Cumhuriyet Dental Journal, 28(3): 310-314, 2025
DOI: https://doi.org/10.7126/cumudj.1611423

Cumhuriyet Dental Journal

| cdj.cumhuriyet.edu.tr | Founded: 1998 Available online, ISSN: 1302-5805 Publisher: Sivas Cumhuriyet Üniversitesi

Prevalence of Tooth Wear and Orthodontic Anomalies in School-Age Children

Marianna Atanasova Dimitrova[1,a,*], Nadezhda Georgieva Mitova[1,b], Dimitar Nikolaev Kosturkov[2,c], Valentina Svetozarova Petkova-Ninova[1,d], Giuseppe Varvara[3,e]

[1]*Department of Pediatric Dentistry, Faculty of Dental Medicine, Medical University, Sofia, Bulgaria.*
[2]*Department of Conservative Dentistry, Faculty of Dental Medicine, Medical University, Sofia, Bulgaria.*
[3]*Department of Innovative Technologies in Medicine & DentistryUniversity "G. d'Annunzio" of Chieti-Pescara, Chieti, Italy.*
**Corresponding author*

Research Article

History

Received: 02/01/2025
Accepted: 20/06/2025

ABSTRACT

Objectives: Tooth wear is typically a physiological process with multifactorial etiology. When it progresses rapidly and leads to visible or functional changes, it becomes pathological. Although more common in adults, tooth wear can also be observed in children. This study aimed to assess the prevalence and clinical characteristics of tooth wear in school-aged children and examine its association with orthodontic anomalies.

Materials and Methods: The study included 262 children, divided into two age groups: 7-10 years (elementary school) and 11-14 years (middle school). The examined children underwent a clinical examination, during which the following were registered: dental status, type, degree and prevalence of tooth wear and orthodontic malocclusions. After the examination, the parents of the examined children filled a questionnaire about the child's general health, eating habits, bruxism, harmful habits, etc. The results were statistically processed with SPSS-19. No power analysis was performed, but the sample size was based on similar literature.

Results: Tooth wear was found in 70.6% of the examined. It was more frequent in elementary school children (74.2%) and significantly more prevalent in boys ($p < 0.05$). Orthodontic anomalies were present in 66.4% of participants, with deep bite and overjet being the most common. A statistically significant association between tooth wear and orthodontic anomalies was identified ($p < 0.05$).

Conclusions: Tooth wear is common in school-age children, particularly in those with orthodontic anomalies such as deep bite and overjet. These findings emphasize the importance of early diagnosis and orthodontic evaluation during the mixed dentition phase.

***Keywords*:** Tooth wear, orthodontic anomalies, deep bite, overjet, childhood.

[a] *drmatanasowa@gmail.com* *0000-0002-9069-1073*
[b] *n.mitova@fdm.mu-sofia.bg* *0000-0003-4716-7724*
[c] *dkosturkov@gmail.com* *0000-0002-8302-300X*
[d] *petkova_valentina@yahoo.com* *0009-0003-7041-9923*
[e] *gvarvara@unich.it* *0000-0002-7501-0794*

How to Cite: Atanasova Dimitrova M, Georgieva Mitova N, Kosturkov DN, Petkova-Ninova VS, Varvara G. (2025) *Prevalence of Tooth Wear and Orthodontic Anomalies in School-Age Children*, Cumhuriyet Dental Journal, 28(3): 310-314.

Introduction

Tooth wear in childhood is a common finding that has a multifactorial etiology and can be both physiologic and pathologic.[1] It represents the superficial loss of mineralized tooth structures due to physical or chemical-physical processes not related to dental caries.[2-5] Several multicentric studies and systematic reviews have reported a prevalence of tooth wear ranging from 29-60%. The variance in data is due to the different methods used to quantify the loss of structures and the examination of various age groups.[7-13] Gatou et al. found lack of attrition in only 1.6% of the children they studied.[14]

Tooth wear is found in different forms, depending on the mechanism by which it occurs-erosion, attrition, abrasion or abfraction, occurring independently or in combination. Attrition is the abrasion between two tooth surfaces. Erosion is the result of acid dissolution of the hard tooth tissues-the cause can be extrinsic (diet, medication, environment) or intrinsic acids (gastric fluids). Abrasion of tooth surfaces is caused by externally acting factors or objects, most commonly by harmful habits.[2,14]

The loss of tooth structures occurs over time due to tooth function.[7] Attrition is assumed to be the physiological abrasion of tooth surfaces upon contact during function, but when it occurs too rapidly due to parafunctional habits such as bruxism, traumatic occlusion, hard food diet, orthodontic anomalies, etc. it is referred to as pathological.[4-6,15]

Tooth wear is common in patients with orthodontic anomalies. Warrent et al. found that mild attrition is universal to all primary teeth, but different types of malocclusion can result in a predominance of tooth structure loss in different areas of the dentition.[14] Differences in attrition patterns are also found in specific types of Class II occlusions due to the particular relations between the teeth.[16] The loss of dental structures is often a multifactorial phenomenon, therefore, when examining the patient, both clinical findings of attrition, orthodontic status and anamnestic data

related to the patient's diet, habits and parafunctions should be taken into account.

The aim of the present study is to investigate the incidence and clinical characteristics of tooth wear in school-aged children and its association with orthodontic anomalies. The objectives are:

1. To study the prevalence of tooth attrition in school-aged children,
2. Investigating the prevalence of a common risk factor associated with tooth attrition-orthodontic anomalies.

Materials and Methods

In the present study, we examined 262 children aged 7-14 years attending Nikolai Petrini Primary School and Hristo Smirnenski Primary School in Yambol. The children were included in the study after obtaining their parents' written consent. It was based on an ethical approval from KENIMUS – Ethical commission of Medical University of Sofia – 35/09.06.2023. The children were selected randomly following CONSORT guidelines and according to the following criteria:

- Age – 7 to 14 years;
- Completed informed consent and questionnaire by the parents;

The children were divided in two groups for the purpose of the present study: in elementary school (aged 7-10) and in middle school (aged 11-14). No power analysis was performed, but the sample size was based on similar literature.

Clinical Method

Children underwent a clinical examination of the oral status and the degree of loss of dental structures. Registration of the findings was done on a specially developed card, based on the approved one in the Department of pediatric dentistry in the Faculty of Dental Medicine, Sofia. Additional items have been added, in relation to the specific study, for the registration of dental attrition.[17]

Tooth wear was recorded on both primary and permanent teeth based on visual identification of wear type. The degree of tooth structure loss was then assessed using a grading index with the following categories: 0 – no loss; 1a – minimal loss of cusps and incisal edges; 1b – visible reduction of cusps and incisal edges in enamel; 2a – tooth wear with loss of coronal length ≤ 1/3; 2b – tooth wear with loss of coronal length of 1/3-2/3; 3 – tooth wear with loss of coronal length ≥ 2/3.[17] The clinical method finished with registration and assessment of the orthodontic status.

Questionnaire method

The questionnaire method is used to investigate various diseases and/or harmful habits related to tooth grinding. It included questions towards the parents of the studied children regarding: 1) Oral hygiene habits; 2) Eating habits; 3) Bruxism; 4) Harmful habits.

IBM® SPSS® Statistics 19 statistical program was used for statistical processing of the results. A 95% confidence interval ($p < 0.05$) was selected as the significance level at which the null hypothesis was rejected. Descriptive analysis, cross-tabulations and t-criteria were used.

Results

Prevalence of Tooth Wear

During the clinical examination of the studied children, the following prevalence of tooth wear was found in different age groups:

Table 1. Prevalence of tooth wear according to age group

Children	With tooth wear		Without tooth wear		Total	
Age	N	%	N	%	n	%
Elementary school	98	74.2%	34	25.8%	132	100%
Middle school	87	66.9%	43	33.1%	130	100%
Total	185	70.6%	77	29.4%	262	100%
$\chi^2 = 1.36$, df = 1, $p = 0.244$						

Tooth wear was more frequently observed in children from the elementary school group (74.2%) compared to middle school (66.9%). However, the difference was not statistically significant ($\chi^2 = 1.36$, df = 1, $p = 0.244$), suggesting that age group was not a major determinant of tooth wear in this sample.

When examining tooth wear depending on gender, the following results were found, presented in Table 2.

Tooth wear was significantly more prevalent among boys (56.2%) than girls (43.8%). The association between gender and the presence of tooth wear was statistically significant ($\chi^2 = 4.92$, df = 1, $p = 0.027$), indicating a possible gender-related susceptibility.

Table 2. Prevalence of tooth wear according to gender

Children	With tooth wear		Without tooth wear	
Gender	N	%	N	%
Male	104	56.2%	31	40.3%
Female	81	43.8%	46	59.7%
Total	185	100%	77	100%
$\chi^2 = 4.92$, df = 1, $p = 0.027$				

Tooth Wear and Orthodontic Anomalies

In the presence of an orthodontic anomaly, uneven tooth wear is possible due to the specific occlusion between tooth surfaces. The distribution of the presence or absence of an orthodontic anomaly in the examined children is presented in Table 3.

Orthodontic anomalies were found in 66.4% of the children, a significantly higher proportion than would be expected by chance ($\chi^2 = 28.23$, df = 1, $p < 0.001$). This highlights the high prevalence of malocclusion in the examined pediatric population. While examining the patients, we found the following: overjet, deep bite, crossbite, edge-to-edge bite, crowding or misplaced midline.

Table 3. Frequency of orthodontic anomalies in the studied children

Children	N	% ± SP
Without anomalies	88	33.6 ± 2.9
With anomalies	174	66.4 ±2.9
Total	262	100%
$\chi^2 = 28.23$, df = 1, $p < 0.001$		

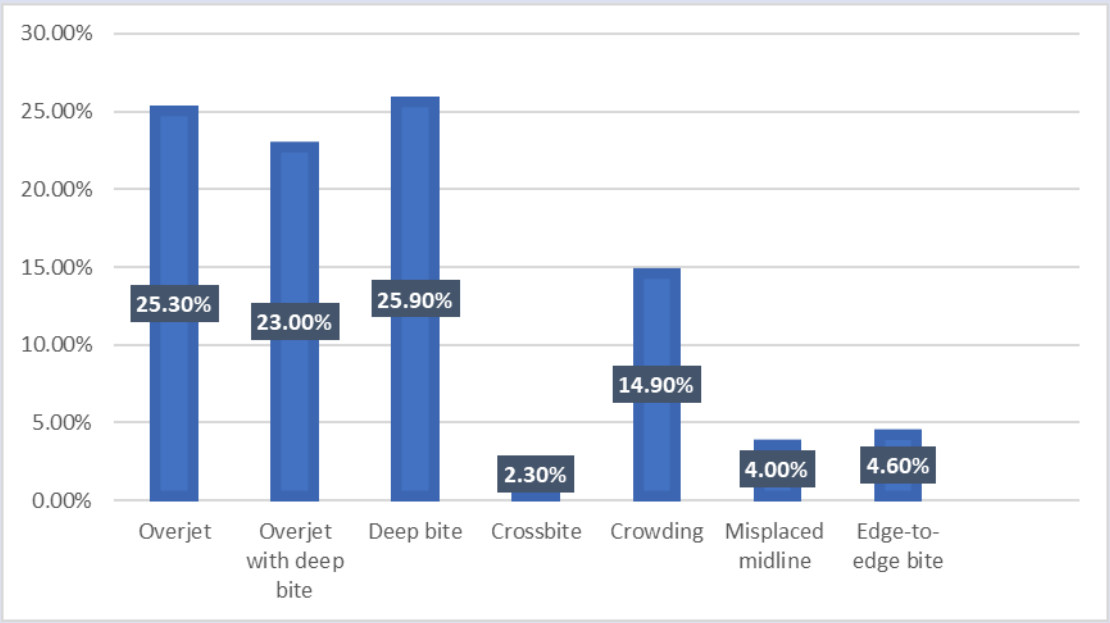

Figure 1. Distribution of types of orthodontic anomalies in the studied children.

The distribution of the different types of anomalies, in children with identified such, is presented in Figure 1.

The chart shows that the deep bite has the highest frequency - in more than 1/5 of children with anomalies, followed by overjet, overjet with deep bite and crowding of teeth.

When examining the relationship between the presence of an orthodontic anomaly and tooth wear, the following results are found, shown in Table 4.

Among children with orthodontic anomalies, 75.3% also exhibited tooth wear. The relationship between orthodontic anomalies and tooth wear was highly statistically significant ($\chi^2 = 44.51$, df = 1, $p < 0.001$), supporting the hypothesis that specific malocclusions may contribute to increased dental attrition.

Table 4. Relationship between the presence of an orthodontic anomaly and tooth wear

	Children with an orthodontic anomaly	
	N	% ± SP
Without tooth wear	43	24.7 ± 4.1
With tooth wear	131	75.3 ± 4.1
Total	174	100%
$\chi^2 = 44.51$, df = 1, $p < 0.001$		

Discussion

After a comprehensive examination and study of the obtained data from 262 children, it was found that 70.6% of them had tooth wear ($p < 0.05$). The analysis of the different age groups showed that children in elementary school had loss of tooth structure more often – 74.2% ($p > 0.05$). Children in whom tooth wear was not registered were 29.4%, of whom those in middle school predominated slightly ($p > 0.05$) [Table 1]. In a 2021 study of a group of children aged 2-12 years, scientists found a prevalence of tooth wear of 69.4% and also observed an increasing trend with age, unlike the current study.[18] Fung et al.[19] found that in the children they studied from 6 to 12 years of age, the prevalence of the loss of dental structures was 66%.

According to the present study, there is a statistically significant difference in the prevalence of tooth wear in girls and boys, showing higher rate in males ($p < 0.05$) [Table 2]. There are studies in the literature that find a prevalence in boys,[13,19-21] as this can be explained by the effect of testosterone, which is in a higher level in them.[21] No gender predominance is found in other publications.[22]

Orthodontic anomalies occur in 66.4% of the examined children [Table 3]. Such a high frequency causes disturbed occlusal contacts of teeth in these children, which can be the cause of a greater prevalence of tooth wear.[14,22] In a systematic review from 2024, Chen et al. found that the prevalence of malocclusion was highest in Asia at 61.81%, followed by Europe at 61.5%, South America at 52.69%, and lowest in Africa at only 32.5%.[23] A publication by Hungarian researchers reported a 70.4% incidence of orthodontic malocclusions.[24] The most common anomalies we found in the present study were deep bite and overjet, followed by the same combined [Fig.1]. This confirms the thesis that dental attrition is found in the presence of an orthodontic anomaly due to specific occlusion between teeth. A similar finding is also confirmed by the analysis of Chen et al.[23] in which overjet and deep bite are indicated as the most common anomalies, with 33.08% prevalence of deep bite in Europe. Another similar systematic review indicates a frequency of deep bite in mixed dentition of 24.34%, and of overjet – 23.01%, and as for permanent teeth, the values are 21.98% and 20.14%, respectively.[25]

When studying the relationship of tooth wear with the orthodontic status of patients, we found that in 75.3% of the children with orthodontic anomalies, dental attrition was also present (Table 4). Other studies also confirm the positive relationship between the examined factors.[14,22,26] These findings should direct the attention of clinicians to look for tooth wear in children and its possible etiology, which can often be an orthodontic malocclusion. Of course, the loss of dental structures is multifactorial and cannot be explained solely by the influence of one cause in each patient. It can also be the result of bruxism, brushing method, eating habits, harmful habits.[4,6,15,19,27] There should be further research on the cause of tooth wear in children and the ways to identify whether it is pathological of physiological, depending on the additional present risk factors, age, degree of wear, etc.

Conclusions

Tooth wear was observed in 70.6% of the examined school-aged children, indicating it is a highly prevalent condition during the mixed dentition period. Boys were significantly more affected than girls. Orthodontic anomalies were identified in 66.4% of the children, with deep bite and overjet being the most common. A statistically significant association was found between the presence of orthodontic anomalies and tooth wear ($p < 0.05$). These findings underscore the importance of early detection, orthodontic assessment, and preventive strategies to mitigate the risk of progressive tooth structure loss during growth and development.

Acknowledgements

This publication is part of a study, funded by the Project 101071321-BI4E-HORIZON-WIDERA-2021-ACCESS-05

Conflicts of Interest Statement

The authors declare that they have no competing interests.

References

1. O'Sullivan E. Tooth wear in children: prevalence, presentation and prevention. Dent Update 2023;50(10):884-889.
2. FDI General Assembly. (2023, September). Tooth wear policy statement. Sydney, Australia.
3. Field J, Walls A, Steele J, Wassell R. Recognising Tooth Surface Loss. In: Extra-Coronal Restorations. Springer, Cham, 2019. p. 67-74.
4. Johnson GK, Sivers JE. Attrition, abrasion and erosion: Diagnosis and therapy. Clin Prev Dent 1987;9:12–16.
5. Smith BGN. Toothwear: Aetiology and diagnosis. Dent Update 1989;16:204–212.
6. Hattab FN, Yassin OM. Etiology and Diagnosis of Tooth Wear: A Literature Review and Presentation of Selected Cases. Int J Prosthodont 2000;13(2):101-107.
7. Bartlett D, O'Toole S. Tooth Wear: Best Evidence Consensus Statement. J Prosthodont. 2021;30:20-25.
8. Bartlett DW, Lussi A, West NX, Bouchard P, Sanz M, Bourgeois D. Prevalence of tooth wear on buccal and lingual surfaces and possible risk factors in young European adults. J Dent 2013;41:1007-1013.
9. Awad MA, El Kassas D, Al Harthi L, Abraham SB, Al-Khalifa KS, Khalaf ME, Al Habashneh R, Bartlett D. Prevalence, severity and explanatory factors of tooth wear in Arab populations. J Dent 2019;80:69-74.
10. Sun K, Wang W, Wang X, Shi X, Si Y, Zheng S. Tooth wear: a cross-sectional investigation of the prevalence and risk factors in Beijing, China. BDJ Open 2017;3:16012.
11. Van 't Spijker A, Rodrigues JM, Kreulen CM, Bronkhorst EM, Bartlett DW, Creugers NH. Prevalence of Tooth Wear in Adults. Int.J.Prosthodont. 2009;22:35-42.

12. Zhang Q, Witter DJ, Bronkhorst EM, Bartlett DW, Creugers NH. Occlusal tooth wear in Chinese adults with shortened dental arches. J Oral Rehabil 2014;41:101-107.
13. Gatou T, Mamai-Homata E. Tooth wear in the deciduous dentition of 5-7-year-old children: risk factors. Clin Oral Investig 2012;16(3):923-933.
14. Warren JJ, Yonezu T, Bishara SE. Tooth wear patterns in the deciduous dentition. Am J Orthod Dentofacial Orthop 2002;122(6):614-618
15. Khan F, Young WG. The multifactorial nature of toothwear. Toothwear: The ABC of the Worn Dentition 2011, 1-14
16. Agnani S, Bajaj K, Mehta S, Pandey L. Tooth wear patterns in subjects with class II division 1 and class II division 2 malocclusion. Int J Adolesc Med Health. 2021;33(4): 20180227
17. Wetselaar P, Lobbezoo F. The tooth wear evaluation system: a modular clinical guideline for the diagnosis and management planning of worn dentitions. J Oral Rehabil 2016;43(1):69-80.
18. Dahal S, Poudel P, Pradhan M, Mainali B. Tooth Wear and Associated Factors in School Children with Primary Dentition in Kathmandu Valley. J Nepal Health Res Counc 2021;18(4):637-643.
19. Fung A, Brearley Messer L. Tooth wear and associated risk factors in a sample of Australian primary school children. Aust Dent J 2013;58(2):235-245.
20. Harding MA, Whelton HP, Shirodaria SC, O'Mullane DM, Cronin MS. Is tooth wear in the primary dentition predictive of tooth wear in the permanent dentition? Report from a longitudinal study. Community Dent Health 2010;27(1):41-45.
21. Buchhardt J, Kiess W, Körner A, Biemann R, Hirsch C, Child Study Team L. The Influence of Steroid Hormones on Tooth Wear in Children and in Adolescents. J Clin Med. 2022;11(13):3603.
22. Grzegocka K, Williams S, Loster J, Wieczorek A, Loster B. Relationship between occlusion and dental attrition in a group of young Polish adults. J Stomatol 2016;69(3):285-294.
23. Chen H, Lin L, Chen J, Huang F. Prevalence of Malocclusion Traits in Primary Dentition, 2010–2024: A Systematic Review. Healthcare 2024;12(13):1321.
24. Gábris K, Márton S, Madléna M. Prevalence of malocclusions in Hungarian adolescents. Eur J Orthod 2006;28(5):467-470.
25. Alhammadi MS, Halboub E, Fayed MS, Labib A, El-Saaidi C. Global distribution of malocclusion traits: A systematic review. Dental Press J Orthod 2018;23(6):40.e1-40.e10.
26. George SA, Felicita AS, Kareem N. Presence of occlusal wear facets in patients with a deep bite in patients with skeletal class I malocclusion in different gender. J Pharm Negative Results. 2022; 13(4):1219–1226.
27. Dahal S, Poudel P, Pradhan M, Mainali B. Tooth Wear and Associated Factors in School Children with Primary Dentition in Kathmandu Valley. J Nepal Health Res Counc 2021;18(4):637-643.