The characteristic features of malocclusion among Saudi females seeking orthodontic treatment

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ABSTRACT
The purpose of the present study was to investigate the different malocclusion features and their degree of severity in a sample of 330 Saudi females (12-35 years) attending Dammam Central Hospital for orthodontic treatment. None of them had a previous orthodontic treatment. The result showed that 73.9% of the subject had Class I malocclusion. The proportion of Class II and Class III malocclusion was 10.9% and 12.1% respectively. The next common malocclusion traits were crowding and spacing (58.48% and 58.18% respectively), followed by Overjet (20.91%), deep bite (19.1%) and posterior crossbite (17.87%). Open bite, midline diastema, anterior crossbite, and scissors bite were recorded to have the least frequency, and finally, the congenitally missing teeth (1.5%). The observation of the present study highlights the variations in the malocclusion traits among the population which may help in planning the orthodontic services.
INTRODUCTION

Occlusal characteristics and the prevalence of malocclusion vary from country to country and among different population and ethnic groups. A wide variation in the reported prevalence of orthodontic need exists, ranging from 11 per cent in Sweden to 75.5 per cent in Saudi Arabia. The growing public awareness of dental health is increasing and it subsequently increases the demand for orthodontic treatment. Therefore, knowledge about types of malocclusion, and orthodontic treatment needs is essential for planning an orthodontic service and is important in assessing the resources required in most countries. During the recent years, the observed number of Saudi patients seeking orthodontic treatment has increased markedly. This stresses the importance of epidemiological studies in Saudi Arabia to obtain knowledge about the prevalence of different types of malocclusion and the patient demands in order to achieve a successful orthodontic treatment.

Numerous studies on the epidemiology of malocclusion and orthodontic treatment needs and demands have been reported in the regions of Saudi Arabia. Two studies were conducted by Al-Emran et al and Nashashibi et al to investigate the prevalence of malocclusion and the need for orthodontic treatment during the mixed dentition stage in Saudi population.

Al-Balkhi and Al-Zahrani studied the different patterns of malocclusion features in Saudi patients attending for orthodontic treatment. They found that crowding, spacing and crossbite as the principal reasons to seek orthodontic treatment. AlKawari evaluated the characteristics and frequencies of various types of malocclusion among Saudi patients seeking orthodontic treatment.

However, no studies have been published in regard to the distribution of the different features of malocclusion in patients seeking orthodontic treatment in the Eastern region of Saudi Arabia. The purpose of the study was, therefore to investigate the different malocclusion features among Saudi females attending for orthodontic treatment in Dammam city.
MATERIAL AND METHODS
The age range of patients attending Dammam Central Hospital seeking orthodontic treatment was between 8 and 35 years. The selected age of the subjects for the current study was between 12 and 35 years. Thus, the initial sample was consisted of 372 Saudi patients (42 male and 330 female). Based on the sample size, the study was only conducted on 330 female Saudi patients (age range 12 - 35 years). None of the patients had orthodontic treatment. The patients were seated in the dental chair and were examined. Data was collected from the clinical examination using dental mirror and periodontal probe (William probe) and orthopantomograms (OPG). For each patient, there was a registration chart with the following variables; sex, age, type of malocclusion, overjet, over bite, open bite, crossbite, scissors bite, crowding, spacing, midline diastema and single tooth anomaly. The registration was performed according to method used by Bjoerk et al. 24

Occlusal anomalies
A - Sagittal relationship
1. The type of malocclusion was classified according to the method proposed by Angle 25 (Class I, Class II, and Class III).
2. Overjet considered (edge to edge = 0 mm; moderate = 4-6 mm; severe < 6 mm).
3. Anterior Crossbite (all the lower anteriors are in crossbite).

B - Vertical relationship
1. Overbite considered (edge to edge = 0; moderate = 4-6 mm; severe > 6).
2. Open bite, anterior open bite considered (moderate =1-3mm; severe >3mm) and lateral open bite (at least 2 pairs of antagonists are in lack of contact unilaterally or bilaterally).

C - Transverse relationship
1. Posterior crossbite (differentiated into unilateral right, left or bilateral).
2. Scissors bite (differentiated into unilateral right, left or bilateral).

Space anomaly
1. Space discrepancies assessed in both arches, and categorized into spacing (considered if there is 2mm or more excess in each dental arch) and crowding (considered if there is 2 mm or more deficiency in each dental arch).
2. Midline diastema, if the space between upper central incisors is 2mm or more.
Dental anomaly
Congenitally missing teeth, by interpretation from the OPG.

Statistical analysis
The results were processed and analyzed using SPSS for Windows, version 11.5 (SPSS, Inc, Chicago, IL). The percentage of different malocclusion features and their degree of severity were calculated. A Chi square test was utilized to investigate the statistical difference between sexes.

RESULTS
SEX AND AGE DISTRIBUTION
The distribution of female patients attending for orthodontic treatment was 88.7% whereas, the male patients was 11.2%. The difference between them was highly significant (p< 0.05); the male sample was not large enough to be representative, therefore they were excluded from the study. The results showed that the majority of the patients seeking the orthodontic treatment were adolescents (Fig.1). Thus, the age group between 12-16 years constituted a higher frequency 74.8% than the age group (17-35 years) who only represents 25.2%.

OVERALL FINDINGS (Table 1)
As was seen from table 1 The overall findings showed that Class I relationship was the major feature of the total sample, and it was 73.9%. The next common malocclusion trait were crowding and spacing which almost equally distributed (58.48 % and 58.18% respectively), followed by Overjet (20.91%), deep bite (19.1%) and posterior crossbite (17.87%). Conditions such as open bite, midline diastema, Anterior crossbite, and scissors bite were recorded to have the least frequency. The occurrence of congenitally missing teeth was found to be 1.5%.

OCCLUSAL ANOMALIES
Sagittal Relationship (Fig.2 and 3)
The occlusal anomalies as reported in sagittal relationship showed that, the predominant dental arch relationship using angle’s classification was Class I (73.9% ). Class III malocclusion constituted a higher distribution (12.1%) than Class II Division 1 malocclusion (7.9%). Class II Division 2 was uncommon constituting only 3% of the subjects. Some cases of malocclusion could not readily be placed in any type of malocclusion and therefore, were classified in this study as Class II and Class III subdivision ( one side was Class I and other side was Class II or
Class III malocclusion) and these formed 1.8% and 1.2% respectively. Moderate overjet was found in 15.2%, and almost twice as common as edge to edge relationship 8.8% and three times as common as severe overjet 5.8%. Anterior crossbite was recorded in 3.9% of the subjects.

**Vertical relationship (Fig. 4)**
The vertical relationship of occlusal anomalies displayed that moderate deep bite was the most common finding of the sample (16.7%). Edge to edge bite was found to be 10% followed by lateral open bite (6.1%). Both moderate and severe anterior open bite had a low representation of 3.3% and 1.2% respectively. 2.4% of the subjects had severe deep bite.

**Transverse relationship (Fig. 6)**
The highest prevalence of transverse anomalies was right posterior crossbite (8.2%) followed by left and bilateral posterior crossbite which were equally distributed (4.8%). Scissors bite (all types) was found to be uncommon totaling only 3% of the subjects.

**SPACE ANOMALIES (Fig.6)**
Dental crowding and spacing were occurring in a large proportion of the total sample, and were equally distributed between upper and lower dental arch. Almost more than half the subjects (58.4%) had crowding and about the same proportion had a spacing (58.1%). Crowding was distributed as maxillary crowding (23.6%) and mandibular crowding (34.8%). Maxillary and mandibular spacing was observed in 37.6% and 20% of the subjects respectively. Midline diastema was rare, representing only 4.2% of the subjects.
DISCUSSION
Dammam Central Hospital serves the community in Eastern region of Saudi Arabia. There is an orthodontic department for managing patients seeking orthodontic care. In the current study the subjects were categorized into two age groups; adolescents and adults as it is the time for patients to seek orthodontic treatment. All permanent teeth had erupted and none of the patients had interceptive or corrective orthodontic treatment.

In epidemiological studies, the sample size should be large enough and form well defined population. In this survey, the available male sample did not satisfy these requirements. The sample was too small to present any meaningful results, and therefore, the male was excluded from the survey.

The obvious differences in proportions between the sexes highlight the differences in the demand for orthodontic treatment. However, It is common experience that the girls seek the orthodontic treatment more than the boys 19,22,26 either due to the higher level of awareness to malocclusal traits or because female patients exhibited much more concern for correcting the dental malalignment for esthetic reasons. In the present study 88.7 percentage of subjects seeking orthodontic care were females. This is unlike the observation of Al-Balkhi and Al-Zahrani 21, who observed an even distribution of male and female subjects in their study.

Large proportion of the sample was adolescents rather than adults. The small percentage of adult female patients who attended for treatment could be explained, either by the fact that older patients were not frequently referred for orthodontic treatment from different specialties, or that younger patients are more interested about the dental appearance and the obtaining such treatment. This observation is in agreement with the Al-Balkhi and Al-Zahrani 21 observation.

Overall findings
The overall findings of this study outline the proportions of the different occlusal traits in the sample studied. It is interesting to note that in this sample it was more normal to have Class 1 malocclusion as the most predominant feature. As it is clearly seen that many prevalence studies have used Angle’s classification or various modification of his system 2-9. In the present survey, the first molar malocclusion was utilized for comparison and the high distribution of class I relationship confirms the finding of the previous studies in Saudi population, which reported
similar finding\textsuperscript{15,17,20-22}. The next common findings were crowding and spacing, followed by overjet and deep bite. These five features will be responsible for producing the main bulk of orthodontic treatment for these patients.

In the present study, Class III dental relationship more than Class II relationship which is in disagreement with the other studies conducted in Saudi population\textsuperscript{15,16,21,22}. The current study also demonstrated higher number of Class III malocclusion compared to the previous reports. This supported the suggestion that class III relationship is an important factor in the demand for orthodontic treatment in eastern region specifically and this may be explained by some distinct features of Saudi population in the different regions or may be due to a different sample size.

**Occlusal anomalies**

Of the sagittal relationship, moderate overjet was three times as frequent as severe overjet and was slightly less frequent than the other studies\textsuperscript{15,22}. The frequency of severe overjet (5.8 \%) was slightly higher than Al-Emran et al\textsuperscript{15}. The main reason for such a difference could be due to different definitions of severe overjet between the two studies. Anterior crossbite was uncommon finding in the study. This is in agreement with the finding reported by Al-Emran et al\textsuperscript{15}.

The highest frequency of vertical relationship was moderate deepbite (19.1\%). It was more frequent than that reported by Nashashibi et al\textsuperscript{16} and much closer to the finding of Al-Emran et al\textsuperscript{15}. Anterior open bite was slightly less than the observation of Al-Emran et al\textsuperscript{15} and much less than the observations of Al-Nashashibi et al\textsuperscript{16}. Lateral open bite was unlike Al-Emran et al\textsuperscript{15} finding who reported very low figure in this respect. The existing variation in the frequency of lateral open bite in different epidemiological studies seems to be due to the sample size and different variable used, rather than the real difference.

In this investigation, transverse relationship displayed that the unilateral crossbite showed tendency to appear more frequent in the right side. This corresponds well with the observations of Al-Emran et al\textsuperscript{15} and Alkawari\textsuperscript{22}. However, unilateral crossbite and scissors bites were more common than bilateral cases. This is in agreement with Al-Emran et al study\textsuperscript{15} and Alkawari\textsuperscript{22} and unlike Al-Balkhi and Al-Zahrani\textsuperscript{21} study where the crossbite was much higher and almost equally distributed in the anterior and posterior segments.
Space and dental anomalies

More than half of the patients attending for orthodontic treatment showed crowding and spacing of the dental arches 58.48% and 57.6% respectively which is higher than the other studies reported from Saudi Arabia\textsuperscript{15,21}. Crowding was more commonly observed in the mandible than the maxilla. On the other hand, the spacing was much higher in maxilla than mandible; both findings were in agreement with the observations of Al-Emran et al\textsuperscript{15}. The most likely explanation for high frequency of crowding is that the hereditary factors and extracted deciduous molars which might have lead to mesial drift of the first permanent molars.

The frequency of midline diastema observed (4.2 %) was similar to the findings of Al-Emran et al\textsuperscript{15} and lower than the observations of Al-Balkhi and Al-Zahrani\textsuperscript{21}. The reason for midline diastema among Saudi patients is more dependent on hereditary factors related to tooth size, jaw size and asymmetrical tooth extraction\textsuperscript{15,27}. Congenitally missing teeth was the least common in the present sample and it was less frequent than reported by Thilander et al\textsuperscript{27}.

However several studies have described the distribution of occlusal features in different populations, reporting variations in the prevalence and this may be attributed to the ethnicity, sample composition, and registration methods\textsuperscript{27,28}. Therefore, the influence of the above factors must be taken into account when comparing the findings from different studies.

CONCLUSIONS

1. The female patients showed more interest in obtaining orthodontic treatment than males.
2. The majority of orthodontic patients were of the adolescents
3. Patients attending for orthodontic treatment displayed a high prevalence of Class I molar relationship, followed by Class III then Class II molar relationship.
4. Spacing and crowding seemed to be very common features in the present study, followed by overjet, deep bite and posterior crossbite. Whereas anterior open bite, midline diastema, anterior crossbite, scissors bite and congenitally missing teeth had the least distribution.
5. Further epidemiological studies of malocclusion are recommended among randomly selected population with higher number of subjects.
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REFERENCES


Table 1. Distribution of Occlusal, Space and dental anomalies

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Fig. 1. Distribution of subjects according to the age group

Fig. 2. The percentage distribution of subjects with malocclusion (Angle’s classification)
(73.9%) (7.9%) (3.0%) (1.8%) (12.1%) (1.2%)

percentage of patients

Class 1         Class II div.1,   Class II div. 2,   Class II S.D.          Class III,    Class III S.D.
Fig. 3. The percentage distribution of occlusal anomalies in sagittal relationship

![Graph showing percentage distribution of occlusal anomalies in sagittal relationship.]

Fig. 4. The percentage distribution of occlusal anomalies in vertical relation

![Graph showing percentage distribution of occlusal anomalies in vertical relation.]

- **Overjet**
  - edge to edge (8.8%)
  - moderate (15.2%)
  - severe (5.8%)
  - minimal (3.9%)

- **Anterior Crossbite**
  - edge to edge (6.4%)
  - moderate (5.8%)
  - severe (3.9%)

- **Deep Bite**
  - edge to edge (10%)
  - moderate (16.7%)
  - severe (2.4%)

- **Anterior Open Bite**
  - moderate (3.3%)
  - severe (1.2%)

- **Lateral Open Bite**
  - 6.1%
Fig. 5. The percentage distribution of occlusal anomalies in transverse relationship

Fig. 6. The percentage distribution of space anomalies