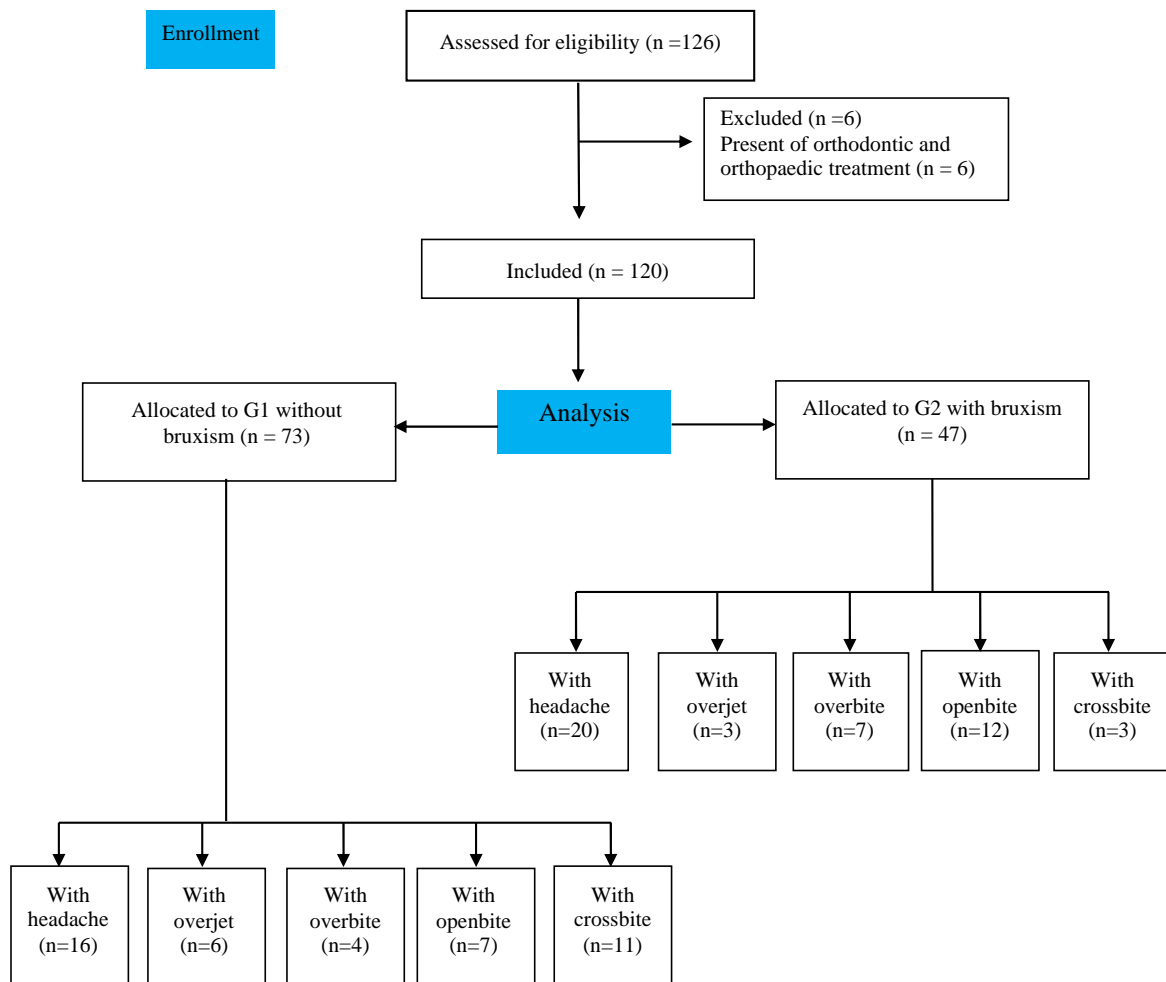
2.6 Statistical analysis

The data were computed, and statistical analysis performed, adopting a level of significance of 95% ($p < 0.05$). The statistical analysis of the results was performed using the program SPSS 12.0 for Win. To evaluate the association of categorical variables, the Chi-square test and Fisher's exact test were used.

3. Results

A total of 126 children were examined according to inclusion and exclusion criteria, but only 120 participants remained for the clinical trial (Fig. 1) with a mean age of 6.28 years (standard deviation = 1.81).

Figure 1 – Flow diagram of the cross-sectional study including detailed information on the excluded participants and the results.



Source: Authors.

Among the 126 children examined, 6 were excluded because they were currently undergoing orthodontic or orthopaedic treatment. The sample consisted of 120 children who were allocated into two groups: children diagnosed without bruxism (G1) and children with bruxism (G2).

3.1 Prevalence of bruxism

The children were allocated in two groups as bruxers or nonbruxers based on the child's parent report (Figure 1 and Table 1).

Table 1 - Characterization of the sample.

Variable	Frequency	
	N = 120	(%)
Child's Sex		
Male	57	(47.5)
Female	63	(52.5)
Probable Bruxism		
Absent (G1)	73	(60.8)
Present	47	(39.2)

Source: Authors.

Table 1 describes the variables Child's Sex and Probable Bruxism. The sample consisted of 57 boys (47.5%) and 63 girls (52.5%) The Group 1 showed the children diagnosed without bruxism, a total of 73 children (60.8%) and the Group 2 showed the children with bruxism, a total of 47 (39.2%)

3.2 Bruxism and associated factors

It was possible to observe an association between the presence of bruxism and headache, and bruxism and open bite. Regarding the presence of headache, a statistically significant difference was observed ($p = 0.014$); among the children with bruxism, 55.6% had headache; in children without bruxism, this value drops to 44.4%. Regarding the presence of open bite, a statistically significant difference was also observed ($p = 0.020$); the percentage of bruxist children with open bite was 63.3%, and 36.8% of non-bruxist children presented open bite, a number well below the previous one (Table 2).

Table 2 – Incidence of bruxism and associated factors.

Variable	Bruxism		p-value	OR (IC 95%)
	Absent	Present		
	N (%)	N (%)		
Headache				
No	57 (67.9)	27 (32.1)	p=0.014*	2.63 (1.1-5.8)*
Yes	16 (44.4)	20 (55.6)		
Molar Relationship				
Plane	10 (50)	10 (50)	p=0.136	
Mesial	14 (73.7)	5 (26.3)		
Distal	3 (37.5)	5 (62.5)		
Class I	29 (63)	17 (37)		
Class II	12 (80)	3 (20)		
Class III	5 (41.7)	7 (58.3)		
Overjet				
No	67 (60.4)	44 (39.6)	p=0.502	0.761 (0.18-3.20)
Yes	6 (66.7)	3 (33.3)		
Overbite				
No	69 (63.3)	40 (36.7)	p=0.079	3.01 (0.832-10.9)
Yes	4 (36.4)	7 (63.6)		
Openbite				
No	66 (65.3)	35 (34.7)	p=0.020*	3.23 (1.16-8.94)*
Yes	7 (36.8)	12 (63.2)		
Crossbite				
No	62 (58.5)	44 (41.5)	p=0.122	0.38 (0.101-1.45)
Yes	11 (78.6)	3 (21.4)		

* Statistically significant difference (Chi-square test, Fisher's exact test, $p < 0.05$; OR – IC95%)
Source: Authors.

4. Discussion

The stomatognathic system consists of a set of skeletal, muscular and dental structures that are ready to perform functions such as speaking and chewing. However, besides these, it is possible to perform non-typical activities for which this system is not adapted which we call parafunctional habits. One of these habits is bruxism, which can occur during the day or night, and usually, unconsciously. Although the term originates from the Greek “brychein”, that means grinding of teeth, other names have been used to describe this activity: neurosis of occlusal habit, traumatic neuralgia, bruxomania, grinding-teeth, briquing, clenching, and oral parafunction (Association ASD, 1997; Medicine AAoS, 2005).

The sleeping bruxist contracts the muscles with a force greater than the natural, causing friction and strong noises when grinding the teeth, what does not occur during bruxism in vigil. Among the possible consequences of this habit are dental

wear, sensitivity and dental mobility, as well as soft tissue trauma, headaches, sensitivity of mastication muscles, progression of periodontal disease and temporomandibular joint disorders (Insana et al., 2013; Cheifetz et al., 2005).

This study's primary goal was to establish the prevalence of bruxism in children. The prevalence of bruxism varies greatly in studies; in the majority (Cheifetz et al., 2005; Demir et al., 2004; Buysse et al., 2003; Serra-Negra et al., 2010); including this study, the prevalence of bruxism in children was similar (mean between 38.4% and 43%). However, authors found a prevalence of 12%, well below most of the studies evidenced above. This discrepancy would be justified by the fact that each researcher adopts a methodology, and this is a limitation of this type of research (Demir et al., 2004; Ghafournia & Ghafournia, 2012).

Our study was able to demonstrate an association between headache and bruxism in children, and because it is a frequent sign, reported by most children, it has a great relevance in the care of these patients. Several studies have suggested this association, but most of them did not classify the headaches (Aromaa et al., 1998; Carra et al., 2011, Wänman & Agerberg, 1986; Cortese & Biondi, 2009; Quintero et al., 2009). Some mechanisms have been described to explain the association between bruxism and headache. Headache is the referred pain from trigger points (TrPs) in the posterior cervical, head, and shoulder muscles. The TrPs would be the primary hyperalgesic areas responsible for the development of central sensitization in chronic tension-type headache. Bruxism can be considered an important contributing factor for the development of TrPs in the head and neck, which in turn generate and/or contribute to headache (Fernandez-de-Las-Penas et al., 2007).

In the present study, we could note the association between open bite and bruxism. Sari et al. reported statistically significant relationship between an overjet of >6 mm, negative overjet, overbite, open bite, and bruxism in permanent dentition but not in mixed dentition (Sari & Sonmez, 2001). There are still divergences when relating malocclusion and occlusal interference as the main etiologies of bruxism, which consider that morphological disorders are a peripheral cause of bruxism. When occlusion is unbalanced, motor neuron activity of the masticatory muscles is triggered by periodontal receptors (Behr et al., 2012). In addition, research has suggested that oral breathing children are more likely to have bruxism, anterior open bite and associated parafunctional habits. Thus, open bite is related to a child's daily habit, and bruxism could be intimately associated with the habit and not directly with the malocclusion (Sari & Sonmez, 2001).

Considering this, we can conclude that there is an association between bruxism and headache, and between bruxism and open bite. However, as the differences regarding bruxism in children are many, new studies are necessary to evaluate the associations between bruxism and headache, and bruxism and open bite, and the evaluation of diagnostic and therapeutic possibilities to control this parafunction.

5. Conclusion

The present findings demonstrate strong associations between bruxism in both the primary and mixed dentitions. Within the limitations of this study, we suggest associations between bruxism and both headache and open bite in the primary dentition. Further studies are needed to confirm these associations as well as establish diagnostic and therapeutic measures to control this parafunctional habit.

The cross-sectional design of the present study precludes the establishment of cause-and-effect relations. Thus, there is a need for further evidence-based longitudinal investigations. Further studies should be conducted using the most recent consensus for the assessment of bruxism with standardized, validated diagnostic criteria.

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