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Original article

TOOTH WEAR IN CHILDREN - PREVALENCE, CLINICAL FEATURES AND RISK FACTORS

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ABSTRACT

Introduction: Pathological tooth wear in children with primary dentition can be a result of various harmful habits, risk factors and nocturnal bruxism. It is difficult to be distinguished from physiological tooth wear.

Aim: To study caries prevalence, tooth wear prevalence, its clinical characteristics and its relationship with bruxism in children aged 3 - 7 years.

Materials and methods: The object of the study are 222 children, divided into 5 age groups - from 3 to 7 years. The examined children underwent a clinical examination, during which the following were registered: dental status, caries prevalence, the type, degree and prevalence of tooth wear. Information on the presence and characteristics of nocturnal bruxism in the examined children was obtained from the parents. The results were statistically processed with SPSS-19.

Results: Tooth wear is found in more than 2/3 of the examined children (P<0.05). The highest average number of abraded teeth is present in 6- and 7-year-old children - about 7. Tooth abrasion affects 75% of canine teeth, 37.6% of incisors and 11.8% of molars in children aged 3-7 years. The predominant severity of wear is that in the inner ½ of the enamel (degree 1b) and occurs in 41.7% of children (P<0.05). 1/3 of the examined children have nocturnal bruxism (P<0.05). In almost 90% of them, tooth wear was found (P<0.05).

Conclusions: There is an increase in the severity of tooth abrasion with age in children between 3-7 years. Nocturnal bruxism is almost always accompanied by tooth wear.

Keywords: tooth wear, abrasion, attrition, nocturnal bruxism

INTRODUCTION

Tooth wear is a common finding in children, with epidemiological studies showing a prevalence of 21.5% to 81.2% [1, 2]. It has been found to be more common in incisors and canines than in molars [1-3]. Knight et al. conducted a longitudinal study, which found that tooth abrasion in childhood has a significant relationship with subsequent wear in adulthood, which suggests a similar etiology [4]. That is why it is important to identify it during childhood, as well as the factors associated with its occurrence and severity, in order to prevent damage to the permanent dentition [5].

"Tooth wear" is a term used in the literature to describe physiological wear as well as various forms of pathological loss of tooth surfaces. The loss of dental structures is usually divided into 4 types - attrition, abrasion, erosion and abfraction, often observed in combination [6-8]. When the loss of structures is widespread and affects the function of the dentition and/or creates discomfort, then it is assumed to be pathological wear [8, 9]. It has been found that the normal vertical loss of enamel as a result of physiological wear is about 30 - 65 μm / year [9-10].

One of the most common causes of tooth wear is bruxism [11-13]. It is considered a multifactorial parafunction that is controlled centrally rather than peripherally and has a complex and controversial etiology [14]. It is defined as a repetitive jaw-muscle activity characterized by clenching or grinding of the teeth and/or by bracing or thrusting of the mandible. Depending on the time of day in which it is observed, it is divided into awake bruxism and sleep/nocturnal bruxism [15].

Early diagnosis of tooth wear is important for discovering its etiology and accordingly applying the necessary treatment and prevention measures to limit the pathological loss of tooth structures. Therefore, in this study, the presence, type and extent of tooth wear were recorded during the clinical examination of the oral status of the enrolled children.

Aim

The aim of the present study is to investigate risk factors, frequency and clinical characteristics of tooth wear in children aged 3 - 7 years.

MATERIAL:

In the present study, we examined 222 children aged 3-7 years, attending 14 and 189 kindergartens in the city of Sofia. After completing a written informed parental consent approved by KENIMUS, the children underwent a thorough examination, and the parents were provided with a questionnaire to complete. Of all children, 162 returned completed questionnaires.

METHODS:

Clinical method

Clinical examination of the oral status of the enrolled children and registration on a specially developed

form, based on the approved one in the Department of Pediatric Dentistry (MU-Sofia), including:

- oral status and DMF (T + t) index;
- tooth wear registration – type, affected tooth surfaces and degree of wear.

The type of tooth wear was first registered using visual characteristics: 1) Erosion (chemical non-bacterial agents); 2) Attrition (function or parafunction); 3) Abrasion (foreign object); 4) Abfraction (occlusal overload) [6]. The level of wear was then marked by an additional index, the degrees of which are shown in Table 1. The highest registered degree in the dentition of each child was accepted as representative.

Questionnaire method

Table 1. Degrees of tooth wear and their characteristics [16]

Degree	Clinical characteristics
0	without wear
1à	minimal wear of the cusps and/or incisal edges
1b	visible reduction of the cusps and/or incisal edges in the enamel
2a	wear with loss of ≤1/3 crown length
2b	wear with loss of1/3–2/3 crown length
3	wear with loss of ≥ 2/3 crown length

A survey of 31 questions to study the risk factors for tooth wear and the grinding of teeth (bruxism) was completed by the parents, and the data from 162 surveys were statistically processed.

The statistical program IBM® SPSS® Statistics 19 was used for the statistical processing of the data. A 95% confidence interval (P<0.05) was chosen for the significance level at which the null hypothesis was rejected. Descriptive analysis, crosstables and Independent T-test were used.

RESULTS

1. Caries and tooth wear prevalence in the examined children

When studying the relationship between caries and tooth wear, the established results are shown in Table 2.

Table 2. Caries and tooth wear prevalence in the examined children

	N	DMF(T+t) Mean±SD	D(T+t) Mean±SD	M(T+t) Mean±SD	F(T+t) Mean±SD
Children without tooth wear	54	2.54±3.85	1.85±3.02	0	0.7±1.7
Children with tooth wear	168	4.01±4.81	2.91±3.7	0	1.26±2.24
Total	222	3.65±4.63	2.65±3.6	0	1.13±2.13
Ind T test		t = -2.042 P = 0.042	t = -1.901 P = 0.059		t = -1.625 P = 0.106

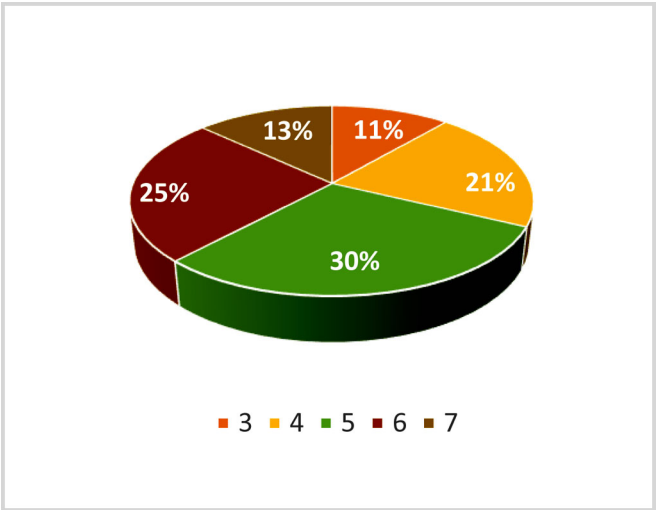
The data in the table shows that children with tooth wear have a significantly higher average value of the DMF(T+t) index (4.01) that those without tooth wear (2.54) (P<0.05), which is due to the higher frequency of decayed teeth in the group.

2. Prevalence and clinical characteristics of tooth wear

In the clinical examination of 222 children, it was found that 168 (75.7%) presented tooth wear (P <0.05). Attrition was found in 162 (96.4%) of them, and in the remaining 6 (3.6%) - a combination of attrition and erosion was found (P <0.05).

Figure 1 shows the relative share of children with tooth wear in different age groups.

Fig. 1. Relative share of children with tooth wear according to age



Tooth abrasion is relatively evenly distributed among children aged 4, 5 and 6 years and is less common in 3- and 7-year-olds, which is most likely due to the newly eruption of primary teeth (in the 3-year-olds) and the physiological loss of some of the primary teeth in the 7-year-old children.

The mean number of teeth with wear in the different age groups are presented in Table 3.

Table 3. Mean number of teeth with wear in the different age groups in children with tooth wear

Age	N - teeth with wear	Mean±SD	Ind T test
3 years	104	2.97±3.5	$t^{3,4}$= -2.96 p = 0.006
4 years	272	5.9±5.03	$t^{3,5}$ = -1.375 p = 0.172
5 years	283	4.04±3.89	$t^{3,6}$ = -3.965 p = 0.0001
6 years	350	7.14±5.47	$t^{3,7}$ = -3.786 p = 0.0001
7 years	148	6.72±3.88	$t^{4,5}$ = 2.25 p = 0.026
Total	1157	5.21±4.7	$t^{4,6}$ = -1.138 p = 0.26
			$t^{4,7}$ = -0.67 p = 0.506
			$t^{5,6}$ = -3.613 p = 0.0001
			$t^{5,7}$ = -2.824 p = 0.006
			$t^{6,7}$ = 0.321 p = 0.75

The mean number of abraded teeth is around 5 teeth. There is an increase in the number of affected teeth with age, as most were registered in 6-7 year olds - an average of 7 teeth.

The distribution of tooth wear in the different groups of teeth is presented in Table 4.

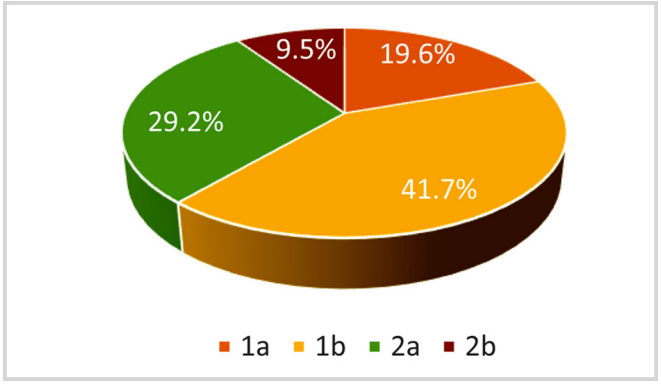
Table 4. Distribution of tooth wear in the different groups of teeth

Groups	Teeth with wear		Teeth without wear		Total	
	N	%±SP	N	%±SP	N	%
Incisors[1]	505	37.6±1.32	839	62.4±1.32	1344	100%
Canines[2]	504	75±1.67	168	25±1.67	672	100%
Molars[3]	158	11.8±0.88	1186	88.2±0.88	1344	100%
Statistics	$t^{1,2}$ = 17.57 P< 0.05; $t^{1,3}$ = 16.27 P< 0.05; $t^{2,3}$ = 33.51 P< 0.05					

The canine teeth are most often affected by tooth wear – in 75% of them. The loss of dental structures in the group of the incisors was in 37.6% of them, while in molars - only in 11.8% (P <0.05).

The distribution of teeth with wear according to the degree of severity is shown in Figure 2.

Fig. 2. Relative share of teeth with abrasion, distributed according to the severity of the wear



In half of the children, there is wear in enamel, predominant in its inner half. In other children, the wear occurs mainly in the initial third of the dentin, and only in 16 children (9.5%), the process is advanced to 2/3 of the dentin.

When studying the relationship between the degree of abrasion and age, the following results were found, shown in Table 5.

Table 5. Severity of tooth abrasion in different age groups

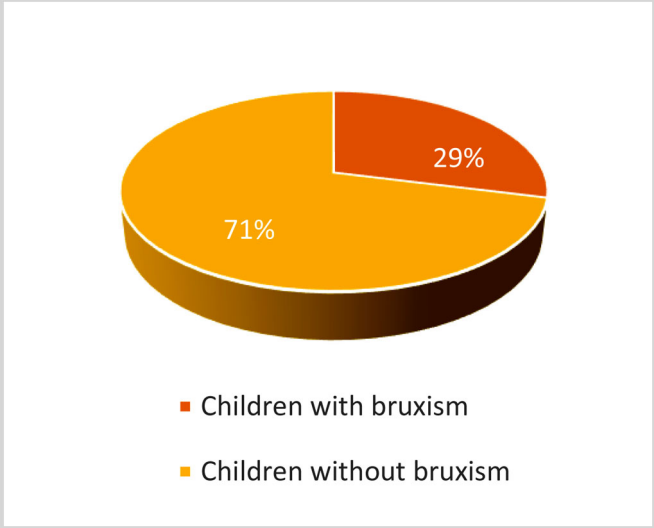
Severity	3 years[1]		4 years[2]		5 years[3]		6 years[4]		7 years[5]	
	N	%±SP	N	%±SP	N	%±SP	N	%±SP	N	%±SP
1a	11	57.9±11.3	11	31.4±7.9	5	10±4.2	6	14.3±5.4	0	0
1b	7	36.8±11.1	10	28.6±7.6	29	58±7	11	26.2±6.8	13	59.1±10.5
2a	1	5.3±5.1	10	28.6±7.6	16	32±6.6	19	45.2±7.7	3	13.6±7.3
2b	0	0	4	11.4±5.4	0	0	6	14.3±5.4	6	27.3±9.5
Total	19	100%	35	100%	50	100%	42	100%	22	100%

The severity of tooth abrasion, according to the age of children, shows that with age, it increases in degree. It is predominating in the enamel in 3 year old children, includes the surface of dentin in 4 year olds. As for 5 and 6 year olds, it mainly affects dentin. With age, the cases with involvement of up to 2/3 of the clinical crown increase.

3. Nocturnal bruxism and tooth wear

The frequency of children with bruxism from all examined cases, according to anamnestic data from the mother, is presented in Figure 3.

Fig. 3. Frequency of bruxism in the studied children



It was found that out of 162 examined children, bruxism was reported in 47 (29%) of them (P <0.05).

When studying the relationship between bruxism and tooth wear, the established results are presented in Figure 4.

In 89% of the children with bruxism tooth wear is present, which shows that tooth abrasion largely accompanies nocturnal bruxism, but there are also children with loss of tooth structure as a result of other possible risk factors (P<0.05).

Fig. 4. Frequency of children with tooth wear in children with bruxism

DISCUSSION

In our study, we found that children with tooth wear have a higher caries prevalence than children without abrasion (P <0.05). It was found that 75% of the examined children presented tooth wear. Abrasion of incisors is found in 37.6% of them, of canine teeth - in 75% of them, and of molars - in 11.8% of them. In a study from 2012, it was found that the frequency of tooth wear is 98.4%, and it is most common in the canines - 83.2% [17]. Rios et al. found similar results, respectively for incisors - 34.8%, for canine teeth - 78.1% and for molars - 40.7%, but in a group of only 6-year-old children [18]. Another similar study also confirmed that the highest incidence of abrasion was found in incisors and canines [19].

In the present study, we obtained data on bruxism from 162 children, and 47 (29%) of them confirmed to have bruxism (P<0.05). 89% of children with bruxism have tooth wear (P<0.05). This shows that this parafunction is closely related to tooth abrasion, but not every wear is a consequence of bruxism. The causes of tooth wear are varied, and the distinction between their different forms is particularly important from a clinical point of view. [5, 7, 16].

In the analysis of the results of the present clinical study, we found a statistically significant relationship between bruxism and tooth wear in children. Most similar studies have also confirmed the link between bruxism and

abrasion [6, 8, 13, 18]. While in other studies, such a relationship is not confirmed [20].

CONCLUSIONS

1. In 2/3 of children aged 3-7 years, tooth wear is observed, and the caries prevalence of these children is higher than the average for the same age.

2. Tooth wear affects 75% of the canine teeth, 37.6% of the incisors and 11.8% of the molars in children 3-7 years of age with tooth wear.

3. There is an increase in the severity of tooth wear with age in children from 3-7 years of age.

4. Nocturnal bruxism occurs in 29% of children aged 3-7 years, and in most of them, it is combined with tooth wear.

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