

An epidemiological study of malocclusion and occlusal traits related to different stages of dental development

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ABSTRACT

Introduction: Various types of malocclusions present one of the most common dental problems of today's population. Planning the implementation of orthodontic therapy, especially preventive and interceptive measures is one of many activities of public sector health, and it requires information regarding the prevalence of malocclusion in different parts of our country.

The aim: The aim of this study was to determine the prevalence of malocclusion of preschool and school children in the city of Sarajevo.

Materials and methods: This study was comprised of 373 children out of which 200 preschool and school children were included in the final sample according to the inclusion and exclusion criteria for participation. 100 children were five-year-olds with complete deciduous dentition, and 100 children were 14-year-olds with permanent dentition. The examined variables in the study were: dental status and existence of caries, overjet, depth of overbite, a presence of premature contacts, a presence of diastemas, crowding of teeth in the dental arch (for 14-year-olds) and rotation of teeth in the dental arch (for 14-year-olds).

Results: The prevalence of malocclusion was 58% in the group of preschool children and 83% in the group of school children.

Conclusion: Results of this study demonstrate a need for the implementation of preventive and interceptive orthodontic methods in primary health care, which would reduce the need for expensive and long term orthodontic therapy.

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INTRODUCTION

Malocclusion presents aesthetically and functionally non-acceptable occlusion and it is defined as an irregularity of the teeth or a malrelationship of the dental arches beyond the range of what is accepted as normal.¹ Malocclusion is a manifestation of normal biological variability, ranging from an ideal occlusion to considerable deviation from normal.²

The World Health Organization (1987), had included malocclusion under the heading of Handicapping Dento Facial

Anomaly, defined as an anomaly which causes disfigurement or which impedes function, and requiring treatment "if the disfigurement or functional defect was likely to be an obstacle to the patient's physical or emotional well-being".³

Even though malocclusions do not present life-threatening conditions, or cause temporomandibular disorder or postural problems,⁴⁻⁶ their high prevalence puts them in focus of public healthcare.⁷

Malocclusions are a result of orofacial adaptation to various etiological factors. Maloccluded teeth can cause psychosocial problems related to impaired dentofacial aesthetics and disturbances of oral function, such as mastication, swallowing, speech and greater susceptibility to trauma and periodontal disease.

More important implications of malocclusion in everyday life are psychosocial problems caused by disturbed dentofacial esthetics, which demonstrates a sizable problem considering today's trends of imposed standards of beauty.⁸

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Today's society dictates norms of acceptable, normal and attractive look. Therefore much expressed forms of malocclusions can create a feeling of marginalization and social rejection what could cause negative consequences for individual social integrity.^{9, 10}

Results of a study whose objective was to assess Oral Health-Related Quality of Life (OHRQoL) in young people aged 11–14 and to measure the association between orthodontic treatment need (using the IOTN) and oral health-related quality of life (OHRQoL) showed that children with higher IOTN index showed higher levels of impact than those with lower IOTN index.¹¹

Adolescents who have undergone orthodontic treatment and cured existing malocclusion had a significantly lower score regarding the negative impact of oral health on their everyday life compared to the group of adolescents which have never been through orthodontic treatment regardless of existence of indications. Adolescents from the second group of non- treated patients also had a higher score regarding the influence of oral health on their psychosocial state.¹²

Malocclusions feature the third highest prevalence among oral pathologies, second only to tooth decay and periodontal disease and therefore rank third among worldwide dental public health priorities.¹³

The need for orthodontic treatment is rising in the majority of countries, which requires rational planning of resources and treatment priorities on whole population level. This fact shows the importance of epidemiological studies in order to provide information about the prevalence of different types of malocclusions and a real need for orthodontic treatment.

Gathering information about the prevalence of malocclusion is the first step in planning and latter implementation of preventative and interceptive orthodontic measures at an early age, which would significantly improve oral population health and diminish orthodontic therapy costs at a later stage.

A large number of studies were published regarding the prevalence of malocclusion in different types of populations. The results of prevalence of malocclusion ranged between 26–87%, clearly showing that majority of children had some sort of orthodontic irregularity. This large discrepancy in results can be attributed to different factors starting from different ethnic groups to differences in criteria for interpretation of relevant occlusal discrepancies.^{14–22}

Our research goals were:

1. Evaluate prevalence malocclusions in pre-school children.
2. Evaluate prevalence malocclusions in school children.

MATERIALS AND METHODS

This study was comprised of 373 children. Inclusion criteria for this study were age, dental status and history of orthodontic treatment. 200 preschool and school children were included in the final sample according to the inclusion and exclusion criteria for participation. 100 children were five-year-olds (48 males and 52 females) with complete deciduous dentition, and 100 children were 14-year-olds (50 males and 50 females) with permanent dentition. Exclusion criteria were that children included in the study have never been treated, nor have they been under any kind of orthodontic treatment during the time of this research.

The children from this research are from four different municipalities of Sarajevo. Preschool and school institutions were picked randomly. Parents of children received detailed information about this study, and only children whose parents signed the consent form were included in a study. All children were examined according to standardized procedure according to WHO.²³

Examinations were conducted inside preschool and school institutions where children attended classes, in their classrooms while being sat in their chairs with the doctor in front of them.

In school classrooms, examinations were conducted under daylight in combination with headlamps, using dental mirror and probe. For precise measurements, the orthodontic caliper was used.

The examined variables in this study were: dental status and existence of caries, overjet, depth of overbite, a presence of premature contacts, a presence of diastemas, crowding of teeth in the dental arch (for 14-year-olds) and rotation of teeth in a dental arch (for 14-year-olds).

Class of intercuspitation was determined according to Angle classification in relation to first permanent molars for permanent dentition and primary canine teeth for deciduous dentition.

Data received by clinical examination were recorded in specially designed files for this study, which apart from the parameters mentioned above, included the following information: name, last name, age, sex, municipality and the name of preschool or school institution.

RESULTS

In the sample of preschool children 48 were males (48%), while 52 were females (52%). In the sample of school children 50 were males (50%), and 50 were females (50%).

Results of this study showed that 58.0% of preschool children included in this study, had some orthodontic irregularity (Table 1).

Table 1. The prevalence of malocclusion in preschool children

IRREGULARITY	%
Increased overjet (>3 mm)	27.0
Mandibular overjet	11.0
Deep bite	12.0
Open bite	9.0
Incompatibility of interincisal points	15.0
Crossed bite	7.0
Premature contacts	24.0
Absence of diastema	17.0
Class II of intercuspidation	19.0
Class III of intercuspidation	9.0

Prevalence of malocclusion in school children included in this study was 83%. (Table 2.)

Table 2. Prevalence of malocclusion in school children

IRREGULARITY	%
Increased overjet (>3 mm)	34.0
Mandibular overjet	8.0
Deep bite	30.0
Open bite	14.0
Incompatibility of interincisal points	46.0
Crossed bite	30.0
Premature contacts	10.0
Presence of diastema	15.0
Crowding of teeth after the dental arch	42.0
Rotation of teeth after the dental arch	59.0
Class II of intercuspidation	28.0
Class III of intercuspidation	7.0

The prevalence of caries was 71.0% in primary dentition and 47% in permanent dentition.

To prove the presumption of the research study, all the variables that were measured in the study relating to respondents of school age and the respondents of preschool age were crossed out. Alpha level <5% (0.05) was taken as a level of significance.

Chi-square test, with continuity correction according to Yates, confirmed the existence of the association between the presence of malocclusion in respondents and their age, $p < 0.000$. In Table 3, it is possible to observe differences in the incidence of modalities between the tested variables.

Table 3. Testing the association between the presence of malocclusion and the age of respondents

		Age of respondents*					
		5 years		14 years		Total	
		n count	n%	n count	n%	n count	n%
Presence of malocclusions*	Yes	58	58,0	83	83,0	141	70,5
	No	42	42,0	17	17,0	59	29,5
Total		100	100	100	100	200	100

* $p < 0,000$ Continuity Correction ($X^2 = 13,85$; $df = 1$; $n = 200$)

DISCUSSION

High prevalence of malocclusion in pre-school children (58%) shown in this study points out the need for regular screening of children through each stage of development for the purpose of reducing the need for latter complex and expensive orthodontic treatment by conducting measures of preventive and interceptive orthodontics.

The results of high prevalence of caries in deciduous dentition (71%) indicate a health unenlightenment of children's parents and their insufficient knowledge about the importance of preserving intact deciduous dentition as one of the basic preventive measures in the development of malocclusion.

Untreated carious lesions of primary teeth create a risk of malocclusion appearance, either by loss of interproximal contacts and consequent shortening of the dental arch or teeth loss.²⁴

Premature loss of deciduous teeth is considered to be the most common local causal factor in the development of malocclusions, as the remaining teeth tend to drift towards space of supporting zone.²⁵

Prevalence of dental caries in school-age children was lower compared to children of preschool age but prevalence of 47% is a devastating statistic in relation to other European countries.^{26,27}

Crowding and rotation of teeth were the most usual present irregularities in the permanent dentition in adolescents examined in this study and were observed in 42.0% and 59.0% of cases. These abnormalities usually occur in combination with one another and are usually observed as abnormalities in adolescents. Crowding of teeth usually occurs as a result of a premature loss of deciduous teeth, or is caused by mesial drift of the first permanent molars due to caries on adjacent permanent teeth.

Increased overjet (>3 mm) was registered in 27% of children of preschool age, while the mandibular incisal step was represented in a lower percentage of 11.0%. In a group of school children, increased overjet (>3 mm) was found in 34.0% respondents, while mandibular incisal step was observed in 8.0% of this group.

Incisor protrusion increases their predisposition to trauma, gingivitis and caries. Therefore, it is very important to start orthodontic treatment in time to achieve relatively fast normopositioning of these teeth.²⁸ Protruded and malposed maxillary teeth can represent negative psychosocial factors in the development of the child. Consequently, according to the guidelines provided by the WHO their early treatment must be considered as a priority.³

The deep bite was seen in 30.0% and open bite in 14.0% of pre-school children. Deep bite in pre-school children was seen in 12.0% of them, and open bite in 9% of cases. In literature, there is a strong and convincing evidence that the anterior open bite in children is a result of bad habits such as thumb sucking at early age.²⁹

However, in the study done by Karaiskos and the associates in which the prevalence of anterior open bite was seen in 10% in a sample of 216 children age of 6, only a handful of parents confirmed this anamnestic data which once again confirms the multi-causal etiology of this disorder.³⁰

Early treatment of bad habits such as thumb sucking and tongue thrust is recommended in the eighth year of life which simultaneously improves the speech disorder caused by the open bite. In the eighth year of life, the first permanent molars have fully grown favoring conditions for different types of mobile devices that are better tolerated at this age. Also, children at this age are often more cooperative than adolescents.³¹

Another most commonly observed anomaly in our study is a premature contact that was observed in 24.0% of preschool children, while the lateral crossed bite was observed in 7.0% of patients. Irregularity that often occurs in combination with unilateral cross bite is a discrepancy of the dental midline. In our study, this abnormality was observed in 15.0% of pre-school children.

Regarding the irregularities in the transverse plane in a group of school children, posterior crossed bite was seen in 30.0% of them and discrepancy of dental midlines in 46.0% of children. Premature contact was recorded in 10% of cases.

All forms of cross-bites should be treated as early as possible because if not treated initially, purely dental disorders can later lead to severe skeletal anomalies that are treatable only surgically.³²

This is particularly important for cross-lateral bites caused by functional irregularities that must be treated in the primary dentition.³³

Spontaneous correction of lateral cross-bite is described in literature but is very rarely the case.³²

28% of school-age children had Angle's Class II intercuspidation,

while 7.0% were had Class III intercuspidation.

19% of preschool children at had a distal relationship of primary canines, while 9.0% of them had a mesial relationship. Perinetti in 2008 concluded the prevalence of malocclusion traits in Italian children is very high, and more effort is needed to implement early interventions, including close monitoring and modifications of lifestyles.³⁴

Analyzing the prevalence of malocclusion among school and preschool age children, it can be concluded that it increases with age. It can be assumed that the reason for this lies in the fact that certain irregularities that are observed in the primary dentition, are transferred to permanent dentition, but also that external factors, which can be prevented, lead to an increase in the prevalence of malocclusion through different stages of development of a child. So there is a need for better communication and continuous education of dentists concerning the practical implementation of preventive and interceptive measures and also rise of the awareness of parents about the importance of deciduous dentition.

CONCLUSION

1. Results of this study showed a high prevalence of malocclusion in children of school and pre-school age which confirms the importance of epidemiological studies of this type.
2. Results of this study indicate that there is a need for better communication and continuous education of dentists concerning the practical implementation of preventive and interceptive measures.
3. It is necessary to raise the awareness of parents about the importance of deciduous dentition through various educational programs that should be implemented starting from the pediatric department.

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