ORIGINAL RESEARCH

The Prevalence of Major Types of Occlusal Anomalies among Saudi Middle School Students

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ABSTRACT

Introduction: Malocclusion is the most common dental anomaly among children and adolescents. Accordingly, this study was conducted to investigate the prevalence of major types of occlusal anomalies in permanent dentition among Saudi Arabian middle school adolescent students seeking orthodontic treatment in Jeddah.

Materials and methods: The sample comprised 150 males and 150 females with mean age of 14.25 (±1.09) for both males and females. Data were registered using the Bjork method.

Results: The results of the study showed that postnormal occlusion, prenormal occlusion, and bimaxillary protrusion represented 22, 14.7, and 8.3% of the studied sample respectively. Moderate and severe overjet accounted for 24.7 and 5.7% and for overbite 28 and 13% respectively. Midline deviation was detected in 25.3% of the sample. Mild, moderate, and severe maxillary and mandibular crowding represented 10, 27.3, and 10% and 13, 40, and 9.7% respectively.

Conclusion: The prevalence of occlusal anomalies was 90% and some occlusal anomalies were higher in females.

Clinical significance: The prevalence of occlusal anomalies in Saudi Arabian middle school students necessitates the demand for obtaining baseline data for planning orthodontic services.

Keywords: Adolescent, Malocclusion, Prevalence.

INTRODUCTION

Malocclusion is the most common dental anomaly among children and adolescents with several consequences.

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These consequences of malocclusion vary among patients and have impact on developmental growth, social, and psychological status of these individuals and may be associated with snoring and sleep-related breathing disorders.[1,2] Understanding the prevalence of malocclusion within the population has been an important tool in orthodontic diagnosis and treatment planning procedures. Knowing and recording these deformities will ease communications between professionals (orthodontist, other specialists, and the general practitioners) to manage and treat these deformities.[3-6]

Recording and measuring malocclusion deformity could be divided into two main types: Qualitative, for recording diagnostic classification of malocclusion (Angles system, Ackerman and Proffit and classification of Incisor relationship), and quantitative, to measure a feature of a malocclusion (Bjork method, Peer Assessment Rating, Index of Orthodontic Treatment Need indices, Little index, etc.).[6] The orthodontic literature contains sample studies involving different malocclusion features and treatment need of Western Europeans, Arabs, and other ethnic groups, employing different systems for recording and measuring. From these features, many variables were recorded, such as classification of malocclusion, crowding, spacing, and overjet, in addition to overbite, cross bite, tooth anomalies, and dental arch form.[7-12]

The orthodontic treatment demand is increasing in Saudi Arabia and in other populations.[4,10-13] Different studies have been carried out since the early 1980s on Saudi patients. Nashashibi et al[10] investigated the malocclusion pattern, frequency, and treatment need. He found that the frequency of class I was greater than class II malocclusion and about 5% of the sample showed class III malocclusion. In 1987, Jones[11] conducted a study to investigate the malocclusion and facial types among a Saudi patient sample in Riyadh city. In that sample, the author found a greater proportion of class III

malocclusion and a tendency for bimaxillary dentoalveolar proclination were noticed. The prevalence of different malocclusion features in 500 male school children was studied by Al-Emran et al[12] in 1990. They found that 62.4% of the sample expressed one or more malocclusion feature related to dentition, occlusion, or space. Later, Al-Bulkhi and Zahrany[4] investigated the pattern of different malocclusion features in Saudi patients attending for orthodontic treatment at the College of Dentistry in Riyadh, Kingdom of Saudi Arabia. They found that the most encountered Angles type of malocclusion was class I (69.3%) followed by class II division 1 (12.2%), class II division 2 (5%), and (10%) for class III.

Murshid et al[13] investigated the distribution of certain types of occlusal anomalies among Saudi Arabian adolescents; they found that only 9% of the examined adolescents had normal occlusion, where the reminder of the examined adolescents showed some occlusal anomalies. These anomalies displayed higher percentage in adolescent girls. Recently, Bourzgui et al[14] studied the prevalence of malocclusion in 1,000 Moroccan schoolchildren using Bjork method of register malocclusion and found the postnormal and prenormal relationship of 24 and 10% of the sample respectively. Moderate and severe overjet and overbite found to be 17.2 and 10% respectively, while overbite for more than 4 mm was 23.6%. They also reported that 50% of sample presented anterior crowding, while only 2.5% showed posterior crowding.

In this study, the sample was extracted from a major study sample which involves more than 2,000 school children and published by Murshid et al.[13] The previous studies were limited to the district where the studies were performed and were affected by lifestyle in these areas. Therefore, the purpose of this study was to assess the prevalence of certain types of occlusal anomalies among middle school students aged 13 to 15 among Saudi Arabian patients seeking orthodontic treatment at the Faculty of Dentistry, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia.

MATERIALS AND METHODS

Orthodontic records of patients who were seeking orthodontic treatment at the Faculty of Dentistry, King Abdulaziz University, were randomly collected. The inclusion criteria were Saudi nationals, age between 13 and 15 years, complete orthodontic records with clear panoramic and lateral cephalometric X-rays, all permanent dentition have erupted excluding the third molars, free of restorative treatment other than class I restorations, free of air blows or fractured teeth.

The exclusion criteria were history of previous orthodontic treatment, the presence of bubbles or voids in the study casts or broken cusps, casts showing malformed or ectopically erupted teeth, and history of facial or dental trauma.

The collected data were registered in a predesigned malocclusion registration chart. These registrations were performed according to Bjoerk et al[15] as follows.

Sagittal Anomalies

- Postnormal occlusion (distocclusion, Angle class II)
- Prenormal occlusion (mesiocclusion, Angle class III)
- Bimaxillary protrusion (Angle class I with lip strain over protruded teeth)
- Maxillary over (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 maxillary and mandibular crowding, arch length analysis was performed for incisor segment and canine and the premolar segment for each jaw as (1–3 mm = mild; 4–6 mm = moderate; more than 6 mm = severe).

The dental cast measurements were performed using a digital caliper (Mitutoyo, Japan) calibrated to the nearest 0.01 mm. Double determination (Dahlberg) method was used for all measured variables and the intraobserver agreement was 0.93.

Statistical Analysis

Data were collected and statistically analyzed (descriptive and comparative) using the Statistical Package for the Social Sciences version 18 (Inc., USA). For age, the independent sample t-test was used. For all other variables, the chi-square test was used. A $p < 0.05$ was considered significant.

RESULTS

A total of 300 records were selected from 1,024 orthodontic records (150 males, mean age = 14.13 (±0.62) and 150 females, mean age = 14.34 (±0.94) with no significant difference in age between genders (p = 0.31).

Table 1 summarizes the different occlusal anomalies of the examined sample in relation to gender. Only 30 of the sample had normal occlusion representing 10% of the total sample (12 males and 18 females).

Table 1: Data summary presented as number (percentage) and bivariate comparisons between males and females

Variables	Boys n = 150(%)	Girls n = 150(%)	Total n = 300 (%)	p-value
Normal occlusion	12 (8)	18 (12)	30 (10)	0.25
Postnormal	24 (16)	42 (28)	66 (22)	0.01*
Prenormal	15 (10)	29 (19.3)	44 (14.7)	0.04*
Bimaxillary protrusion	11 (7.3)	14 (9.3)	25 (8.3)	0.53
Overjet > 4				
Moderate	30 (20)	44 (29.3)	74 (24.7)	0.06
Severe	6 (4)	11 (7.3)	17 (5.7)	0.21
Overbite > 4				
Moderate	33 (22)	51 (34)	84 (28)	0.02*
Severe	15 (10)	24 (16)	39 (13)	0.12
Midline deviation				
Present	26 (16.7)	51 (34)	76 (25.3)	<0.001*
Absent	124 (82.7)	99 (66)	223 (74.3)	<0.001*
Maxillary crowding				
Mild	9 (6)	21 (14)	30 (10)	0.02*
Moderate	30 (20)	52 (34.7)	82 (27.3)	<0.01*
Severe	12 (8)	18 (12)	30 (10)	0.25
Mandibular crowding				
Mild	17 (11.3)	23 (15.3)	40 (13)	0.31
Moderate	46 (30.7)	74 (49.3)	120 (40)	<0.001*
Severe	11 (7.3)	18 (12)	29 (9.7)	0.17

*Statistically significant difference

Postnormal occlusion, prenormal occlusion, and bimaxillary protrusion represented 22, 14.7, and 8.3% of the total sample respectively.

Moderate and severe overjet was prevalent among 24.7 and 5.7% of the examined students respectively. Students with moderate and severe overbite represented 28 and 13% of the total sample respectively. Midline deviation accounted for 25.3% of the examined students.

Mild, moderate, and severe maxillary crowding represented 10, 27.3, and 10% of the total sample, while the corresponding values for mandibular crowding were 13, 40, and 9.7% respectively.

Regarding gender distribution, females had a significantly higher prevalence than males in some all the variables including postnormal, prenormal occlusion, overbite, midline deviation, and moderate 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 an increasing demand for orthodontics and dental esthetics treatment in the population of Saudi Arabia. This demand provides an importance for obtaining baseline data for planning orthodontic services. The present data could provide an estimated of the prevalence of malocclusal anomalies in adolescents living in the Western region of the Saudi Arabia. Moreover, this investigation is to adopt a single trait recording method based on the criteria defined by Bjoerk et al[15] using study cast for the epidemiological registration of malocclusion.

The sample of this study recruited adolescents between 13 and 15 years. At this age, most of the orthodontic problems become evidently defined and orthodontists can start their treatment at this early permanent dentition stage. In addition, at this period, the development of occlusion is almost complete, and therefore, it provides a reliable appraisal of occlusal status.[16,17] The methodology used in this study is widely used allowing objective comparison of our results with other studies of different populations.

Results of this study revealed that only 8% of the examined adolescents had normal occlusion. This was in accordance with Murshid et al,[13] Ciuffolo et al,[18] and Thilander et al,[19] who used the same diagnostic criteria and found that 92, 93, and 88% of the examined adolescents had some type of occlusal anomalies respectively. However, the prevalence of occlusal anomalies detected in this study was similar to Murshid et al[13] and higher than that reported among the rest of Saudi adolescents (62.4%) using a modification of the method described by Björk et al.[15] In contrast to the sample population of Al-Emran et al,[12] this region of Saudi Arabia comprises a mixture of Arab, Africans, Indians, and Turks. The great increase in outbreeding that has occurred between these originally distinct human population groups over a millennium is the major explanation for the higher malocclusion observed in this study.[3]

The prevalence of malocclusion recorded in this study was higher than that reported among adolescents in Kuwait and other developing countries.[20-22] On the contrary, it was lower than that recorded among Lebanese.[17] These differences in results could be attributed to different ethnic and behavioral 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.[19,21,23] Similarly, midline shift and maxillary and mandibular crowding, illustrated in this study were higher compared to those obtained from other developing countries.[20,21] Different ethnic background, different sizes and ages of the studied samples and different methodologies used in classification of the occlusal anomalies may elucidate these results diversity. The higher prevalence figures of occlusal anomalies observed in this work compared to those of other developing countries could be explained on basis of higher urbanization of the western region of Saudi Arabia in comparison to other developing countries. Increased incidence of malocclusion along with modern industrialization has been frequently reported.[24-26] 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.[27] This could justify the elevated level of crowding and other occlusal anomalies among youths of high socioeconomic urban communities.[28-30]

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[19] 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.[31,32] The premature teeth extraction has a detrimental effect on the development of normal occlusion.[33,34] Pedersen et al[35] 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, Kingdom of Saudi Arabia, which is dominated by mandibular crowding, overbite, and maxillary crowding. In this study, no difference was found in results between this orthodontic patients sample and the general middle school student's sample where this study sample was pulled. However, more studies are required to assess occlusal anomalies (including dental anomalies) through the Kingdom of Saudi Arabia via conducting large-scale surveys.

CONCLUSION

- Overall prevalence of occlusal anomalies was 90% of the sample.
- Females had more occlusal anomalies were higher compared with males.

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