

# Prevalence of malocclusions in Hungarian adolescents

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**SUMMARY** The aim of this epidemiological study was to assess the prevalence of malocclusion, associated caries experience, and level of oral hygiene in the Hungarian population using the World Health Organisation (WHO) questionnaire designed to assess dentofacial anomalies. A total of 483 adolescents (289 girls, 194 boys), aged 16–18 years, were assessed.

Orthodontic anomalies were detected in 70.4 per cent of the sample. Crowding and spacing were observed in 14.3 and 17 per cent, respectively, with the latter being more prevalent in the maxilla than in the mandible (10.4 and 2.9 per cent, respectively). A Class I occlusion was found in 52.8 per cent of the subjects. A half cusp anomaly in the antero-posterior molar relationship was more prevalent than a full cusp anomaly (26.9 and 20.3 per cent, respectively). The decayed, missing, and filled teeth (DMFT), the decayed, missing, and filled surfaces (DMFS), and the visible plaque indices scores (VPI) of the 340 adolescents with malocclusion were significantly higher ( $P < 0.05$ ) than those of the adolescents who displayed no anomalies. The prevalence of malocclusion in the Hungarian population seems to be comparable with other European communities.

## Introduction

There are little available epidemiological data on dental and oral hygiene status in middle and Eastern European adolescent populations. The only significant exception is the longitudinal study by Legovic *et al.* (1998).

Yasuda *et al.* (1990) reported on malocclusion and caries prevalence in 6665 high-school Japanese girls and found it to range between 54.1 and 56.6 per cent, depending on age. Burgersdijk *et al.* (1991) studied the prevalence of malocclusion and orthodontic treatment need in adolescents and adults in The Netherlands and found crowding in the incisor region in 15 per cent, an Angle Class II malocclusion in 28 per cent, and an open bite greater than 5 mm in 23 per cent of their sample. Stecksén-Blicks and Holm (1995), in a cross-sectional study, examined caries status, accidental injuries, and prevalence of orthodontic anomalies, between 1967 and 1992 in Sweden. They found that the prevalence of a unilateral crossbite decreased slightly (from 18 to 16 per cent), while that of an open bite increased (from 35 to 41 per cent) during the 25-year observation period. Helm and Petersen (1989), who examined 176 adolescents aged 13–19 years and re-examined them after 20 years in order to detect any relationship between malocclusion and caries, found no relationship between malocclusion traits and caries prevalence. Ng'ang'a (1991) identified a malocclusion, and particularly crowding, in 47 per cent of 250 African children aged 13–15 years. According to the epidemiologic studies of the World Health Organisation (WHO) carried out in Hungary, the prevalence of malocclusion traits in 12-year olds was 40.8 per cent in 1985 and 41.3 per cent in 1991 (Czukur, 1994).

With regard to the considerable variation in the reported prevalence of malocclusions, the association with dental caries, and the minimal data available, particularly in adolescents, the aim of the present study was to establish the frequencies of the different occlusal traits, associated caries experience, and level of oral hygiene among adolescents in Hungary. Accordingly, three comprehensive stomatological surveys were carried out in order to compile oral, dental, and salivary microbiological data on 16- to 18-year old schoolchildren living in Budapest and Debrecen. Data relating to the association of microbiology and caries experience have been previously published (Gábris *et al.*, 1999).

## Subjects and methods

A total of 483 adolescents (289 girls, 194 boys) aged 16–18 years were randomly selected from secondary schools and examined by two orthodontist, in Budapest (KG) and in Debrecen (MM), with the use of a dental mirror, probe, and Community Periodontal Index probe (for measuring overjet, overbite, open bite, and dental irregularity; WHO, 1997), under artificial light. Before the epidemiological survey, the examiners were calibrated in the use of the WHO (1997) guidelines. For documentation of the presence, type, and severity of the malocclusion, an extended version of the WHO (1997) questionnaire was used. The basis of the WHO questionnaire was the criteria of the Dental Aesthetic Index (DAI) by Cons *et al.* (1986). Decayed, missing, and filled teeth (DMFT) and decayed, missing, and filled surfaces (DMFS) index scores were defined in accordance with the

WHO (1977) directives. The visible plaque index (VPI) was defined after Ainamo and Bay (1975) but with some modification: the presence of plaque was examined only on the buccal surface. The possibilities of correlations between anomalies causing plaque accumulation, caries scores, and VPI were also studied. In accordance with the WHO questionnaire, crowding, considered to be one of the most important orthodontic anomalies causing plaque retention, was examined in the maxillary and mandibular incisor region.

Data processing and statistical analysis were undertaken using the Statistical Packages for Social Sciences (SPSS, Chicago, Illinois, USA) version 8.0. The Student's *t*-test, Pearson and Spearman correlation coefficients, and analysis of variance were carried out.

## Results

Orthodontic anomalies were found in 70.4 per cent (340) of the 483 adolescents. Incisor, canine, and/or premolar teeth were missing in 11.2 per cent (54 subjects). Data on crowding and spacing in the incisor segments are presented in Table 1. Crowding and spacing were observed in nearly the same proportions 14.3 and 17 per cent, respectively. Spacing, however, was more prevalent in the maxilla than in the mandible (10.4 and 2.9 per cent, respectively).

A Class I occlusion was found in 52.8 per cent (255 subjects). A half cusp anomaly in the antero-posterior relationship was more prevalent than a full cusp anomaly: 26.9 (130 subjects) and 20.3 per cent (98 subjects), respectively. The anomalies were unilateral in 8.1 per cent. Findings relating to other occlusal traits are shown in

**Table 1** Prevalence of crowding and spacing in the incisor region.

	Orthodontic anomaly			
	Crowding		Spacing	
	<i>n</i>	%	<i>n</i>	%
No	414	85.7	401	83.0
Yes	69	14.3	82	17.0
One segment	34	7.0	64	13.3
Two segments	35	7.2	18	3.7

**Table 2** Prevalence of occlusal traits.

Orthodontic anomaly	Number	Frequency %	Minimum (mm)	Maximum (mm)	Mean (mm)
Diastema	38	7.8	1.0	4.0	1.55
Largest anterior maxillary irregularity	274	56.7	1.0	20.0	2.22
Largest anterior mandibular irregularity	202	41.8	1.0	6.0	1.99
Anterior maxillary overjet	294	60.8	1.0	11.0	3.38
Anterior mandibular overjet	9	1.8	1.0	9.0	3.0

Table 2. One hundred and twelve (23.2 per cent) subjects displayed an Angle Class I incisor relationship, 125 (25.9 per cent) a Class II division 1, 64 (13.2 per cent) Class II division 2, and 39 (8.1 per cent) a Class III.

Table 3 indicates that a deep bite was present in 26.1 per cent (126 subjects). The prevalence of an open bite and crossbite was similar: 10.8 and 11.6 per cent, respectively.

Buccal segment crowding was detected in 16.4 per cent (79 subjects). The prevalence of crowding in the upper and lower arches was 7.2 and 4.6 per cent, respectively.

An association between malocclusion and DMFT and DMFS scores is shown in Table 4. This was statistically higher than in adolescents without anomalies ( $P < 0.05$ ). The difference between the mean DMFT scores was highly statistically significant. The mean standard deviation for the DMFT scores in the presence and absence of malocclusion was 8.0 (5.08) and 6.1 (4.74), respectively. The VPI scores for the 340 adolescents with malocclusion (26.32 per cent) were significantly higher than for those without anomalies (18.19 per cent). When the VPI frequency was examined as a function of crowding in the incisor segments, a statistically significant difference ( $P < 0.05$ ) was found between subjects without crowding (22.70 per cent) or with crowding in either one (52.88 per cent) or two (39.99 per cent) crowded segments.

## Discussion

While a number of researchers have studied malocclusion in patients of different ages, the WHO questionnaire has not been applied in all cases (Burgersdijk *et al.*, 1991; Pietilä *et al.*, 1997; Tod and Taverne, 1997; Tschill *et al.*, 1997; Dacosta, 1999). Thus, direct comparison with the current findings cannot be made. A malocclusion was observed in 70.4 per cent of subjects in the current investigation. This is higher than the figures reported by Yasuda *et al.* (1990) and Ng'ang'a (1991). However, the difference may be explained by the use of a more detailed questionnaire in the present survey.

Alexander *et al.* (1997) examined 817 children aged 7–17 years and found associations between the prevalence of malocclusion, gingival bleeding, and calculus. The present results are similar, in as much as they reveal significant associations between crowding and the VPI.

**Table 3** Prevalence of open bite, crossbite, and deep bite.

	Orthodontic anomalies					
	Open bite		Crossbite		Deep bite	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
No	431	89.2	427	88.4	357	73.9
Yes	52	10.8	56	11.6	126	26.1
Anterior	43	8.9	5	1.0		
Unilateral	5	1.0	38	7.9		
Bilateral	4	0.8	0	0.0		
Single tooth	0	0	13	2.7		

**Table 4** Association between caries and malocclusion using the decayed, missing, and filled teeth (DMFT) and decayed, missing, and filled surface (DMFS) indices.

Malocclusion	DMFT		<i>P</i>	DMFS		<i>P</i>
	Mean	SD		Mean	SD	
Yes	8.0	±5.08	<0.05	11.59	±8.48	<0.05
No	6.06	±4.74		8.44	±7.65	

SD, standard deviation.

Among 1028 children in Nigeria, aged 11–18 years, Dacosta (1999) observed spacing in the upper and lower anterior segments in 30 and 45.9 per cent, respectively, and a deep bite in 1.6 per cent of subjects. The findings of the present study differ considerably from these, with spacing detected in fewer subjects but more prevalent in the upper than the lower anterior segment, which is in agreement with Dacosta (1999). A deep bite was found more frequently than reported by Dacosta (1999).

When malocclusions are compared in patients of different ages, a number of facts must be taken into consideration. Tod and Taverne (1997) concluded that the incidence of posterior crowding and crossbite along with an anterior crossbite increased with age. This is only partly confirmed by other data. Carvalho *et al.* (1998) found a posterior crossbite in 10.1 per cent of Belgian children aged 3–5 years, while Tschill *et al.* (1997) reported a prevalence of 16 per cent in children aged 4–6 years. The present survey found a prevalence of 16.4 per cent. A diastema was observed less frequently (7.8 per cent) than reported by Kaimenyi (1998) who evaluated Kenyan children (35 per cent).

The use of indices is important in assessing orthodontic treatment need. The indices used most often are the Index of Orthodontic Treatment Need (Brook and Shaw, 1989) and the Dental Aesthetic Index (Cons *et al.*, 1986). De Muelenaere *et al.* (1998) reported that 45 per cent of

subjects they examined needed orthodontic treatment. Proffit *et al.* (1998) stated that 57–59 per cent of different ethnic groups required some kind of orthodontic treatment. Zeltmann *et al.* (1998) used the 5-point scale of the Swedish National Board of Health and Welfare to assess treatment need. An urgent need for treatment was reported in 32 per cent of the examined 9-year olds, while little or no need for treatment was found in 36 per cent. The present survey did not employ such indices, but the orthodontic anomalies were assessed as being ‘minor’, ‘medium’, or ‘major’ using the guidelines issued by the Hungarian Ministry of Health (1999). On this basis, it was found that 26 per cent needed urgent treatment, while 35 per cent had little need for treatment.

The relationship between malocclusion, DMFT, DMFS, and VPI scores is an important finding of this epidemiological survey. The data reveal that orthodontic anomalies, principally crowding, may be associated with susceptibility to plaque retention and caries. This supports the findings of Kolmakow *et al.* (1991) and Alexander *et al.* (1997). While direct comparison with other studies is difficult to undertake as a result of differences in the age of subjects assessed, the findings of the present survey remain significant in providing the first data on the orthodontic status of 16- to 18-year old Hungarian adolescents, and at the same time, reflecting the need for orthodontic treatment in this population.

## Conclusions

1. A high proportion (70.4 per cent) of Hungarian adolescents displayed orthodontic anomalies.
2. A statistically significant association was observed between the presence of malocclusion, caries experience, and levels of oral hygiene ( $P < 0.05$ ).

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