

Assessment of Oral Health in Patients Referred for an Orthodontic Examination to the Orthodontic Department of the Sarajevo Faculty of Dentistry

SUMMARY

Background/Aim: The objective of this research was to evaluate the level of oral hygiene, the prevalence of caries, and the condition of the soft tissues in children and adolescents referred for their first orthodontic examination. **Material and Methods:** The research was conducted at the Department of Orthodontics of Sarajevo University – at the Faculty of Dentistry with the Dental Clinical Center. A total of 300 patients with mixed and permanent dentition who were referred for their first orthodontic examination were included in the study. The patients were offered to sign a Letter of Informed Consent for this study. All patients were assigned a Decayed, Missing, and Filled Teeth (dmft/DMFT) index. Periodontal indices were evaluated on all first permanent molars and all permanent central incisors. The periodontal indices included the determination of PI, CI, GI, PBI. **Results:** The results were processed with the application of standard statistical methods, by using the SPSS computer program for statistical analyses (SPSS-Statistical Package for Social Sciences) Version 21.0. The results of this study show a high dmft and DMFT indices in patients referred for orthodontic examination. The dmft index value in the respondents with mixed dentition was 3.0 (1.0 – 6.0). The DMFT index value in the respondents with permanent dentition was 4.0 (0.0 - 6.0), while in the respondents with mixed dentition, it was 1.0 (0.0 - 3.0). Our research also shows that out of 300 patients referred to an orthodontist for their first orthodontic examination, 250 of them (83.33%) have demonstrated an increased value of the Plaque index. **Conclusions:** The results of this research should be peculiarly alarming for pedodontists and general dentists, cautioning them to implement caries prevention measures more intensively and make referrals to an orthodontist only in case of those patients who have been cured previously.

Keywords: Orthodontic Patients, Dmft/DMFT Index, Periodontal Indices

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Introduction

Diseases of the oral cavity are among the most common health problems. They include diseases such as dental caries and periodontal diseases and they affect all populations and all age groups. Both kinds of infections have a multifactorial etiology, whereas poor oral hygiene and the resulting accumulation of plaque play a major role

in terms of both the onset of caries and the development of periodontal diseases¹.

Dental caries is one of the most common diseases in children worldwide^{2,3,4,5}. If not treated in a timely fashion, it can cause various problems, such as e.g. eating, speech, and social interaction disorders. Caries in children under the age of 6 is also known as early childhood caries. The prevalence of caries in early childhood is recorded in almost 30-60% of preschool children globally^{6,7}.

Malocclusions caused by various consequences of tooth decay, particularly by those of early childhood caries, require an increased need for restorative and orthodontic therapeutic interventions, while an obvious example where such interventions are necessary is the lack of space for alignment of the permanent lateral teeth⁸.

The role of general dentists is of major importance in the prevention of various malocclusions caused by the loss of space due to caries⁹. Before any active orthodontic treatment, it is necessary that the patient has established satisfactory levels of oral hygiene and cured all carious lesions, both on deciduous and permanent teeth¹⁰. Nevertheless, patients with active caries who have been referred to the orthodontist office are encountering this problem ever increasingly. If the teeth are not healed, anchorage of an orthodontic appliance will not be made possible. In addition, if caries lesions were possibly covered with parts of a fixed orthodontic appliance, an anaerobic environment would lead to progressive tooth destruction as a result of dental caries¹¹.

The purpose of this study was to assess the oral health condition in the patients referred to an orthodontist. The objective of this research was to evaluate the level of oral hygiene, the prevalence of caries, and the condition of the soft tissues in children and adolescents referred for their first orthodontic examination.

Material and Methods

The research was conducted at the Department of Orthodontics of Sarajevo University – at the Faculty of Dentistry with the Dental Clinical Center. The study was carried out for a period of 6 months and included all patients who were referred for their first orthodontic examination during that period.

Patients with exclusively deciduous dentition were excluded from further analysis. Before the examination, all patients were informed about the method and purpose of this research and were offered to sign a Letter of Informed Consent. For minor patients, the informed consent was signed by the child's parent or guardian.

This research was approved by the Committee for Ethics of the University of Sarajevo – at the Faculty of Dentistry with the Dental Clinical Center. All patients were examined during the first visit to the orthodontic office. Clinical examination was performed under artificial light, by using a dental mirror and a dental probe. All teeth and soft tissues were examined, and the patient's status was recorded in the patient dental treatment record. The patients were examined according to the World Health Organization recommendations, and all researchers in the team were trained and calibrated according to the same recommendations.

All patients were assigned a Decayed, Missing, and Filled Teeth (dmft/DMFT) index. The caries diagnosis was made according to the World Health Organization recommendations. Periodontal indices were evaluated on all first permanent molars and all permanent central incisors. The clinical examination runs to determine the periodontal indices included the determination of: Silness-Löe plaque index (PI) – as a score within the range from 0 to 3, to quantify the presence of dental biofilm, Silness-Löe calculus index (CI) – as a score within the range from 0 to 3, to quantify the presence of supragingival and subgingival concretions, Silness-Löe Gingival Index (GI) – as a score within the range from 0 to 3, to quantify the degree of inflammation and alteration of the superficial periodontium, and Papilla Bleeding Index (PBI) – as a score within the range from 0 to 4, to quantify the presence and intensity of bleeding in the gingiva provoked by the probe. Williams periodontal probe was used to determine the periodontal indices.

Results

The results were processed with the application of standard statistical methods, by using the SPSS computer program for statistical analyses (SPSS-Statistical Package for Social Sciences) Version 21.0. The results are featured as the mean (\bar{X}) score and the standard deviation (SD), but also as the median value and the interquartile range (25-75 percentile). The Kolmogorov-Smirnov test was used to test the extent to which the difference in deviation from the normal distribution is found to be statistically significant. The results were analyzed with the student t-test for variables that have met the requirements for application, and with the corresponding non-parametric MannWhitney U-test for variables with established irregular distribution. A value of $p < 0.05$ was taken as statistically significant.

Out of a total of 300 respondents examined in this research, 134 (44.7%) were male, and 166 (55.7%) were of the female gender. Out of that number, 208 of them (69.3%) came from an urban municipality, while the other 92 (30.7%) came from a suburban municipality. Mixed dentition was represented by 129 (43.0%) respondents, while permanent dentition was represented by 117 (57.0%) respondents.

Table 1. Baseline characteristics of the subjects

Gender:	Male	134	(44.7%)
	Female	166	(55.3%)
	Urban municipality	208	(69.3%)
Municipality:	Suburban municipality	92	(30.7%)
	Mixed:	129	(43.0%)
Dentition:	Permanent:	171	(57.0%)

PI total 250 (83.33%) **dmft index total** 3.0 (1.0 – 6.0) **DMFT index total** 4.0 (0.0 – 6.0)

The results are presented as absolute counts and percentages, and as mean value \pm standard deviation ($\bar{X} \pm SD$); PI – plaque index; dmft index – decayed, missing, and filled teeth milk dentition; DMFT index –Decayed, Missing, and Filled Teeth permanent dentition

Table 2. Comparative analysis of kep and KEP index values in subjects stratified according to dentition

Variable	Dentition		P
	Permanent	Mixed	
dmft index	0.0 (0,0 – 0,0)	3.0 (1.0 – 6.0)	<0.001
DMFT index	4.0 (0.0 – 6.0)	1.0 (0.0 – 3.0)	<0.001

Results are presented as median and interquartile range (25-75 percentiles)

Table 3. Number of subjects with plaque present and subjects without plaque

Number of subjects	PI 0	PI 1	PI 2	PI 3
300	50 (16.66%)	126 (50.4%)	114 (45.6%)	140 (4%)
		Total	250 (83.33%)	

The results are presented in percentage values (%); PI-plaque index

Discussion

The results of this study show a high dmft and DMFT indices in patients referred for orthodontic examination. The dmft index value in the respondents with mixed dentition was 3.0 (1.0 – 6.0). The DMFT index value in the respondents with permanent dentition was 4.0 (0.0 - 6.0), while in the respondents with mixed dentition, it was 1.0 (0.0 - 3.0). No significant difference has been found in the dmft and DMFT index values between male and female respondents with mixed dentition. On the other hand, the value of the DMFT index for the respondents with urban residence was 2.0 (0.0 - 4.0), while for the respondents with suburban residence, it was 3.0 (0.0 - 5.0), which is why in that case the established difference was found to be statistically significant ($p= 0.043$). Similar data have also been found by Seow in his study, indicating that the percentage of early childhood caries is higher in smaller and poorer communities⁷.

The high degree of dmft and DMFT indices in the patients referred for an orthodontic examination, in our research, can be attributed to the fact that the results of previous studies show a high prevalence of caries in children and adolescents in Bosnia and Herzegovina¹². In any case, such patients would have to be cured first before

being referred to an orthodontist. A similar conclusion has been drawn in their research by Tadić *et al.*, whose study results show that the oral health of children and adolescents in Croatia is poor and that one in 3.5 children referred to an orthodontist for examination suffers from caries. The authors also indicate that the results of their study show clearly that Croatian dentists tend to refer to an orthodontist both children and adolescents without curing their teeth first, which constitutes a further delay in terms of their inclusion in orthodontic therapy. Almost 70% of children come to see the orthodontist with carious deciduous teeth and 30% with carious permanent teeth¹⁰.

The results of our research lead to a similar conclusion. The proof that the situation is similar in the entire region is provided in the results of a study conducted by Đuričković *et al.*, who – by comparing the DMFT values in Montenegrin children aged 12 with those established for the same population group in other countries (ranging from 3.24 in Mexico, 2.4 in the Philippines, 1.8 in Slovenia, 1.7 in Portugal, 1.07 in Spain, 1.66 in Israel, 1.1 in Sweden, 0.9 in Denmark and Switzerland to the lowest values of 0.65 and 0.5 in Nicaragua and India respectively) – conclude that the state of oral health of Montenegrin 12-year-olds is quite worrying¹³.

Viewed from a different angle, previous studies^{14,15,16} have shown that the presence of orthodontic irregularities is positively correlated with an increased risk of tooth decay. On the other hand, there are studies whose results show that there is no significant benefit from orthodontic treatment in terms of improving dental health¹⁷. Given that orthodontic therapy itself makes oral hygiene more difficult and that increases the risk of caries¹⁸, these results call for caution in the treatment of such patients.

A series of research evaluating the periodontal status of patients before, during, and after the therapy with a fixed orthodontic appliance showed that the evaluated patients have had an increased plaque index and gingival hyperplasia during and after such therapy¹⁹. Our research shows that out of 300 patients referred to an orthodontist for their first orthodontic examination, 250 of them (83.33%) have demonstrated an increased value of the Plaque index. The CI value of incisors was 0.14 ± 0.01 , and the CI of molars was 0.17 ± 0.01 . In addition to these, also recorded were the values of GI of incisors 0.48 ± 0.02 , GI of molars 0.57 ± 0.02 , PBI of incisors 0.21 ± 0.01 , and PBI of molars 0.21 ± 0.01 . The gingival index in the respondents with urban residence was 0.55 ± 0.01 , while this index in the respondents with suburban residence was 0.47 ± 0.02 . The established difference was found to be statistically significant ($p= 0.009$). The PI, CI, and PBI values did not differ significantly between the examined groups with different places of residence. The high values of the Plaque index observed in our research represent an aggravating circumstance for the provision of orthodontic

therapy because patients with a high risk of tooth decay require special attention from the orthodontist during treatment, and sometimes an assessment is also required to be made as to how justifiable the orthodontic therapy would be overall.

As part of their research, Karacoglu *et al.* prove that the number of patients suffering from gingivitis has increased during orthodontic therapy and that this is associated merely with the fact that the maintenance of oral hygiene is difficult and insufficient due to the presence of orthodontic appliances²⁰.

Preoteasa *et al.* have investigated the plaque index in patients undergoing orthodontic therapy and noted that the accumulation of plaque has increased by even 2-3 times²¹. The mean value of visible plaque and visible gingival inflammation show a significant increase during orthodontic treatment. Therefore, before orthodontic therapy, the level of periodontal health in patients should be raised to a much higher level, while such health should be further maintained during the treatment period²².

Conclusions

The state of oral health in patients referred for orthodontic examination is poor. The prevalence of caries is high, oral hygiene is poor, and the value of the plaque index is high. The results of this research should be peculiarly alarming for pedodontists and general dentists, cautioning them to implement caries prevention measures more intensively and make referrals to an orthodontist only in case of those patients who have been cured previously.

References

1. Soldo M, Matijević J, Malčić Ivanišević A, Čuković-Bagić I, Marks L, Nikolov Borić D, Jukić Krmek S. Impact of oral hygiene instructions on plaque index in adolescents. *Cent Eur J Public Health*, 2020;28:103-107.
2. Velasco SRM, Pistelli GC, Razera FPM, Menezes-Silva R, Bastos RS, Navarro MFL. Dental caries spectrum profile in Brazilian public school children and adolescents. *Braz Oral Res*, 2021;35:e067.
3. Manohar N, Hayen A, Fahey P, Arora A. Obesity and dental caries in early childhood: A systematic review and meta-analyses. *Obes Rev*, 2020;21:e12960.
4. Mathur VP, Dhillon JK. Dental Caries: A Disease Which Needs Attention. *Indian J Pediatr*, 2018;85:202-206.
5. Leong PM, Gussy MG, Barrow S-YL, de Silva-Sanigorski A, Waters E. A systematic review of risk factors during first year of life for early childhood caries. *Int J Paediat Den*, 2013;23:235-250.
6. Benjamin RM. Oral health: the silent epidemic. *Public Health Rep*, 2010;125:158-159.
7. Seow WK. Early Childhood Caries. *Pediatr Clin North Am*, 2018;65:941-954.
8. Baskaradoss JK, Geevarghese A, Roger C, Thaliath A. Prevalence of malocclusion and its relationship with caries among school children aged 11- 15 years in southern India. *Korean J Orthod*, 2013;43:35-41.
9. Špalj S, Katalinić A, Varga S, Radica N. *Ortodontski priručnik*. Rijeka: Medicinski fakultet Sveučilišta u Rijeci; 2012. p. 97-8.
10. Tadić K, Katić V, Špalj S. Caries Experience of the Patients Referred for an Orthodontic Consultation. *Acta Stomatol Croat*, 2018;52:123-131.
11. Travess H, Roberts-Harry D, Sandy J. Orthodontics. Part 6: Risks in orthodontic treatment. *Br Dent J*, 2004;196:71-77.
12. Markovic N, Arslanagic Muratbegovic A, Kobaslija S, Bajric E, Selimovic-Dragas M, Huseinbegovic A. Caries prevalence of children and adolescents in Bosnia and Herzegovina. *Acta Med Acad*, 2013;42:108-116.
13. Đuričković M, Ivanović M. The state of oral health in children at the age of 12 in Montenegro. *Vojnosanit Pregl*, 2011;68:550-555.
14. Kukletova M, Izakovicova Holla L, Musilova K, Broukal Z, Kukla L. Relationship between gingivitis severity, caries experience and orthodontic anomalies in 13-15 year-old adolescents in Brno, Czech Republic. *Community Dent Health*, 2012;29:179-183.
15. Cernei ER, Maxim DC, Zegan G. The study of the Association of Decay Risk With Malocclusions in Mixed Dentition at Children From Northeast Romania. A Transversal Retrospective Study. *Rev Med Chir Soc Med Nat Iasi*, 2016;120:932-941.
16. Bernhardt O, Krey KF, Daboul A, Völzke H, Splieth C, Kocher T, Schwahn C. Association between coronal caries and malocclusion in an adult population. *J Orofac Orthop*, 2021;82:295-312.
17. Dođramaci EJ, Brennan DS. The influence of orthodontic treatment on dental caries: An Australian cohort study. *Community Dent Oral Epidemiol*. 2019;47:210-216.
18. Singh A, Purohit B, Sequeira P, Acharya S, Bhat M. Malocclusion and orthodontic treatment need measured by the dental aesthetic index and its association with dental caries in Indian schoolchildren. *Community Dent Health*, 2011;28:313-316.
19. Hadzic S, Gojkov-Vukelic M, Pasic E, Jahic IM, Muharemovic A, Redzepagic-Vrazalica L, Jeleskovic A, Nakas E. Evaluation of Periodontal Changes in Patients Before, During, and After a Fixed Orthodontic Therapy. *Mater Sociomed*, 2022;34:121-125.
20. Karacaoglu F, Gazioglu C, Akkaya S, Akkaya M. Are the Effects of Fixed Orthodontic Treatment on Gingival Health Similar in Adolescents and Young Adults?. *J Biomedical Sci*, 2016;6:1-6.
21. Preoteasa CT, Ionescu E, Preoteasa E. Risks and Complications Associated with Orthodontic Treatment. In: Bourzgui F. *Orthodontics: Basic Aspects and Clinical Considerations*. Rijeka: In Tech; 2012. p.403-428.
22. Boke F, Gazioglu C, Akkaya S, Akkaya M. Relationship between orthodontic treatment and gingival health: A retrospective study. *Eur J Dent*, 2014;8:373-380.

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