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Original Article

The Relationship Between Dental Occlusal Parameters and Bruxism in Preschool Children in Hamadan During Years 2016-2017

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Abstract

Background: Teeth bruxism and clenching are important parafunctional habits that have a high prevalence and can cause serious physical and mental complications. Its etiology, however, remains a challenging issue. Therefore, the present study was conducted to investigate the relationship between occlusal parameters and bruxism in 3- to 6-year-old children.

Methods: This study was conducted in a 3- to 6-year-old preschool children in Hamadan selected by random sampling. To do this, a questionnaire containing 6 standard and comprehensive questions was completed by parents. According to the data from the questionnaires, the children were divided into bruxers and nonbruxers (control). In the intra-oral clinical examination, the presence of facet, cross bite in the anterior or posterior, excessive overjet, open bite, deep bite and the type of dental occlusion on both sides were recorded. The statistical tests used were Spearman correlation coefficient and chi-squared test in SPSS 23.

Results: The findings showed that the prevalence of bruxism was 72% in the studied population. The most observable occlusions were flash terminal and mesial step on both sides. There was no significant relationship between bruxism and dental facet and the correlation of age and sex with bruxism was weak. There was no statistically significant relationship between the occlusal parameters, except for overbite, and bruxism.

Conclusions: The results showed that among occlusal factors, only normal overbite and openbite were significantly associated with bruxism.

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Background

The term bruxism was first introduced by Marie Pietkiewicz in 1907 (1). Bruxism is a parafunctional oral habit consisting of involuntary rhythmic non-functional grinding or clenching of teeth that occurs during sleep (2). However, habitual teeth grinding or teeth clenching usually occurs voluntarily during the wakening state and is defined as diurnal bruxism (3). Parafunctional habits are activities of the masticatory system that do not have functional aims and do not play a role in mastication, swallowing and speaking. These factors can result in excessive load on the masticatory system that can damage this system (4). Bruxism is a habit that begins in childhood and may continue until adulthood, causing severe physical and mental complications, including temporomandibular joint disorders (5,6). It has been reported that insomnia, respiratory problems, and snoring during sleep are associated with bruxism (7). Change in facial asymmetry, pain in masseter and temporal muscles, headache, mouth breathing, periodontal disease, teeth grinding and even loss of teeth are complications that may result from oral habit of bruxism (5,8,9). Various treatment modalities have been proposed for bruxism, including counseling to reduce stress and anxiety, using occlusal splints or night guards. However, drug therapy is not recommended for bruxism, although in patients who suffer from severe muscle pain and do not respond to other treatments, short-term use of analgesics can relieve the pain (10,11). This oral habit is highly prevalent during childhood, with varied rates (2%-40%) reported in different studies, and usually decreases with increasing age (12-14). Bruxism may serve as a behavioral indicator, or a sentinel marker,

Highlights

- There was no significant relationship between bruxism and dental facet.
- The correlation of age and sex with bruxism was weak.
- Only normal overbite and openbite were significantly associated with bruxism.

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for possible adverse health conditions among children and may be a signal that early health care intervention is needed. For example, studies indicate that children who brux are 2.4 times more likely to experience migraine than children who do not. This problem has been attributed to systemic factors such as intestinal parasites, subclinical nutritional deficiencies, allergies, and endocrine disorders as well as to local factors, especially malocclusion, and psychological factors such as stress and anxiety; however, there are contradictory viewpoints regarding its exact etiology (15). A study was conducted by Junqueira et al in children of preschool age (2-6 years old) with the purpose of evaluating the relationship between bruxism and terminal relationship of the primary second molars; the results showed that 29.3% of the children had bruxism, and children with a history of headache were more likely to have bruxism; however, there was no significant relationship between bruxism and terminal relationship of deciduous teeth (16). In a study conducted by Vieira-Andrade et al, the prevalence of bruxism and related factors was investigated in 749 children of pre-school age. The result of that study indicated that there was a relationship between crowding of mandibular teeth, habit of chewing non-food items, drinking milk from breast or bottle for a long time with bruxism in children of preschool age (17). Demir et al reported a relationship between occlusal factors and bruxism among children and adolescents aged 7-19, 12.6% of whom had bruxism, with equal prevalence in girls and boys. No significant relationship was observed between bruxism and occlusal factors, such as angle classification for molars, severity of anterior crowding, existence of anterior and posterior cross bite, open and deep bite, functional shift, and excessive overjet (3). Considering the fact that quantitative studies have been conducted on the relationship between dental malocclusions and bruxism, the study of the relationship between occlusal factors and bruxism is of high significance. To this end, the present study was conducted to examine this relationship.

Materials and Methods

In this cross-sectional study, after the Ethics Committee approved the protocol, children aged 3-6 years were randomly selected from the preschool children in Hamedan. The inclusion criteria were parental presence, having parental consent and lack of extensive decay lesions because of potential interference with biting. Exclusion criteria were tooth loss, the presence of dental anomalies, trauma, psychological disorders, cerebral palsy, auditory disabilities, visual impairments and mental impairments, which may prevent the child from cooperating properly (16). For each child, after clinical examinations and physical health confirmation, a questionnaire consisting of 6 standard and comprehensive questions was completed by their parents or guardians. The questions could indicate the presence or absence of bruxism in children (18) (Table 1). Parents were asked to pay attention to their child for 3 days and report the presence or absence of nocturnal bruxism (19). Parents who gave positive answer to 2 to 6 questions, their children were assigned to bruxism group (18). The data of the questionnaires were supplemented by clinical examinations (16). For clinical examination of intraoral occlusal factors for the signs of bruxism, instruments such as wear facets, tongue depressor, gloves and sterilized gas were used to remove debris and tooth drying. This examination was performed by a trained dentist in a room with sufficient natural light, in a way that the child was seated in front of the examiner. Depending on the presence or absence of wear facet on the teeth, the classification was performed as follows: Grade. 0: no apparent wear facet on the tooth; grade 1: presence of facet wear only on the enamel; grade 2: wear facet only apparent in enamel and dentin; grade 3: presence of were facet on cusp). According to the clinical examination, the children who had at least grade 2 or 3 of wear facets on at least four teeth, were considered to have obvious signs of bruxism (3). In this study, according to the data from the questionnaires, children who had bruxism symptoms were assigned to bruxism group. Children who did not have bruxism symptoms according to the questionnaire were categorized as control group.

Teeth cross bite can be evaluated in terms of dental arches length. According to the studies, the most posterior cross bites are due to the narrow maxillary arch (20). In the examinations, cross bite was assessed in the anterior or posterior. When one or more teeth are on one or both sides of the cross, cross bite was reported. Overjet or the extent of horizontal overlap of the maxillary central incisors over the mandibular central incisors was measured in millimeter. Excessive overjet in deciduous teeth is usually caused by non-nutritive sucking habits or skeletal imbalance between the upper and lower jaw. In this study, the overjet or horizontal difference (in millimeter) between the two anterior teeth (central or lateral teeth) from the level of the labial and lingual tooth of the mandible to incisal edge of the maxillary central incisor was studied by periodontal probe. Overjet greater than 3 mm was considered to be high overjet (21). Overbite, the vertical or overlap of the maxillary and mandibular primary incisors was recorded in millimeters or as a percentage of the total height of the mandibular

Table 1. Questionnaire for Detecting Bruxer Children

Have you heard your child grinding his/her teeth at night?
Is your child's jaw ever fatigued or sore on awakening in the morning?
Are your child's teeth or gums ever sore on awakening in the morning?
Does your child ever experience temporal headaches on awakening in the morning?
Does your child grind his/her teeth during the day?
Does your child clench his/her teeth during the day?

incisor crown (20). The subjects were divided into 3 groups according to the overbite or vertical overlap of their teeth: 1- Open bite group (lack of vertical overlap); 2- Deep bite group (overbite that has a full or close overlap with the lower incisors crown); and 3- An overbite that does not have an adequate amount to make a full coverage of lower incisor crowns. The normal overjet is equal to 2 mm for deciduous teeth (20). Then, the occlusion of each individual was examined on both sides (3). For classification of occlusion in the dentine system, the distal surface of deciduous second molar was used with closed mouth in maximum habitual intercuspation, which included vertical plane (flush terminal plane), mesial step (MS), and distal step (DS) (16). The relationship between the first permanent molars, during the first contact of occlusion during growth, was also divided into one of the following categories: Class I, Class II and Class III. Eventually, the relationship between bruxism and each of the occlusal factors in children was investigated. To do statistical analysis of data, first, frequency tables, columnar and circular diagrams, and appropriate statistical indices were used. To perform data analysis, statistical tests, Spearman correlation coefficient and chi-squared test in the SPSS version 23 were used.

Results

Among 266 children enrolled in the study, 51.5% were girls and the rest were boys. Regarding the occlusion of left and right sides, the most common abnormalities were related to flash terminal (FT), followed by MS. 255 (95.9%) of children did not show bruxism (dental facets) in clinical examinations. Children participating in the study aged 3-6 (mean: 5.085) years old. The majority of children were 5.5- 6 years (34.2%). According to the clinical examinations, 255 children did not have any facets, and out of the remaining 11 children, one child (4.0%) had 5 facets, 8 children (3%) had 6 facets and 2 children (0.8%) had 7 facets. Only 3 children (1.1%) had anterior cross bite and 5 children (1.9%) had posterior cross bite. 17 children (6.4%) had overjet greater than 3 mm. In clinical examinations, 33 children (12.4%) had deep overbite, 25 children (9.4%) had open bite and 208 children (78.2%) were normal. The age group with high frequency of bruxism was 5.5- 6 years, followed by the age group of 4.5- 5. Among people with bruxism, 93 people had left occlusion of FT type and 51 had MS type occlusion, and among people without bruxism, the most frequent observation was MS followed by FT. Moreover, 90 had right occlusion of FT type and 57 had MS type occlusion. Among people without bruxism, the most frequent observation was FT followed by MS (Table 2). According to the chi-squared test results, there was no significant relationship between left and right occlusion and bruxism [*P* value (left)=0.197, P-value (right)=0.781].

The chi-squared test was used to examine the relationship between bruxism and overbite. The results of chi-squared test indicated a significant relationship between bruxism and overbite (*P* value = 0.001**).** The relationship between the standardized normal distribution and chi-squared test is used in order to ensure the existence or lack of a significant relationship. Bonferroni correction was used to correct the type I error; therefore, the *P* values were compared with 0.0083. According to the results, there was a significant relationship between bruxism and normal bite/ open bite (*P* value [normal]=0.0002, *P* value [open] = 0.0052). There was no significant relationship between bruxism and deep bite (*P* value = 0.0315) (Table 3).

The chi-squared test was used to examine the relationship between bruxism and overjet. According to the result of the chi-squared test, there was no significant relationship between bruxism and overjet greater than 3 mm (*P* value =0.683) (Figure 1)**.**

According to the clinical examinations, 10 children had facets only on enamel (grade 1) and one child had facets on the cusp (grade 3). This result indicates that only one child had an obvious sign of bruxism from clinical perspective. According to the chi-squared test, there was no significant relationship between bruxism and facet (*P* value = 0.060).

Spearman correlation coefficient was used to investigate the relationship of bruxism with age and sex. Spearman correlation coefficient between bruxism and age was obtained 0.057, indicating a weak correlation, which was not statistically significant (*P* value = 0.356). The coefficient between sex and bruxism was also 0.035, indicating a weak correlation and not statistically significant (*P* value = 0.565).

Table 2. The Relationship Between Bruxism and the Type of Occlusion (Left/Right)

			Occlusion Type						Total
			MS	DS	FT	C1	C2	C3	
Bruxism	No	Left	30	2	26	12	3	1	74
		Right	22	2	34	10	5	1	
	Yes	Left	51	12	93	25	8	3	192
		Right	57	9	90	22	10	4	
Total		Left	81	14	119	37	11	4	266
		Right	79	11	124	32	15	5	

Abbreviations: MS, mesial step; DS, distal step; FT, flash terminal; C1, Class 1; C2, Class 2; C3, Class 3.

Table 3. The Post Hoc Test for the Relationship Between Bruxism and Overbite

			Bite Type			Total
			Deepbite	Openbite	Normalbite	
Bruxism	No	Number	4.00	1.00	69.00	74.00
		% within bruxism	5.41	1.35	93.24	100.00
		P value	0.0315	0.0052	0.0002	
	Yes	Number	29.00	24.00	139.00	192.00
		% within bruxism	15.10	12.50	72.40	100.00
		P value	0.0315	0.0052	0.0002	
Total		Number	33.00	25.00	208.00	266.00
		% within bruxism	12.41	9.40	78.20	100.00

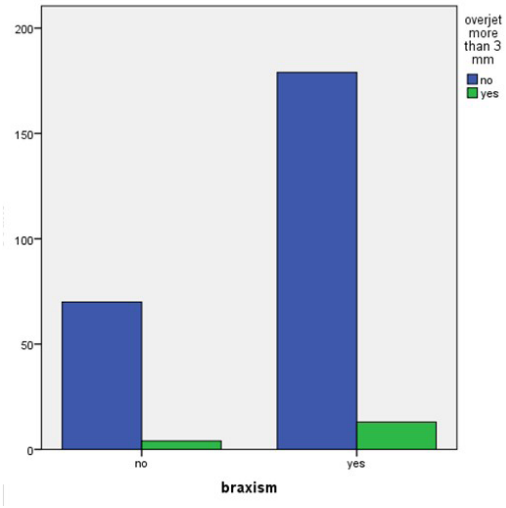

Figure 1. Frequency of Overjet.

Discussion

Parafunctional habits include behaviors such as bruxism, teeth clenching, biting the cheek, finger sucking, chewing hard objects, abnormal head posture, chewing gum, etc. If these habits are more than physiological strength, they can cause changes in the mandibular joint, muscles of mastication and teeth (22). Bruxism can begin in children after the first year of life along with the growth of incisors. The prevalence of bruxism is reported to be very high during childhood, which decreases over time and can even resolve spontaneously (23). In the present study, the prevalence of bruxism was obtained 72%. Bruxism has been reported to have a widely varied prevalence according to various studies, and using different diagnostic strategies, inappropriate selection of samples from the study population and physical and mental disease in the study population can challenge the accurate estimation of the bruxism prevalence. This has been widely accepted that temporomandibular joint disorder is multifactorial and a highly prevalent disorder in women (24). Thus, the study of gender differences in determining the relationship between the disorder and bruxism is of high significance. According to study conducted by Demir et al (3), there were no gender differences in the prevalence of bruxism. The results of this study indicated that there was a weak correlation between gender and bruxism (3). The study of Lam et al (25) on the age group of 9-8 years, and the study of Renner et al (26) on the age group of 9-11 years, showed a higher prevalence of bruxism among male children; in the study of Renner et al, a difference with respect to gender was observed in the studied samples (26). Tooth wear is one of the most significant clinical signs of bruxism (8). Tooth wear can lead to facets on the surface of teeth. Facets are deep glazed areas on the occlusal surface of the tooth, which, due to their shiny appearance, reflect light from these areas. Tooth wear is the result of exposure of the dentin due to the decreased enamel protection or loss of enamel, which can lead to dental sensitivity. Tooth wear can also be seen on the restored teeth (27).

In the present study, no significant relationship was observed between bruxism and dental facets, and only 11 children had clinical signs of bruxism. However, the studies of Xhonga and Pintado et al indicated that bruxism can cause tooth wear (27,28). Marbach et al (29) found that only 34.4% of the patients with self-reported bruxism showed evidence of tooth wear, and reported that not every signs of tooth wear necessarily indicates the presence of bruxism. Although the American Sleep Disorder Institute considers tooth wear as one of the criteria for severe bruxism, no relationship has yet been established between the severity of bruxism and tooth wear (30). Tooth wear is clinically important because it is a sign of bruxism (29). A study by Dettmar et al, indicated that the existence of tooth wear was somewhat dependent on the observer, and there was no relationship between the tooth wear grade and the level of electromyography activity of bruxism (31). As a general rule, the difficulty in measuring tooth wear, the complexity of bruxism activity pattern and different factors that can lead to tooth wear, make the investigation of the relationship between tooth wear and bruxism more challenging. Subjects who begin bruxing may not show signs of tooth wear, and using clinical sign of a dental facet may not be appropriate to assess the presence or absence of bruxism. In the present study, the highest frequency of right and left occlusion was obtained for FT followed by MS, as Yilmaz et al (32) in a study on 205 children aged 3-6 years, which

was consistent with this study, indicated that 77.9% of 6-year-old children had flash occlusion, 13.6% had MS, and 8.5% had DS. The study of Farsi and Salama (33) also indicated that 80% of the population had flash occlusion, while El Motayam and Elbardissy (34) in a study on 4-5 year-old Egyptian children indicated that the highest frequency of occlusion was obtained for MS (51.2%) and 41.1% for flash occlusion, which is probably due to racial differences. Meanwhile, no study has yet investigated the asymmetric molar ratio separately. The results of the present study indicated that no significant relationship was observed between the type of patient's occlusion and bruxism. Carra et al in a study that examined the craniofacial morphology and dental status in 7- to 17-year children, observed that more than 60% of those with nocturnal bruxism had Cl II occlusion and a small percentage of the subjects in this group had posterior cross bite compared to the control group (8). Henrikson et al also concluded that bruxism was frequent in a group with Cl II malocclusion compared to the normal group, suggesting that there is a relationship between parafunctional habits and orthodontic malocclusion (35). In a study on the relationship between occlusal factors and bruxism, Nilner concluded that there is a significant relationship between molar Cl II and Cl III, and bruxism (36). Carlsson showed that angle class II malocclusion and tooth wear in childhood predicted increased tooth wear in adulthood (37). In the study of Junqueira et al, the association between bruxism and the occlusal terminal relationship of the primary second molars was studied, and it was shown that there was no significant relationship between bruxism and occlusal terminal relationship of the primary second molars (16). Clarke also observed that the occlusal factors were not seemingly involved in etiology of bruxism (38). Furthermore, the results of Demir et al (3) indicated that there is no significant relationship between the type of malocclusion and bruxism in both mixed and permanent dentitions. In another study, Nilner (39) examined the relationship between occlusal factors and bruxism in 309 adolescents. The results of that study indicated a significant relationship between deep bite and tooth wear, while the results of present study indicate a significant relationship between normal/open bite and bruxism. Brandt et al (40) examined the relationship between morphologic malocclusion and bruxism in 1342 children and adolescents aged 6-17 years, and found a significant association between molar relationship, excessive overjet, overbite and bruxism. Sari and Sonmez (41) also found a statistically significant relationship between excessive overjet, negative overjet, open bite, and bruxism in permanent dentitions. Nilner (39) indicated that children with deep bite had less worn teeth than other children. In the present study, no significant relationship was found between excessive overjet and anterior and posterior cross bite, and bruxism. The difference between the results of this study and other studies could be due to the fact that the present study was conducted in the age group of 3-6 years, which is different from the age groups enrolled in the cited studies. Further studies with larger sample size are recommended to investigate the relationship between occlusal factors and bruxism.

Authors' Contribution

ME and ST designed and handled the study. FD and AA performed the experiments and wrote the manuscript with input from all authors and MM analyzed data statistically.

Ethical Statement

the Ethics Committee of Hamadan University of Medical Sciences approved the study(No. IR.UMSHA.REC.1396.141).

Conflict of Interest Disclosures

The authors declare that they have no conflict of interests.

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