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Sleep and awake bruxism in pediatric patients - Cross-sectional study of prevalence and associated factors

Aims: To identify the prevalence and associated factors of dental bruxism in children during the development of occlusion.

Study design: *Cross-sectional* observational study.

Place and Duration of Study: Data was collected in two private dental clinics in the city of Maringá - PR. Children treated between 2014 and 2021 were included.

Methodology: 417 medical records of children aged between 5 and 12 years old were selected from two dental clinics in the same city. 260 participants answered a questionnaire to identify bruxism complaints. Bruxism was considered possible when those responsible for the patients indicated the occurrence of audible sounds such as teeth grinding and considered probable when there was a report from those responsible for the patients and tooth wear assessed in the clinical examination. 42 children were included in the group of patients with possible bruxism (GB) and 42 in the control group (absence of bruxism - GC). The results were subjected to statistical and descriptive analysis.

Results: A prevalence of possible bruxism of 24.6% was observed and an association was found for the variables: pain in the temporomandibular joints, ringing in the ears, headache, unilateral chewing, joints with pain when chewing, fatigue in the muscles of the face after a long meal, harmful habits such as onychophagia, biting cheeks and pen; snoring, sleeping with their mouth open; behavioral profile: nervousness about new things and lack of motivation with tasks, in addition to the severity of tooth wear.

Conclusion: The prevalence of probable bruxism in children was 24.6%, with manifestations most occurring at night. More clinical studies are needed to develop multidisciplinary approaches for managing childhood bruxism.

9

10 *Keywords: Bruxism; Pediatric Dentistry; Child Development; Sleep Bruxism.*

11 1. INTRODUCTION

12

13 The development of occlusion in pediatric patients involves complex biological processes, and it
14 is common to encounter several changes, such as dental bruxism [1]. This condition is defined as a
15 repetitive activity of the jaw muscles, generally unconscious, characterized by grinding, touching the
16 teeth, or clenching the jaw in the same position. Dental bruxism has two distinct circadian cycles:
17 during sleep (SB) or during wakefulness (AB) [1,2]. Among sleep behaviors recognized in children, SB
18 is one of the most commonly reported problems [3].

19 The systematic review by Soares *et al.* (2021) demonstrated that bruxism has a prevalence in
20 children of 33.65% [4]. This is a high percentage when compared to the adult (8%) and elderly (3%)
21 population [1]. Sleep bruxism affects one in four Brazilian children, and presumably occurs because
22 of individual rather than regional or collective factors [5]. Despite the frequency of bruxism and its
23 effects during childhood, few studies are addressing the habit during this phase.

24 Several methods are used to assess SB and AB, including self-report and/or report from
25 parents/guardians [2,6], clinical examination [7], and instrumental techniques, such as
26 polysomnography (PSG) with audiovisual recordings [8]. The International Consensus on the
27 Assessment of Bruxism defines AB/SB as possible when the diagnosis is based solely on self-report;
28 probable AB/SB when the diagnosis is by self-report with additional clinical inspection; definite SB
29 when there is self-report, positive clinical evaluation, and polysomnography; and definite AB when
30 there is self-report, clinical evaluation and electromyography [2].

31 Guo *et al.* [9] point out that the risk factors related to bruxism are: genes, sleeping position, a lot
32 of movement, anxiety, nervousness, psychological reactions, responsibility, passive smoking, loud
33 snoring, restless sleep, sleeping with lights on, noise in the room, less than 8 hours of sleep,
34 headache, biting objects, conduct problems, emotional symptoms, and mental health problems [10].
35 Although several risk factors have been listed, there is not enough scientific evidence to support all of
36 them [5].

37 Bruxism can cause tooth wear, fractured restorations, problems with the temporomandibular joint,
38 and, in rare cases, even tooth fractures [11]. Therefore, patients with bruxism must be diagnosed and
39 treated appropriately to avoid further complications. The literature supports the need for further studies

40 to better understand bruxism and joint disorders in children [12]. It is crucial to identify cases, so
41 interdisciplinary clinical approaches may be implemented during the growth and development of
42 occlusion. Therefore, this work aimed to identify the prevalence and association factors of dental
43 bruxism in children aged 5 to 12 during the development of occlusion, through an observational study.

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47 **2. MATERIALS AND METHODS**

48

49 **2.1 Sample characteristics**

50 This cross-sectional study followed the STROBE [13] criteria.

51 Data were collected in two private dental clinics in the city of Maringá - PR. Children between 5
52 and 12 years of age, of both genders, treated from 2014 to 2021, were included.

53

54 **2.2 Ethical aspects**

55 The children's participation in this study was linked to the signing of the Free and Informed
56 Consent Form by their guardians after the approval of the research project by the Research Ethics
57 Committee of the State University of Maringá (CAAE No: 48027421.7.0000.0104).

58

59 **2.3 Eligibility Criteria**

60 Patients with severe skeletal syndromes or discrepancies resulting from congenital malformations
61 that may involve the joints, previous mandibular fractures, and schoolchildren who were undergoing
62 fixed orthodontic treatment were considered ineligible.

63

64 **2.4 Sample calculation**

65 The sample size calculation considered the prevalence of SB to be 35.3% [14] with an estimation
66 error of 5% and a significance level of 95%. These parameters indicated a minimum sample of 111
67 patients to carry out the prevalence study (primary outcome).

68 The sample calculation to evaluate the association between the presence/absence of probable
69 bruxism with the variables of snoring and headache was based on data from a similar study with
70 children [15]. For a two-tailed alpha error of 0.05 and test power of 80%, there was a minimum
71 indication of 30 volunteers for each group.

72

73 **2.5 Research protocol**

74 The medical records of all 417 children treated at two clinics in the city of Maringá-PR were
75 evaluated. After applying the eligibility criteria, 260 child records (118 girls and 142 boys) were
76 included in the study. Data were collected using a questionnaire developed by Serra-Negra et al. [16],
77 based on the criteria of the American Academy of Sleep Medicine via telephone contact (Figure 1).
78 This initial sample was obtained to assess prevalence (primary outcome).

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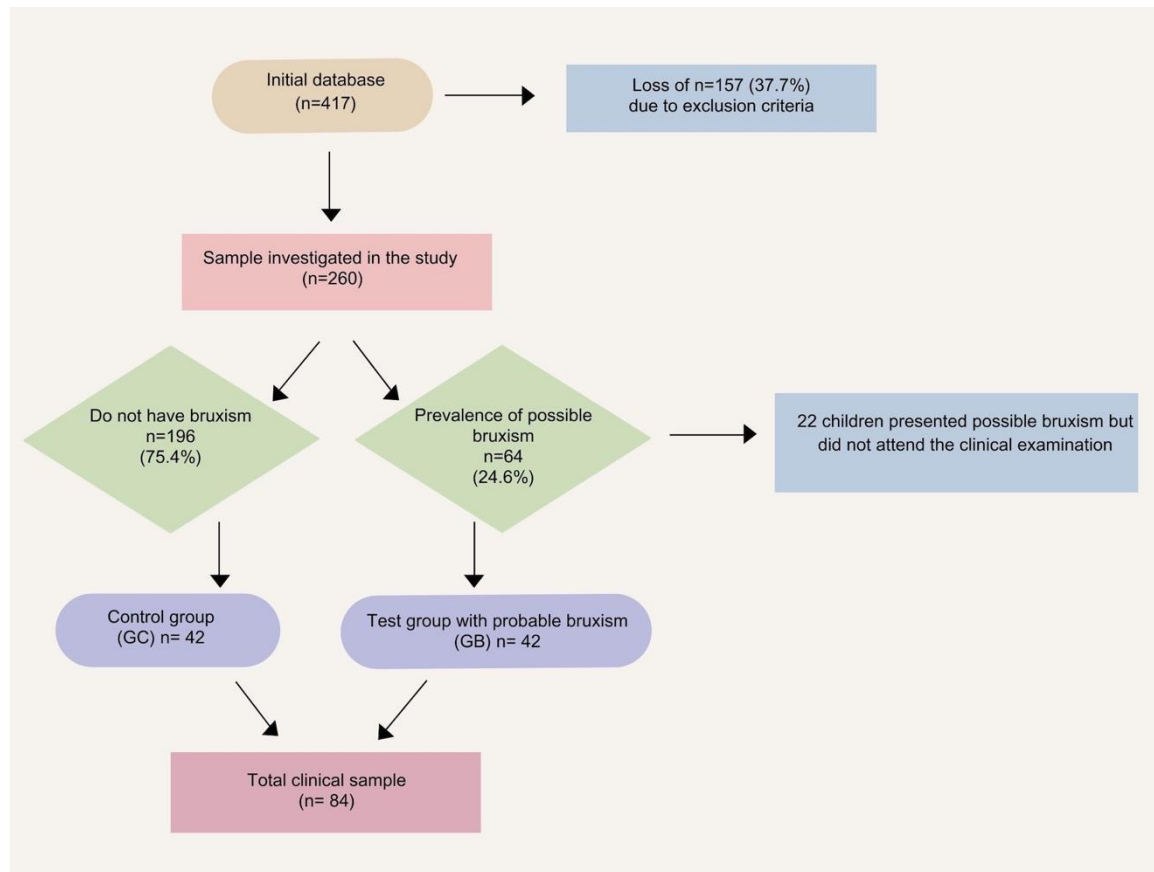


Fig. 1. Flowchart of database and sample distribution

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83 To evaluate possible factors associated with the occurrence of probable bruxism (secondary
 84 outcome), the families of 84 children were invited to attend the clinic for an assessment of their
 85 children by a trained professional. Two subgroups were then formed, GB-group with probable bruxism
 86 (n=42) and GC-control group consisting of children without reports of bruxism and without clinical
 87 evidence of tooth wear (n=42).

88 Both GB and GC groups had the same number of boys and girls, 23 and 19 respectively, and
 89 were evaluated regarding the habits of probable bruxism, sleep quality, symptoms in the
 90 temporomandibular joint, respiratory problems, behavioral profile, occlusion characteristics and the
 91 severity of dental wear.

92 After completing the study, children in the GB group with cases of tooth wear were referred for
 93 dental treatment and follow-up. Those responsible for the children were informed about the diagnosis
 94 and the recommended actions.

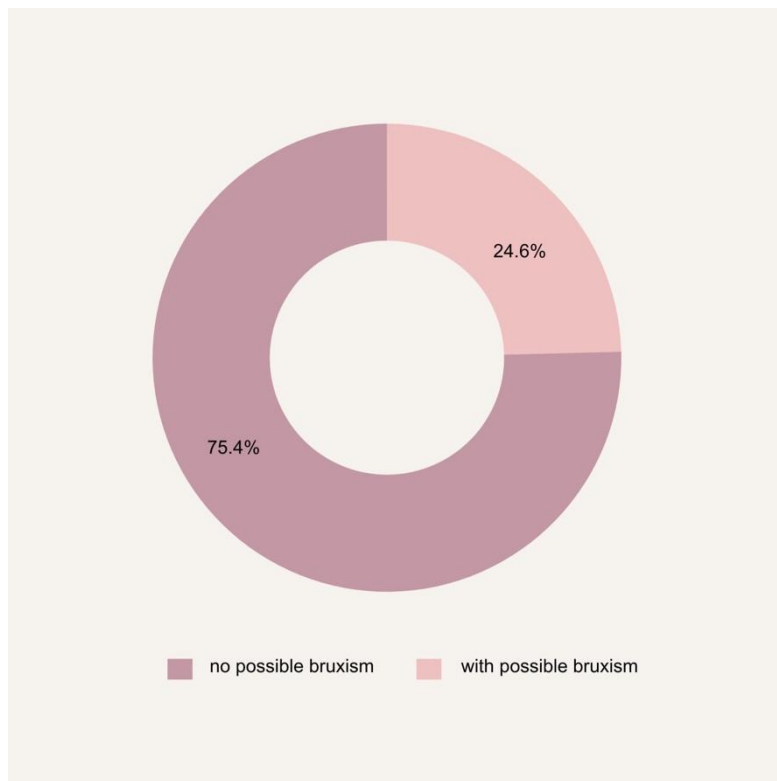
95 The presence of possible bruxism was considered when an affirmative answer was obtained from
96 the responsible for the child to the question, "Does your child have noises on their teeth during the
97 day, or when sleeping?". The questions used in the questionnaire with parents and/or guardians to
98 diagnose probable bruxism were in accordance with the International Consensus on the Assessment
99 of Bruxism [2]. Parents' report regarding the identification of teeth grinding noise at night was used as
100 a definition method of bruxism since detection only through tooth wear has a cumulative nature, which
101 does not make it possible to differentiate between present-day bruxism and its past history [17].
102
103

104 **2.6 Statistical analysis**

105 The research data were recorded in specific and individual forms, and the results were subjected
106 to statistical analysis with the aid of SPSS (Statistical Package for Social Sciences), version 22.0. The
107 Fisher's Exact test was used to verify the association between the presence/absence of probable
108 bruxism and "click", "ear pain", "ringing in the ears", "face or neck pain", "mouth locked" , and
109 "trauma". Chi-square was used to verify the association between probable bruxism and all the other
110 independent variables. Odds ratio (OR) analysis was performed to assess the habit of snoring during
111 sleep. The significance level was set at 5%.

112 **3. RESULTS**

113 In the population investigated (n=260), 24.6% of the children presented probable bruxism
114 according to their parents and/or guardians, with 75.4% not reporting the observation of teeth grinding
115 at the time of the research (Figure 2) In the clinical sample, the children with probable bruxism in GB
116 (n=42) had a mean age of 7.81 and in the GC (n=42) mean age of 7.14.



117
118 **Fig. 2. Prevalence of possible bruxism in the population investigated (n=260)**

119
120 Regarding circadian manifestations, the children's parents and/or guardians reported 88.1%
121 probable bruxism at night, 4.8% during the day, and 7.1% day and night. Regarding frequency per
122 week, 59.5% presented more than 4 times. In the clinical examination, the severity of tooth wear in
123 children with bruxism (GB) was evaluated, with 54.8% presenting mild wear, 11.9% with moderate
124 wear, and 33.3% with no apparent wear. The deciduous canines were the teeth that showed the
125 greatest wear.

126 The presence of probable bruxism about sex comprised 20 girls and 22 boys, respectively
127 7.69% and 8.46% ($P = 0.827$) (Figure 3).

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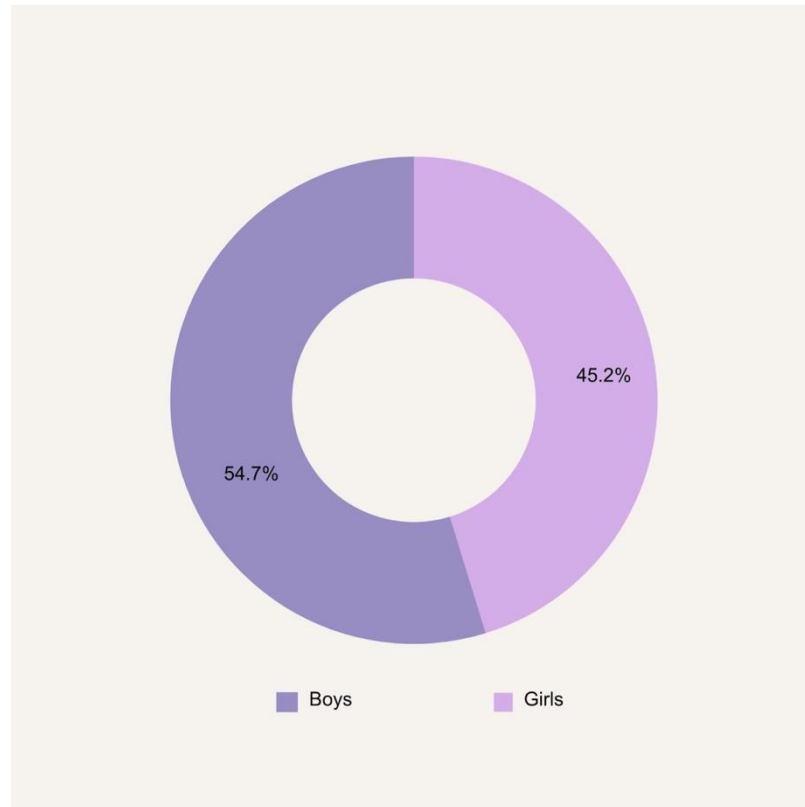


Fig. 3. Prevalence of probable bruxism according to gender in the group with bruxism (GB) (n=42)

Of the children with probable bruxism, 31% have pain in the temporomandibular joints ($P = 0.000$), and 19% have ringing in the ears ($P = 0.005$). It was observed that 22 children (52.4%) presented manifestations of headache associated with probable bruxism, 26.2% in the morning, 16.7% in the afternoon, and 9.5% at night ($P = 0.000$). The quality of “acute” pain was the most prevalent in these cases (21.4%). On the other hand, 6 patients who did not present bruxism (14%) reported a headache. Furthermore, of the children with probable bruxism, 23.8% had joint pain or sensitivity when chewing food ($P = 0.013$) (Table 1).

147 **Table 1. Association of the probable presence/absence of bruxism with temporomandibular**
 148 **joint variables (n=84)**

Variables	Probable bruxism group (GB)		Control group (GC)		Value - P
	n	%	n	%	
TMD	13	31%	1	2,4%	*0,000 ^b
Click	1	2,4%	0	0%	1,000 ^a
Ear pain	4	9,5%	1	2,4%	0,360 ^a
Ringling in the ears	8	19%	0	0%	*0,005 ^a
Headache	22	52,4%	6	14,3%	*0,000 ^b
Face or neck pain	5	11,9%	2	4,8%	0,433 ^a
One-sided chewing	13	31%	8	19%	*0,007 ^b
TMJ hurts when chewing	10	23,8%	2	4,8%	*0,013 ^b
Fatigue in the muscles
Problem opening mouth	13	31%	8	19%	*0,013
Mouth locked	2	4,8%	0	0%	0,494 ^a
Jaw trauma	1	2,4%	0	0%	1,000 ^a
	3	7,1%	1	2,4%	0,616 ^a

149 ^aFisher's Exact Test; ^bChi-square test; *statistically significant ($P \leq 0.05$)

150 There was no association between the probable presence/absence of bruxism and clicking,
 151 pain in the ears, face and neck, difficulty opening the mouth and trauma to the jaw ($P > 0.05$).

152 The presence of harmful oral habits was observed (61.4%), with onychophagia being the
 153 most prevalent condition. There was a significant association ($P = 0.029$) in the probable presence of
 154 bruxism with the habit of biting nails, cheeks, and pens (Table 2).

155 Table 2 shows the frequency and percentage of children with and without bruxism about their
 156 behavioral profile reported by their parents. Among the variables researched, it was observed that
 157 children being nervous about news and unmotivated with tasks are associated with bruxism ($P =$

158 0.005 and $P = 0.039$, respectively). On the other hand, the present study did not find a significant
 159 association between anxiety and the probable presence of bruxism.

160

161 **Table 2. Association of the probable presence/absence of bruxism with the variables of**
 162 **harmful oral habits, with the variables of the behavioral profile and with the habit of snoring**
 163 **and sleeping with the mouth open (n=84)**

Variables	Probable bruxism group (GB)		Control group (GC)		Value - P
	n	%	n	%	
Has a habit	27	61,4%	17	38,6%	0,029*
Has no habit	15	37,5%	25	62,5%	
Nervous about news	22	52,4%	12	28,6%	0,005*
Nervous about responsibilities	30	71,4%	18	42,9%	0,008*
Calm behavior when contradicted	7	16,7%	16	38,1%	0,088
Unmotivated with tasks	14	33,3%	12	28,6%	0,039*
Snores	17	40,4%	5	11,9%	0,011*
Sleeps with mouth open	26	61,9%	11	26,2%	0,003*

164 Chi-square test *statistically significant ($P \leq 0.05$)

165

166 In the clinical analysis, an association between malocclusion and probable bruxism ($P > 0.05$)
 167 was not found, observed through the relationship of canines (26.2%) and deviation of the dental
 168 midline (28.6%).

169 Regarding respiratory problems, the habit of sleeping with the mouth open showed a
170 significant association with probable bruxism ($P = 0.003$). The habit of snoring during sleep, according
171 to the odds ratio (OR) analysis, was 2.9, that is, children who snore are 2.9 times more likely to
172 present probable bruxism when compared to children without this habit ($P = 0.011$). Table 2 also
173 shows the percentage distributions of these findings. When investigating with parents and/or
174 guardians the change in the pattern of probable bruxism in the face of rhinitis and sinusitis, 40.5%
175 were unable to inform, 33.3% responded that bruxism remained unchanged and 26.2% reported an
176 increase in the frequency of the habit, findings that were not significant.

177 Regarding sleep, it was observed that the insufficient number of recommended hours of sleep
178 and having problems sleeping (insomnia and sleep disorders) were not associated with the probable
179 presence of bruxism. It was observed that 50% of children who have probable bruxism sleep 8 hours,
180 while 50% sleep less time. 66.7% of those without bruxism sleep less than 8 hours, 28.6% sleep 8
181 hours, and 4.8% sleep more.

182 A high occurrence of changes in mouth opening (deviation and deflection) and a suggestive
183 presence of ligament hypermobility were observed in both groups (GB and GC), with no association
184 with bruxism.

185 Parents and/or guardians were asked whether they observed greater evidence of probable
186 bruxism during the Covid-19 pandemic. The reports were of a decrease in the habit for 66.6%, 31%
187 with an increase in teeth grinding and 1 guardian (2.4%) was unable to respond. Therefore, the
188 present research did not express an association between the increase in probable bruxism during the
189 COVID-19 pandemic.

190

191 **4. DISCUSSION**

192

193 Approximately 25% of the children evaluated in the present study had the habit of grinding
194 their teeth during the day and/or night. Serra-Negra *et al.* [14] found a higher occurrence of bruxism in
195 the investigated children, at 35.3%. According to a systematic review [18], prevalence rates vary from
196 5.9% to 49.6%, possibly due to the lack of standardization and uniformity of the criteria adopted for
197 the assessment and diagnosis of bruxism [14,18,19].

198 Regarding gender, this study did not find significant differences in the prevalence of probable
199 bruxism in children. Similar results to the work of Nahás-Scocate *et al.* [20]. However, Clementino *et*
200 *al.* [21] observed a higher frequency of the habit in girls, while Alves *et al.* [22] in boys.

201 It was possible to observe an association between bruxism and headache in this study, as
202 well as in other studies [20,23]. The habit can tense the muscles of the face, increasing discomfort.
203 Therefore, it is important to guide parents regarding their children's possible complaints and seek the
204 necessary treatments.

205 Furthermore, no association was observed between the probable presence/absence of
206 bruxism and clicking, pain in the ears, face, and neck, difficulty in opening the mouth, and trauma to
207 the jaw. These results are consistent with other works in the literature. In studies by Santos *et al.* [23]
208 and Nilner and Lassing [24] the values for these conditions also approached 8%.

209 There was a significant association between the probable presence of bruxism and the habit
210 of biting nails, cheeks, and pens. This finding is in agreement with the study by Simões-Zenari and
211 Bitar [25]. However, the investigation by Shinkai *et al.* [26] did not find such a relationship. Some
212 factors can influence the onset of these harmful oral habits, including the breastfeeding pattern [27].

213 Regarding the behavioral profile reported by parents, it was observed that children being
214 nervous about news and unmotivated with tasks are associated with parafunction, corroborating the
215 studies by Shinkai *et al.* [26], which describes that when human beings feel threatened in their
216 integrity, whether physical or mental, an emotional state of anxiety occurs, characterized by tension,
217 agitation, apprehension and physiological responses from the autonomic nervous system. This
218 anxiety favors the discharge of nervous tension on the masticatory muscles, causing the development
219 of parafunctional habits, such as bruxism. On the other hand, the present study did not find a
220 significant association between anxiety and the probable presence of bruxism, probably due to the
221 high frequency of anxiety, being 40.5% for both groups (GB and GC).

222 No association was found between malocclusion and probable bruxism, a condition also
223 observed in the study by Gonçalves *et al.* [28], in which malocclusion also showed no significant
224 difference.

225 Regarding respiratory problems, children who have the habit of sleeping with their mouths
226 open and snoring during sleep are more likely to present probable bruxism, when compared to
227 children without this habit. According to Marks [29], sleeping with your mouth open and snoring

228 reduces the amount of saliva and the need to swallow, increasing the tendency to grind your teeth
229 during the night. The author demonstrated a three times higher incidence of bruxism in allergic
230 children, when compared to children without allergic respiratory processes, since allergic children tend
231 to sleep with their mouths open, although in the current study, there was no statistically significant
232 relationship. Furthermore, according to Miller *et al.* [15], the parents of the children interviewed in their
233 research reported a rate of sleep disorders, such as snoring, of 23% in children with bruxism, a rate
234 considered high, equivalent to the results observed here.

235 Furthermore, it was observed that the number of hours of sleep and difficulty sleeping were
236 not associated with the probable presence of bruxism. Contrary to what was demonstrated in the
237 study by Simões-Zenari and Bitar [25], which observed an increased risk of approximately five times
238 more when the child sleeps less than 10 to 11 hours per night. However, the parameter evaluated in
239 the present study was 8 hours of sleep, following the reference by Serra Negra *et al.* [16].

240 The present research did not express an association between the increase in probable
241 bruxism during the COVID-19 pandemic. However, notes by Almeida-Leite *et al.* [30] showed that
242 psychological factors associated with the pandemic can lead to a greater risk of developing,
243 worsening, and perpetuating bruxism.

244 Thus, given the present findings, there was a significant association between the probable
245 presence/absence of bruxism for the variables: pain in the temporomandibular joints, ringing in the
246 ears, frequent pulsating and acute headache, unilateral chewing, joint pain when chewing, tiredness
247 in the facial muscles after a long meal, harmful habits such as onychophagia, biting cheeks and pens,
248 snoring, sleeping with the mouth open, behavioral profile when nervous about news and unmotivated
249 with tasks and, in terms of tooth wear severity, light and moderate. **These findings facilitate a
250 comprehensive approach during the clinical assessment of pediatric patients, thereby enabling
251 accurate diagnosis and formulation of treatment strategies.**

252 **de Alencar *et al.* related that there exists no significant association between probable bruxism
253 and the socioeconomic or sociodemographic status of the Brazilian children examined. The author
254 posits that sleep bruxism functions as a mechanism for alleviating stress accumulated during waking
255 hours. How individuals manage daily conflicts is intricately intertwined with the habit [31], since there
256 are different personalities in each child.**

257 There are several types of treatments proposed for bruxism, such as the use of an occlusal
258 splint. According to Santos *et al.* [32], sleep hygiene and relaxation techniques should be considered
259 the first line of approach for patients with sleep bruxism, as they are non-invasive, easy to perform,
260 and appear to improve patients' quality of life.

261 The use of rigid stabilizing interocclusal splints, when carefully supervised and monitored, is a
262 good option, as it prevents tooth wear and reduces orofacial pain [33]. However, the acrylic splint
263 should not be used for more than a year due to the risk of restricting the transverse growth of the
264 maxilla. An alternative to compensate for this restriction is the inclusion of an expanding device on the
265 protection plate [19]. Nightly use of the plate and periodic monitoring of the patient is recommended.

266 Furthermore, sleep hygiene can be useful in treating bruxism in children, which includes
267 keeping the room dark, quiet, and with good ventilation; avoiding heavy meals after 7 pm; at night,
268 stopping drinking coffee and tea, in addition to avoiding exhaustive physical and mental activity or
269 watching TV to relax before bed and reducing stress levels [34,35].

270 Treating bruxism is challenging and requires the cooperation of professionals, parents, and
271 the child. Appropriate clinical guidelines for the treatment and prevention of bruxism in children must
272 be developed [34]. During childhood, many changes will occur with craniofacial growth and
273 development, an important period in which the professional needs to be attentive, both for the
274 diagnosis of bruxism and for your multidisciplinary follow-up, and also be prepared for the referral
275 and/or planning of possible interventions, considering the changes in the dental arches expected until
276 the establishment of permanent dentition.

277 It can be pointed out that among the limitations found in the present study, was due to the
278 COVID-19 pandemic period, which made clinical care difficult and probably influenced the families'
279 attendance at scheduling.

280 There has been an increase in reports from parents and caregivers of children about the
281 occurrence of bruxism, especially during and after the pandemic period. Due to this condition, it is
282 necessary to develop more studies with clinical approaches for multidisciplinary action in the
283 management of childhood bruxism.

284

285

286 **5. CONCLUSION**

287

288 Based on the methodology used and the results obtained, it was concluded that the
289 prevalence of probable bruxism in children aged 5 to 12 years was 24.6%, with probable bruxism
290 occurring most frequently at night. The most observed severity of probable bruxism was mild, at
291 54.8%.

292 There was a significant association of probable bruxism for the variables: pain in the
293 temporomandibular joints, ringing in the ears, frequent pulsating and acute headache, unilateral
294 chewing, joints with pain when chewing, fatigue in the facial muscles after a long meal, harmful habits
295 such as onychophagia, biting cheeks and pens, snoring, sleeping with your mouth open, behavioral
296 profile such as being nervous with news and unmotivated with tasks and, in terms of the severity of
297 tooth wear, mild and moderate. **These findings can aid in a comprehensive clinical assessment of
298 pediatric patients, leading to precise diagnosis and treatment planning.**

299 **For new studies, well-designed clinical research with children and standardized
300 methodologies is suggested, to verify the association between bruxism and factors related to its
301 occurrence and the severity of tooth wear.**

302

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306

307 **COMPETING INTERESTS**

308 The authors have declared that no competing interests exist.

309

310 **AUTHORS' CONTRIBUTIONS**

311 This work was carried out in collaboration among all authors. All authors read and approved the final
312 manuscript.

313

314 **CONSENT**

315 All authors declare that a written informed consent was obtained from the patients for publication of
316 this study. A copy of the written consent is available for review by the Editorial office/Chief
317 Editor/Editorial Board members of this journal.

318

319 **ETHICAL APPROVAL**

320 All authors hereby declare that all experiments have been examined and approved by the appropriate
321 ethics committee ethics (State University of Maringá CAAE No: 48027421.7.0000.0104) and have
322 therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration
323 of Helsinki.

324

325 **REFERENCES**

- 326 1. Lavigne GJ, Khoury S, Abe S, Yamaguchi T, Raphael K. Bruxism physiology and
327 pathology: An overview for clinicians. *J Oral Rehabil.* 2008;35(7):476–494. doi:
328 10.1111/j.1365-2842.2008.01881.x.
- 329 2. Lobbezoo F, Ahlberg J, Raphael KG, Wetselaar P, Glaros AG, Kato T, *et al.* International
330 consensus on the assessment of bruxism: Report of a work in progress. *J Oral*
331 *Rehabil.* 2018;45(11):837–844. doi: 10.1111/joor.12663.
- 332 3. Tachibana M, Kato T, Kato-Nishimura K, Matsuzawa S, Mohri I, Taniike M.
333 Associations of sleep bruxism with age, sleep apnea, and daytime problematic behaviors in
334 children. *Oral Dis.* 2016;22(6):557–565. doi: 10.1111/odi.12492.
- 335 4. Soares JP, Moro J, Massignan C, Cardoso M, Serra-Negra JM, Maia LC, *et al.* Prevalence of
336 clinical signs and symptoms of the masticatory system and their associations in children with sleep
337 bruxism: A systematic review and meta-analysis. *Sleep Med Rev.* 2021;57:101468. doi:
338 10.1016/j.smr.2021.101468.

- 339 5. Ferrari-Piloni C, Barros LAN, Evangelista K, Serra-Negra JM, Silva MAG, Valladares-Neto J.
340 Prevalence of Bruxism in Brazilian Children: A Systematic Review and Meta-Analysis. *Pediatr Dent.*
341 2022 Jan 15;44(1):8-20.
- 342 6. Prado IM, Abreu LG, Silveira KS, Auad SM, Paiva SM, Manfredini D, Serra-Negra JM.
343 Study of associated factors with probable sleep bruxism among adolescents. *J Clin Sleep*
344 *Med.* 2018;14(8):1369–1376. doi: 10.5664/jcsm.7276.
- 345 7. Drumond CL, Ramos-Jorge J, Vieira-Andrade RG, Paiva SM, Serra-Negra JMC, Ramos-
346 Jorge ML. Prevalence of probable sleep bruxism and associated factors in Brazilian
347 schoolchildren. *Int J Paediatr Dent.* 2019;29(2):221–227. doi: 10.1111/ipd.12443.
- 348 8. Raphael KG, Santiago V, Lobbezoo F. Is bruxism a disorder or a behaviour? Rethinking
349 the international consensus on defining and grading of bruxism. *J Oral Rehabil.*
350 2016;43(10):791–798. doi: 10.1111/joor.12413.
- 351 9. Guo H, Wang T, Niu X, Wang H, Yang W, Qiu J, *et al.* The risk factors related to bruxism in
352 children: A systematic review and meta-analysis. *Arch Oral Biol* [Internet]. 2018;86(143):18–
353 34. doi: 10.1016/j.archoralbio.2017.11.004.
- 354 10. Ohmure H, Oikawa K, Kanematsu K, Saito Y, Yamamoto T, Nagahama H, *et al.* Influence of
355 experimental esophageal acidification on sleep bruxism: A randomized trial. *J Dent Res.*
356 2011;90(5):665–671. doi: 10.1177/0022034510393516.
- 357 11. Lobbezoo F, Ahlberg J, Glaros AG, Kato T, Koyano K, Lavigne GJ, *et al.* Bruxism
358 defined and graded: An international consensus. *J Oral Rehabil.*2013;40(1):2–4. doi:
359 10.1111/joor.12011.
- 360 12. Pontes L da S, Prietsch SOM. Sleep bruxism: population based study in people with 18
361 years or more in the city of Rio Grande, Brazil. *Rev Bras Epidemiol.* 2019;22:e190038.
362 doi: 10.1590/1980-549720190038.
- 363 13. von Elm E, Altman DG, Egger M, Pocock SJ, Gotsche PC, Vandenbroucke JP.
364 Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)
365 Statement: guidelines for reporting observational studies. *Int J Surg.* 2014;12(12):1495-
366 1499. doi: 10.1136/bmj.39335.541782.AD.

- 367 14. Serra-Negra JM, Paiva SM, Seabra AP, Dorella C, Lemos BF, Pordeus IA. Prevalence of
368 sleep bruxism in a group of Brazilian schoolchildren. *Eur Arch Paediatr Dent.*
369 2010;11(4):192–195. doi: 10.1007/BF03262743.
- 370 15. Miller VA, Palermo TM, Powers SW, Scher MS, Hershey AD. Migraine headaches and
371 sleep disturbances in children. *Headache.* 2003;43(4):362–268. doi: 10.1046/j.1526-
372 4610.2003.03071.x.
- 373 16. Serra-Negra JM, Paiva SM, Fulgêncio LB, Chavez BA, Lage CF, Pordeus IA.
374 Environmental factors, sleep duration, and sleep bruxism in Brazilian schoolchildren: A
375 case-control study. *Sleep Med.* 2014;15(2):236–239. doi:
376 10.1016/j.sleep.2013.08.797.
- 377 17. Koyano K, Tsukiyama Y, Ichiki R, Kuwata T. Assessment of bruxism in the clinic. *J Oral*
378 *Rehabil.* 2008;35(7):495–508. doi: 10.1111/j.1365-2842.2008.01880.x.
- 379 18. Machado E, Dal-Fabbro C, Cunali PA, Kaizer OB. Prevalence of sleep bruxism in
380 children: A systematic review. *Dental Press J Orthod.* 2014;19(6):54–61. doi:
381 10.1590/2176-9451.19.6.054-061.oar.
- 382 19. Rédua RB. Bruxismo na infância – aspectos contemporâneos no século 21 – revisão
383 sistemática. *Full Dent Sci.* 2019;10(38):131–137. doi: 10.24077/2019;1038-131137.
384 Portuguese.
- 385 20. Nahás-scocate ACR, Trevisan S, Junqueira TH. Associação entre bruxismo infantil e as
386 características oclusais , sono e dor de cabeça. *Rev assoc paul cir dent.* 2012;66(1):18–22.
387 Portuguese.
- 388 21. Clementino MA, Siqueira MB, Serra-Negra JM, Paiva SM, Granville-Garcia AF. The
389 prevalence of sleep bruxism and associated factors in children: a report by parents. *Eur*
390 *Arch Paediatr Dent.* 2017;18(6):399–404. doi: 10.1007/s40368-017-0312-x.
- 391 22. Alves CL, Fagundes DM, Ferreira Soares PB, Ferreira MC. Knowledge of
392 parents/caregivers about bruxism in children treated at the pediatric dentistry clinic.
393 *Sleep Sci.* 2019;12(3):185–189. doi: 10.5935/1984-0063.20190083.
- 394 23. Santos ECA, Bertoz FA, Pignatta LMB, Arantes F de M. Avaliação clínica de sinais e
395 sintomas da disfunção temporomandibular em crianças. *Rev Dent Press Ortod e Ortop*
396 *Facial.* 2006;11(2):29–34. Portuguese.

- 397 24. Nilner, M Lassing S. Prevalence of functional disturbances and diseases of the stomatognathic
398 system in 7-14 year olds. *Swed Dent J.* 1981;5(6):173–187.
- 399 25. Simões-Zenari M, Bitar ML. Fatores associados ao bruxismo em crianças de 4 a 6 anos. *Pro-*
400 *Fono.* 2010;22(4):465–472. Portuguese.
- 401 26. Shinkai RSA, Santos L de M, Silva FA e, Nobre dos Santos M. Contribuição ao estudo da
402 prevalência de bruxismo excêntrico noturno em crianças de 2 a 11 anos de idade. *Rev*
403 *Odontol da Univ São Paulo.* 1998;12(1):29–37. Portuguese.
- 404 27. Jorge MLR, Reis MCS, Serra Negra JMC. Como eliminar os hábitos de sucção não nutritiva?
405 *JBP, j bras odontopediatr odontol bebê.* 2000;3(11):49–54.
- 406 28. Gonçalves LPV, Toledo OA de, Otero SAM. Relação entre bruxismo, fatores oclusais e
407 hábitos bucais. *Dental Press J Orthod.* 2010;15(2):97–104. Portuguese.
- 408 29. Marks MB. Bruxism in allergic children. *Am J Orthod.* 1980;77(1):48–59. doi:
409 10.1016/0002-9416(80)90223-7.
- 410 30. Almeida-Leite C, Stuginski-Barbosa J, Conti P. How psychosocial and economic impacts of
411 COVID-19 pandemic can interfere on bruxism and temporomandibular disorders? *J Appl*
412 *Oral Sci.* 2020;28:e20200263. doi: 10.1590/1678-7757-2020-0263.
- 413 31. de Alencar NA, Leão CS, Leão ATT, Luiz RR, Fonseca-Gonçalves A, Maia LC. Sleep
414 **Bruxism and Anxiety Impacts in Quality of Life Related to Oral Health of Brazilian Children and their**
415 **Families.** *J Clin Pediatr Dent.* 2017;41(3):179-185. doi: 10.17796/1053-4628-41.3.179.
- 416 32. Santos T, Pintor A, Imparato JC, Tannure P. Controle do bruxismo do sono na infância:
417 Revisão de Literatura. *Rev Rede Cuid Saúde.* 2020;14(1):62–76. Portuguese.
- 418 33. Giannasi LC, Santos IR, Alfaya TA, Bussadori SK, Franco de Oliveira LV. Effect of an
419 occlusal splint on sleep bruxism in children in a pilot study with a short-term follow up. *J*
420 *Bodyw Mov Ther.* 2013;17(4):418–422. doi:10.1016/j.jbmt.2013.01.001.
- 421 34. Bulanda S, Ilczuk-Rypuła D, Nitecka-Buchta A, Nowak Z, Baron S, Postek-Stefańska L.
422 Sleep bruxism in children: Etiology, diagnosis and treatment—a literature review. *Int J*
423 *Environ Res Public Health.* 2021;18(18):9544. doi: 10.3390/ijerph18189544.
- 424 35. Valiente López M, van Selms MK, van der Zaag J, Hamburger HL, Lobbezoo F. Do
425 sleep hygiene measures and progressive muscle relaxation influence sleep bruxism?

426 Report of a randomised controlled trial. J Oral Rehabil. 2015;42(4):259-265. doi:
427 10.1111/joor.12252.

428

429 **ABBREVIATIONS**

430

431 **AB:** Awake bruxism

432 **GB:** Group with possible bruxism

433 **GC:** Control group

434 **OR:** Odds ratio

435 **PSG:** Polysomnography

436 **SB:** Sleep bruxism

437 **SPSS:** Statistical Package for Social Sciences

438 **TMD:** Temporomandibular disorder

439 **TMJ:** Temporomandibular joint