

Distribution of certain types of occlusal anomalies among Saudi Arabian adolescents in Jeddah city

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Objectives To assess the distribution of certain types of occlusal anomalies in a sample of Saudi adolescents aged 13–15 years in Jeddah city. **Design:** A cross-sectional study. **Clinical settings:** Clinical examination of Saudi adolescents was carried out in the screening clinics, Faculty of Dentistry, King Abdul-Aziz University. Occlusal anomalies were recorded according to Björk and Co-workers (1964). **Participants:** 1,024 adolescents aged 13–14 years (608 males and 416 females) were randomly selected from ten intermediate schools. Participants were invited to dental school during the “Annual Dental Health Week” as a part of collaborative efforts between King Abdul-Aziz University and Ministry of Education. **Main outcome measures:** Distribution of post-normal occlusion, pre-normal occlusion, bimaxillary protrusion, overjet, overbite, midline deviation and maxillary and mandibular crowding were calculated for the examined subjects. **Results:** Only 9% of the examined adolescents had normal occlusion. Post-normal occlusion, pre-normal occlusion and bimaxillary protrusion represented 21%, 15% and 8% of the studied sample respectively. Moderate and severe overjet and overbite accounted for 24% & 5% and 27% & 13%, respectively. Midline deviation was detected in 24% of the students. Mild, moderate and severe maxillary and mandibular crowding represented 9%, 26% & 4% and 11%, 38% & 9%, respectively. All the studied occlusal parameters except bimaxillary protrusion were statistically higher in females. **Conclusion:** Ninety one percent of the surveyed subjects exhibited some occlusal anomalies. These anomalies were generally higher among adolescent girls.

Key words: Adolescents, dental epidemiology, occlusal anomalies

Introduction

Since Angle (1907) formulated his classification system at the turn of the twentieth century, studies on the prevalence of malocclusion have continued in different populations. This task was usually undertaken through epidemiological studies to obtain baseline data of malocclusion in diverse communities (Lew *et al.*, 1993, Thilander *et al.*, 2001, Onyeaso *et al.*, 2004).

Until recently, there were no generally accepted criteria to define normality or abnormality as regards occlusal status (Svedström-Oristo *et al.*, 2000). It is not surprising, therefore, that studies utilized several indices for the same aim. The subjectivity of indices used to record orthodontic anomalies, their questionable validity and reliability may contribute to inconsistency of results (Šidlauskas and Lopatienė, 2009). An alternative approach to the use of indices is a registration of measurable occlusal characteristics such as that developed by Björk *et al.* (1964) for objective epidemiological comparisons of different occlusal anomalies in different populations or racial groups (Kerosuo, 1990, Brunelle *et al.*, 1996, Tschill *et al.*, 1997).

In the Kingdom of Saudi Arabia, however, few epidemiological studies were conducted to assess the pattern of malocclusion. Those studies were mostly based on Angle's classification (Nashashibi *et al.*, 1983, Jones, 1987). Meanwhile, a description of occlusal characteristics using single trait recording has not been performed. This

methodology is reported by Brunelle *et al.* (1996) to be an ideal way for international comparisons as well as planning prevention strategies.

The aim of this study was to assess the distribution of certain types of occlusal anomalies in a sample of Saudi adolescents aged 13–15 years in Jeddah city.

Subjects And Methods

This study was carried out as a cross sectional study among Saudi adolescents, 13–15 years of age, residing in Jeddah city, Makah al-mukarrama province, Kingdom of Saudi Arabia.

Study sample

Table 1 shows the characteristics of the study sample. The sample comprised 1024 middle school students (608 males and 416 females) aged from thirteen to fifteen years old with a mean age of 14.4 ± 0.8 years. They were examined in the screening clinics, Faculty of Dentistry, King Abdul-Aziz University / Jeddah. These students were randomly selected from 2,053 middle school students referred for dental examination during the “Annual Dental Health Week”. This was conducted as a part of collaborative efforts between King Abdul-Aziz University and Ministry of Education. Governmental and private school students were included in this study to represent different socio-economic backgrounds. They accounted for 51%, and 49% respectively.

The clinical examinations were performed after obtaining approval from Ethical Committee of the Faculty of Dentistry, King Abdul-Aziz University. Students with mixed dentition, with cleft lip and/or palate and those under or had previously orthodontic treatment were excluded from this study.

Students were clinically examined under normal clinical conditions using gloves, dental mirror, cheek retractor and Community Periodontal Index (CPI) probes. The collected data were registered in a pre-designed malocclusion registration chart. The registrations were performed according to Björk *et al.*, (1964) as follows:

The following anomalies were assessed and recorded:

- Sagittal anomalies
- Post-normal occlusion (distocclusion, Angle Class II)
- Pre-normal occlusion (mesiocclusion, Angle Class III)
- Bimaxillary protrusion (Angle Class I with lip strain over protruded teeth).
- Maxillary overjet (0 mm = edge-to-edge; 4-6 mm = moderate; >6 mm = severe).
- Vertical anomalies
- Overbite (0 mm = edge-to-edge; 4-6 mm = moderate; >6 mm = severe).
- Transverse anomalies
- Midline shift (registered when >2 mm)
- Space discrepancy
- Maxillary and mandibular crowding.

For students with maxillary or/and mandibular crowding, study casts were constructed and arch length analysis was performed for the incisor segment and the canine premolar segments of each jaw (1-3 mm = mild; 4-6 mm = moderate; >6 mm = severe) (Björk *et al.*, 1964).

Reliability of the examiners was performed by undergoing a period of training together with repeated patients examination before the start of the clinical examination. Inter-examiner calibration tests on 20 study models with different types of malocclusion were performed, in order to ensure consistency of diagnosis. (Kappa = 0.81)

Data were collected, presented and statistically analyzed using Statistical Package for Social Sciences (SPSS, Version 13.0 inc., Chicago, USA). Mean, standard deviation were used as basic descriptive statistics and chi square test was used to evaluate gender differences of different occlusal anomalies. The level of significance used was 5% level.

Table 1. Distribution of the study sample by age, gender and type of school

Character	Boys	Girls	Total
Number	608	416	1024
%	59.4%	40.6%	100%
Age			
\bar{X}	13.9	14.1	14.04
SD	0.8	0.8	0.8
School			
Governmental	340 (55.9%)	184 (44.2%)	524 (51.2%)
Private	268 (44.1%)	232(55.8%)	500 (48.8%)

Table 2. Different occlusal anomalies of the examined students in relation to gender

Occlusal anomaly	Boys (n = 608)	Girls (n = 416)	Total (n = 1024)	p
Post-normal	96 (16%)	118 (28%)	214 (21%)	0.00*
Pre-normal	60 (10%)	80 (19%)	140 (15%)	0.00*
Bimaxillary protrusion	44 (7%)	38 (9%)	82 (8%)	0.27
Overjet				
>4				
Moderate	124 (20%)	120 (29%)	244 (24%)	0.00*
Severe	22 (4%)	28(7%)	50 (5%)	
Overbite				
>4				
Moderate	136 (22%)	140 (34%)	276 (27%)	0.00*
Severe	62 (10%)	70 (17%)	132 (13%)	
Midline deviation				
Present	104 (17%)	142 (34%)	246 (24%)	0.00*
Absent	504 (83%)	274 (66%)	778 (76%)	
Maxillary crowding				
Mild	36 (6%)	58 (14%)	94 (9%)	
Moderate	122 (20%)	144 (35%)	266 (26%)	0.00*
Severe	16 (3%)	24 (6%)	40 (4%)	
Mandibular crowding				
Mild	50 (8%)	61(15%)	111 (11%)	
Moderate	188 (31%)	202 (49%)	390 (38%)	0.00*
Severe	44 (7%)	48 (12%)	92 (9%)	

Results

Only 92 students had normal occlusion representing 9% of the total sample.

Post-normal occlusion, pre-normal occlusion and bimaxillary protrusion were found in 21%, 15% and 8% of the total sample respectively. Twenty four percent and 5% of the students had moderate and severe overjet whilst 27% and 13% had moderate or severe overbite respectively. Midline deviation accounted for 24% of the examined students (Table 2).

Mild, moderate and severe maxillary crowding was recorded in 9%, 26% and 4% of the total sample, while the corresponding values for mandibular crowding were 11%, 38% and 9%, respectively.

Regarding gender distribution, females had a significantly higher prevalence than males in almost all the investigated variables including post-normal and pre-normal occlusion, overjet, overbite, midline deviation and maxillary and mandibular crowding ($p < 0.05$). Bimaxillary protrusion did not show a statistically significant difference between males and females ($p > 0.05$).

Discussion

There is a growing interest of orthodontics and dental aesthetics in Saudi Arabia hence the need to obtain baseline data for planning orthodontic services. The present survey provides an estimate of occlusal anomalies of adolescents in Western region of the Kingdom. Moreover, this investigation is the first in Saudi Arabia to adopt a single traits recording method based on the criteria defined by Björk *et al.* (1964) for the epidemiological registration of malocclusion.

The sample of this study comprised adolescents, 13-15 years. At this age, most of the orthodontic problems become clearly defined and orthodontists can start their treatment at this early permanent dentition stage. In addition, at this age the development of occlusion is almost complete, and therefore, it provides a reliable appraisal of occlusal status (El-mangoury and Mostafa, 1990, Saleh, 1999). The methodology used in this study is widely used allowing objective comparison of our results with other studies of different populations.

Results of the present study revealed that only 9% of the examined adolescents had normal occlusion. This was in accordance with Ciuffolo *et al.*, (2005) and Thilander *et al.*, (2001) who used the same diagnostic criteria and found that 93% and 88% of the examined adolescents had some type of occlusal anomalies, respectively. However, the prevalence of occlusal anomalies detected in this work was higher than that reported among the rest of Saudi adolescents (62.4%) using a modification of the method described by Björk *et al.* (1964) (al-Emran, 1990). In contrast to the sample population of Al-Emran (1990), this region of Saudi Arabia comprises a mixture of Arab, Africans, Indians, Turks and Pakistanis. The great increase in inbreeding that has occurred between these originally distinct human population groups over a millennium is the major explanation for the higher malocclusion levels observed in this study (Proffit, 2000a).

Overall prevalence of malocclusion recorded in this study was higher than that reported among adolescents in Kuwait and other developing countries (Ng'ang'a *et al.*, 1996, Onyeaso, 2004, Behbehani *et al.*, 2005). On the other hand, it was lower than that recorded among Lebanese (Saleh, 1999). These differences in results could be attributed to different ethnic backgrounds of different populations.

The measured values of overjet and overbite recorded in this study were higher than that reported among Jordanians, Nigerians and Columbians (Thilander *et al.*, 2001, Onyeaso, 2004, Abu Alhaija *et al.*, 2005). Similarly, midline shift and maxillary and mandibular crowding illustrated in the present study were higher compared to those obtained from other developing countries (Ng'ang'a *et al.*, 1996, Thilander *et al.*, 2001, Onyeaso, 2004). Different ethnic background, different sizes and ages of the studied samples and different methodologies used in classification of the occlusal anomalies may explain the different results. The higher prevalence figures of occlusal anomalies observed in the present work compared to those of other developing countries could be explained on basis of higher urbanization of Western region of Saudi Arabia in comparison to other developing countries. Increased incidence of malocclusion along with modern industrialization has been frequently reported (Corruccini, 1983, Kelley and Harvey, 1997, Proffit, 2000b). Adoption of modern life style in urban countries and shift toward a soft diet is associated with application of less force on the jaws during chewing and increased prevalence of malocclusion (Staley, 2001). This could justify the higher level of crowding and other occlusal anomalies among youths of high socio-economic urban communities (Corruccini and Whitley, 1981, Beecher *et al.*, 1983, Corruccini and Lee 1984).

In this study, crowding was the most frequent of all anomalies recorded and was significantly higher in girls. This was in complete agreement with Thilander *et al.* (2001) using the same methodology. The higher malocclusion prevalence among females could be attributed to the fact that females always have their permanent dentition erupted earlier than males which predisposes them to higher risk of caries attack and premature extraction of their deciduous teeth (Todd, 1975, US Public Health Service, 1989, Amin, 2003). The premature extraction of teeth has a detrimental effect on the development of normal occlusion (Padma and Retnakumari, 2006, Tunison *et al.*, 2008). Pedersen *et al.* (1978) reported that premature extraction of primary teeth would result in an increased frequency of sagittal, vertical as well as transversal malocclusion.

The results of this study shed some light on the different occlusal anomalies seen in Jeddah city, Saudi Arabia, which is dominated by mandibular crowding, overbite and maxillary crowding. However, studies are required to assess occlusal anomalies through the Kingdom of Saudi Arabia via conducting large scale surveys.

Conclusion

Overall prevalence of occlusal anomalies was 91% of the sample. Generally, all occlusal anomalies were higher in females than males.

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