Frequency of Malocclusion in an Orthodontically Referred Jordanian Population

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ABSTRACT

Objectives: To analyze the frequency of malocclusion among patients attending outpatient orthodontic clinics at the Royal Medical Services hospitals in order to get baseline data with can be used for proper treatment planning, teaching and further research.

Methods: A total of 520 Jordanian dental patients aged 13-15 years were included in this study between 2006 and 2008. These patients were randomly selected from four different regions in Jordan while they attended the Royal Medical Services hospitals in their regions. None of the patients had undergone previous orthodontic treatment, and all the patients were medically free with no history of trauma or surgery that could affect occlusion.

Results: Class II and class III occlusions were found in 39% and 13% of the sample respectively. Simple descriptive statistics were used to describe the study variables. Malocclusion traits detected were crowding in the maxilla (44%) and in the mandible (57%). Increase in overjet was found in 30% of the subjects and deep bite in 22%.

Conclusion: The results of this study provide baseline data on the frequency of malocclusion among 13-15 years old Jordanian children. This data will help to decide treatment priorities among those demanding orthodontic treatment at public expense.

Key words: Crowding, Malocclusion, Overjet

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Introduction

Malocclusion is not a single entity but rather a collection of situations each in itself constituting a problem; many of the situations are complicated by a multiplicity of causes and are reversible through growth and development or through tooth loss and treatment.[1]

Malocclusion varies from country to country and among races. The reported incidence varies from 39%-93% making it clear that the majority of children have irregular teeth and less than ideal occlusal relationships. This divergence of incidence figures may depend on differences for specific ethnic groups, variations in sample number, age among the subjects examined and differences in registration method.[2]

The demand for orthodontic treatment is increasing in most countries, therefore rational planning of orthodontic measures on a population basis is essential in assessing the resources required for such a service. This stresses the importance of epidemiological studies in order to obtain knowledge about the pattern of different types of malocclusion and the need for orthodontic treatment.[3]

Numerous studies report the prevalence of

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malocclusion in different populations. Ingervall and Hedegaard[4] evaluated the prevalence of malocclusion in young Finnish Skolt-Lapps and reported that occlusal and space anomalies were common and hypodontia was very common. Al-Emran *et al.*[5] investigated the prevalence of malocclusion in Saudi Arabia and reported that 62.4 percent of the children had one or more malocclusion features related to dentition, occlusion or space. Thilander *et al.*[2] reported that 88 percent of Bogotanian children in Colombia had some type of anomaly ranging from mild to severe. Half of them had occlusal anomalies, one-third had discrepancies, and one-fifth had dental anomalies.

A review of literature indicates that only a few studies have evaluated malocclusion in a referred population.[6,7] Ozgur and Hakan[8] conducted a study in an orthodontically referred Turkish population to evaluate malocclusion and crowding and reported that Class I malocclusion was the most frequently seen whereas Class II, division 2, was the least seen one. There are few studies reporting the prevalence of malocclusion in Jordan[9,10] Abu Alhaija *et al.*[11] reported that prevalence of malocclusion was as high as 92 percent in North Jordanian school children.

This study was conducted to analyze the frequency of malocclusion among patients attending the out patient orthodontic clinics at four referral hospitals of the Royal Medical Services in Jordan.

Methods

A total of 520 of referred Jordanian orthodontic patients (263 males and 257 females) were evaluated in this study. The age range was 13-15 years, and these patients were randomly selected from four different military hospitals at four different regions in Jordan. The selection criteria in this study ensured that all the subjects were of Jordanian origin, were free of medical illnesses and had no history of trauma or surgery that might affect the occlusion. Patients who had received previous orthodontic treatment were excluded from this study.

The occlusal characteristics of patients were derived from Bjork *et al.*[12] which is a qualitative registration of occlusion, space and dental anomalies which by themselves or in combination characterize malocclusion.

Registration criteria

1. Occlusal anomalies
   - Post-normal occlusion (Angle Class II); more than one –half cusp width at the first molar.
   - Pre-normal occlusion (Angle Class III); more than one–half cusp width at the first molar. In the case of extraction of first molar, the registration was made on the canines.
   - Maxillary overjet was recorded when it was more than 5mm.
   - Mandibular overjet (0-1.9 mm; more than 2mm).
   - Open bite, anterior (0-1.9 mm; more than 2mm).
   - Open bite, lateral (lack of contact between at least two pairs of antagonist).
   - Deep bite registered when more than 5mm.
   - Posterior cross bite (unilateral, bilateral).
   - Scissors bite (unilateral, bilateral).
2. Space anomalies
   - Crowding and spacing recorded for the incisor segment and the canine-premolar segments of each jaw when more than 2mm.
   - Median diastema registered when more than 2mm.
3. Dental anomalies
   - Ectopic eruption, impaction, supernumerary and congenitally missing teeth recorded from the panoramic radiographs.

The method was slightly modified in this study to the malocclusion severity index which is used by the Norwegian Health Services.[13] The clinical examination of each subject was carried out in the dental clinic in a dental chair using a dental mirror, and a vernier gauge, all the examination and measurements were carried out by the one examiner, the collected data were transferred to a data sheet which included all the variables. Diagnostic orthopantomograph were taken for those children with unerrupted permanent teeth mesial to the first molar to determine the frequency of hypodontia and the location of impacted teeth. All the relevant data were analyzed statistically using SPSS version 10.0 and included the assessment of the anomalies ratios in the sample and its prevalence (n/N X 100, where n is the number of the subjects with the diagnosed anomaly, while N is the number of the all subjects examined).

Results

Table I illustrates the frequency of malocclusion features.

Table I. Frequency of malocclusion features in 520 Jordanian children

Occlusal Anomalies	%
Post normal occlusion class II	39
Pre normal occlusion class III	13
Maxillary OJ>5mm	30
Mandibular OJ 0-1.9mm	11.50
Mandibular OJ >2mm	1.90
Open bite 0-1.9	11.20
Open bite > 2mm	6.30
Lateral Open bite	3.70
Unilateral cross bite	18.10
Bilateral crossbite	14.60
Unilateral scissor bite	4
Bilateral scissor bite	0.40
Deep bite >5mm	22.10
Dentition Anomalies	
Inversion Maxillary incisors	10
Impacted teeth	15.20
Ectopic eruption	29.20
Agnesis	9.60
Persistence	17.70
Transposition	2.70
Supernumerary teeth	5
Space Anomalies	
Lack of space Maxilla > 2mm	44.40
Lack of space Mandible > 2mm	56.90
Excess of space Maxilla > 2mm	21
Excess of space Mandible > 2mm	11.20
Other findings	
Median diastema	13.10
High labial frenum	4.40
Midline shift max	23.50
Midline shift mandible	27.70

Occlusal anomalies:

Post-normal occlusion, registered as Angle Class II was recorded in 39% of the subjects. Class II Div I was the most common anomaly and it was associated with increased maxillary overjet (5mm or more) in 30% of the sample. Pre-normal occlusion registered as Angle class III was recorded in 13% and was associated with mandibular over jet (0-1.9 mm) in 11%, while marked mandibular overjet (2mm or more) was only noted in 2% of the total sample. Class I malocclusion was recoded in 48% of the sample.

Deep bite of 5mm or more was found in 22% of the sample. This is frequently combined with Class II malocclusion, bilateral posterior cross bite was found in 14% of the subjects and unilateral cross bite in 18%. Open bite of 0.1-1.9 mm was found in 11% of the cases, and in 6% the open bite was 2mm or more.

Space anomalies:

Crowding in one or more segments of the maxillary arch occurred in 44% and in 56% of the mandibular arch. This was the most frequent figure of all anomalies, spacing in the mandible (11%) was roughly half as common as in the maxilla (21%).

Dental anomalies:

Inversion of the maxillary incisors was recorded in 10% with the highest frequency for the laterals. Tooth impaction excluding the wisdom teeth was found in 15% of the subjects. This was most frequent for the permanent maxillary canines (9%) followed by premolars (6%) of the sample in both jaws. Ectopic eruption was mainly observed in maxillary canine area in 29% of the sample. Agenesis of one or more permanent teeth was recorded in 9% of the sample. The most frequently affected teeth were the maxillary lateral incisor followed by the mandibular second premolars. Persistence of the primary teeth was seen in 17% which is the most frequent deviation related to the deciduous dentition.

Other findings:

Relative to the midline of the face, the mandibular arch showed more frequent midline shift (27%) than the maxillary arch (23%). Median diastema was noted in 13% of the cases whilst a high labial frenum was only found in 4%.

Discussion

The purpose of this study was to provide the oral health care planners in Royal Medical Services Hospitals with adequate information about the frequency of malocclusion among the 13-15 year old age group.

In this study Class II and Class III malocclusion were shown as 39% and 13% respectively. Sari *et al.*[14] evaluated 1,602 patients treated in an orthodontic department in Turkey and found that 28% had Class II and 10% had Class III malocclusions. Sayin[8] evaluated referred (1,356) patients to the department of orthodontics and

recorded Class II malocclusion in 24% and Class III malocclusion in 12% ofcases. Jones[6] investigated malocclusion and facial type in 132 Saudi patients referred for orthodontic treatment and reported that 34% had class II and 12.9% had class III malocclusion. Yang[7] evaluated 3,305 patients who had visited the department of orthodontics in Seol. The percentage of class II malocclusion was 15.5% and class III was 49%. The differences in the percentages of class II and class III malocclusions in our study compared to the three mentioned studies may be related to the sample size and ethnic differences.

In a study conducted in the north of Jordan 1,003 school children were evaluated by Abualhaija *et al.*[11] Class II and Class III were shown to be 19% and 1.4% respectively, the difference between our results and their results can be attributed to the sample differences, where theirs comprised school children whilst our sample was a referred population.

The frequency of overjet exceeding 5mm and mandibular overjet less than 2mm corresponds well with the figures of Agle Class II and Class III malocclusions.

Deep bite of more than 5mm was twice as frequent as anterior open bite 0-1.9 mm. The frequency of deep bite increased up to the late mixed dentition and often was associated with a Class II malocclusion. Anterior open bite was decreased in the late mixed dentition and increased again in permanent dentition, which may be explained by the common practice of extraction of the deciduous molars.[2]

Posterior cross bite was higher than in other population with frequency varying from 8-16%, the great majority was unilateral, which was also observed in the present study. A disproportion of the basal or the dentoalveolar width between the two jaws is an important reason for an extensive transverse anomaly. Crossbite was therefore observed in Angle Class III cases due to the prognathic position of the mandible.[15]

The higher figures of dental anomalies (impaction, agenesis, persistence and supernumerary teeth) seen in this study compared to other populations correspond well with Hamdan[16] who reported that in Jordanian children 24% of the Grade 5 were classified as Grade 5i (in the index for orthodontic treatment need (IOTN).[17] Abu Alhaija[18] quoted 17% in this group. Camilleri reported figures for impaction Grade 5i as high as 74% of grade 5 in a Maltese population.[19]

Related to congenital absence of teeth in the present sample, the figure was of about the reported prevalence of dental agenesis in the literature which varied from 0.3-36.5%.[20] Genetic factors,[21] mutation of human genes,[22] developmental anomalies, endocrine disturbances, local factors as pathology, facial trauma and medical treatment have been mentioned as etiological factors.[23]

Crowding was the most common anomaly in the maxillary and mandibular dental arch in agreement with Abu-Alhaija,[11] Thilander,[2] Ozugur[8] and Al-Emran.[5]

Lack of space was more common in the mandible than in the maxilla, the same had been found by Grewe *et al.*, and Roberts,[24,25] while spacing was more common in the maxilla than in the mandible. Good agreement was found between the present result and those reported by Al-Emran,[5] This could be attributed to the fact that occlusal development became negatively influenced due to the mesial migration of the first permanent molars which in turn caused deviation of the midline, tipped and rotated teeth.[26]

The frequency of midline shift is higher in the mandible compared to the maxilla, this confirms the findings in other investigations[4] and the reason may be due to the greater tendency for crowding in the mandible.

Conclusion

In a sample of orthodontically referred Jordanian population, Class II was the most frequently seen malocclusion, whereas Class III was the least common. Mandibular crowding was the most common finding.

The results of this study provide baseline data on the malocclusion frequency of 13-15 year old Jordanian children which will help to decide treatment priorities among those demanding orthodontic treatment at public expense.

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