

# Gender differences, facial profile and treatment need of malocclusion for a sample of Al-Muthanna governorate students aged 15 years

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## ABSTRACT

**Background:** Survey of the occlusion in population groups usually include in their objections the academic assessment of occlusal feature, the planning resources for public health treatment programmers, the comparison of different population and the screening of groups for orthodontic treatment. Likewise a thorough investigation of the occurrence of malocclusions among school-students would be of major importance in the planning of orthodontic treatment in the public dental health services. For this purpose it is necessary to have detailed information on the prevalence of individual malocclusion among boys and girls at different ages distributed regionally, and moreover, an analysis of the need for orthodontic treatment in the different school classes.

**Materials and methods:** This study was conducted from 20<sup>th</sup> October 2011 to 9<sup>th</sup> May 2013 on (3424 ) students (1712 males and 1712 females); from which 62 students (1.8%) were excluded because of incomplete information (no molar relation can be attended) giving a valid sample of 3362 (1681 males and 1681 females) aged (15) years old were studied with respect to facial profile ,sagittal occlusion according to Angle's classification, overjet, overbite, anterior crossbite , posterior crossbite, scissorsbite, rotation and displacement spacing and crowding.

**Results:** The normal profile were presented in (73.76%) students (74%) males and (73.53%) females. Convex profiles were presented (20.34%) students (20.46%) males and (20.23%) females. A concave profile were presented in (5.9%) students (5.54%) males and (6.24%) females), The malocclusion were presented (73.05%) students (73.46%) males and (72.64%) females, According to the Dental health component of index of the orthodontic treatment subjects with no need for treatment were about 44.11% , the subjects who need little treatment were about 26.82%, 13.06% of the subjects who need moderate treatment, 10.03% great treatment need and about 5.98% very greatly treatment need.

**Conclusions:** Orthodontic treatment need according to IOTN shows that there was no significant difference between males and females in the malocclusion, Facial profile and treatment need.

**Key words:** Malocclusion, Facial profile, Treatment need. (J Bagh Coll Dentistry 2013; 25(3):142-148).

## INTRODUCTION

Al-Muthanna governorate lies 280km to the south of Baghdad, itself part of middle furat of Iraq. It is bounded on the North by Diwaneya, on the west by Saudi Arabia, on the south by Nasiriya and on the east by Meesan. A thorough investigation of the occurrence of malocclusions among schoolchildren would be of major importance in the planning of orthodontic treatment in the Public Dental Health Service. For this purpose it is necessary to have available detailed information on the prevalence of individual malocclusions among boys and girls at different ages distributed regionally, and moreover, an analysis of the need for orthodontic treatment in the different school classes. An analysis of such data collected from large of children would throw light on the relationship between different types of malocclusion, widen our knowledge of their etiology and hence increase the possibility of preventing them. It is likewise important to carry out a comparison of the prevalence of malocclusion with different racial groups on an objective basis, since the information they would provide might well throw light on the causes of malocclusion<sup>(1)</sup>.

Malocclusion is endemic and wide spread throughout the world however its prevalence varies widely in different communities; knowledge of the nature of malocclusion feature is an essential step for planning orthodontic services on community<sup>(2)</sup>. Since malocclusion affects a large number of the population, it is by definition a public health problem and as any other phase of public health work, it is essential to have accurate information on the prevalence and incidence of the condition as up to date prevalence figures obtained from studies vary greatly and epidemiologic studies of the incidence of malocclusion in particular population date back to early 1900s<sup>(3)</sup>.

In various populations, malocclusion was examined by using the Index of Orthodontic Treatment Need (IOTN) and the reproducibility of IOTN was examined and the values indicated substantial agreement<sup>(4-6)</sup>. Several occlusal indices have been developed over the years in order to help professionals to objectively categorize malocclusion severity and to provide criteria indicating which patients should have treatment priority, mainly in those places where this treatment is unevenly spread. Among these indices, the Index of Orthodontic Treatment Need (IOTN) consists of two separate components which can be used for assessing

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dental and functional health (Dental Health Component-DHC) as well as aesthetic impairment due to malocclusion (Aesthetic Component-AC)<sup>(7)</sup>.

## MATERIALS AND METHODS

### The Sample

The sample consists of 15-year-old students attending third year intermediate schools. Age was considered according to the last birthday giving an age range from 15 years 0 months to 15 years 11 months<sup>(8)</sup>.

The total number of students attending third year intermediate schools in Al-Muthanna governorate were (21680) and number of intermediate schools were ( 66 ), while the number of population were (700000) (Ministry of Education, Al-Muthanna directorate 2013). The minimum number of the sample to be representing is taken according to the following equation<sup>(9)</sup>:- (The number of sample= Number of student / Number of population × 100000 ) =21680 / 700000 × 100000= 3097

The sample has been taken from (32) intermediate schools, which were randomly selected in Al-Muthanna governorate. The subjects were chosen from different parts of the governorate, from urban and rural part ( alsammawa, alrumaitha, alkhuder and alsalman). The sample consist of (3424) students (1712 males and 1712 females); from which 62 students (1.8%) were excluded because of incomplete information (no molar relation can be attended) giving a valid sample of 3362 (1681 males and 1681 females).

The sample was taken in terms of the following criteria:-

1. No missing permanent teeth.
1. No previous orthodontic treatment.
2. No Partially erupted and tipped teeth.
3. No severe facial disfigurement due to trauma, pathology or congenital.
4. No Submerged deciduous teeth.
5. No Supplemental teeth.

Permission was obtained from the Al-Muthanna directorate of education. The schools` authorities were contacted and the purpose of the study was explained to them to assure full cooperation.

### Methods of Examination

The examinations were carried out in rooms that were available in host school. The subjects were seated on ordinary chairs. The subject`s head was supported in an upright position and the examiner standing in front of the chair<sup>(10)</sup>.

The following instruments were used: Plane mouth mirrors (No.4) Dentaureum (042-751), Soft stainless steel wire (0.5mm), Tweezers ,Kidney dish, Millimeter graded vernier (Inox, Zurcher Modell, An instrument designed to measure tooth rotation and displacement modified from Van Kirk and Pennell and Björk et al<sup>(11,1)</sup>. It is 6.5 cm long and consist of two stainless steel rods of 1mm in diameter with rounded ends and 15 degree angle between them ( Figure,1), Indelible pencil, concentrated sterilization solution (Ethyl Alcohol 95%) and Portable light.

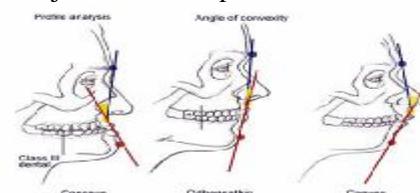


**Figure 1. Instrument to measure tooth rotation and displacement**

### Orthodontic Methods

#### Facial profile

This step requires placing the patient in the physiologic natural head position, the head position of the individual adopts in the absence of others. This can be done with the patient either sitting upright or standing, but not reclining in a dental chair, and looking at the horizon or a distant object. With the head in this position, note the relationship between two lines, one dropped from the bridge of the nose to the base of the upper lip, and a second one extending from that point downward to the chin. Each line segments should form a nearly straight line. An angle between them indicates either profile convexity (upper jaw prominent relative to chin) or profile concavity (upper jaw behind chin) as shown in (Figure, 2). A convex profile therefore indicates a skeletal Class II jaw relationship, whereas a concave profile indicates a skeletal Class III jaw relationship<sup>(12)</sup>.



**Figure 2. Facial profile**

#### Sagittal Occlusion

Depending on Angle's classification<sup>(13)</sup>, the criteria described by Lavelle<sup>(14)</sup> and described by Houston<sup>(15)</sup> This variable was divided as follows (Figure 3) :-

(a) Normal molar occlusion (Class I). It is registered when the mesiobuccal cusp of the upper first permanent molar occludes with the

anterior buccal groove of the lower first permanent molar.

(b) Distal molar occlusion (Class II). It is observed when the relative position of mandibular molar has shifted distally by half cusp width or more.

(c) Mesial molar occlusion (class III). It is observed when the relative position of the mandibular molar had shifted mesially by half a cusp width or more. In addition to that cusp to cusp relationship of molars.

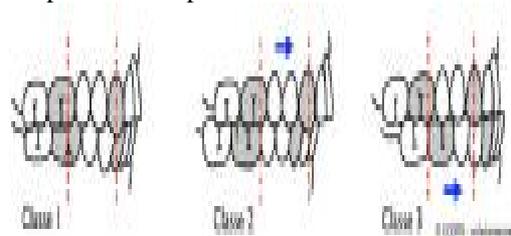


Figure 3. Angle's classification

Overjet (O.J)

Measurement of the horizontal relation of the incisors is made with the aid of millimeter graded vernier while the subject is in centric occlusion and measured the distance from the most prominent surface of labial surface of upper central incisor and labial surface of lower central incisor (Figure,4a). The measurement of overjet is recorded to the nearest millimeter. Increased overjet was considered as > 4mm and decreased overjet was considered as <1 mm. An increased, decreased, or reversed overjet value was considered as a single occlusal anomaly<sup>(10)</sup>.

Overbite (O.B)

The overbite was measured according to Draker<sup>(16)</sup> while the subject is in centric occlusion with his occlusal plane horizontal. The amount of vertical overlap of the upper incisor on the lower incisor is marked with the pencil on the labial surface of the lower incisor using the incisal edge of the upper incisor to guide the pencil with the conical plane of the sharpened point of the pencil itself parallel to the subject's occlusal plane (Figure,4b). If there is lack of vertical overlap between any of the opposing pairs of incisors (openbite), the amount of openbite is measured directly and recorded to the nearest whole millimeter. Increased overbite was considered as >4mm and decreased overbite as < 1mm. An increased or decreased overbite including anterior openbite was considered as a single occlusal anomaly.



Figure 4a. Overjet Figure 4b. Overbite

Crossbite and Scissorbite

Anterior crossbite was recorded according to Bjork<sup>(1)</sup> in which one, two or three of the upper incisors occlude lingual to the lowers.

The measurement of the transverse lateral segment relation was made by direct inspection of the lateral segments on each side. One of three separate relations was recorded for the transverse interdigitation of the lateral segments<sup>(10)</sup>:

Crossbite: a buccal cusp of a mandibular tooth lied buccal to the maximum height of a buccal cusp of an opposing maxillary tooth. Scissors bite : a buccal cusp of a mandibular tooth lied lingual to the maximum height of a lingual cusp of an opposing maxillary tooth (Figure,5).

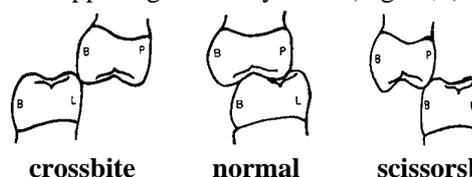


Figure 5. Posterior crossbite and scissorbite (B=buccal, L=lingual, P=palatal)

Rotation and Displacement

Fully erupted teeth that were rotated more than 15° (Figure, 6a) were registered under 'mesial' or 'distal' rotation. The degree of rotation was measured with the registration instrument shown in (Figure,1)<sup>(1)</sup>. Any tooth displaced bodily from the ideal arch line by more than 1mm was registered under 'buccal' or 'palatal' displacement (Figure,6b).<sup>(11)</sup>



Figure 6a. Rotation. Figure 6b. Displacement.

Spacing and Crowding

Spacing (excessive arch space) existed, the vernier was used to measure the amount of space discrepancy and it was also recorded. Later, in statistical analysis each segment was regarded as spaced where there was a shortage of 2mm or more of space beyond that required for the correct alignment of all teeth in that segment. While crowding (insufficient arch space) existed, a segment was regarded as crowded where there

was a shortage of 2mm or more of space preventing the correct alignment of all teeth in that segment<sup>(1,10)</sup> (Figure, 7).



**Figure 7. Spacing Figure 7. Crowding**

**Treatment needs assessment:**

The treatment need depends on the dental health component of the Index of Orthodontic Treatment Need (1987)<sup>(17)</sup>. So the criteria of the assessment as follow:

**Grade 1 (No treatment need)**

Extremely minor malocclusion, include displacement less than 1mm.

**Grade 2 (Little)**

**2a** Increased overjet greater than 3.5mm but less than or equal to 6mm with competent lips. **2b** Reverse overjet greater than 0mm but less than or equal to 1mm. **2c** Anterior or posterior crossbite with less than or equal to 1mm discrepancy between retruded contact position and intercuspal position. **2d** Displacement of the teeth greater than or equal to 2mm. **2e** Anterior or posterior openbite greater than 1mm but less than or equal to 2mm. **2f** Increased overbite greater than or equal to 3.5mm without gingival contact. **2g** Prenormal or postnormal occlusions with no other anomalies. Include up to half a unit discrepancy.

**Grade 3 (moderate )borderline need**

**3a** Increased overjet greater than 3.5 mm but less than or equal to 6mm with incompetent lips. **3b** Reverse overjet greater than 1mm but less than or equal to 3.5 mm.

**3c** Anterior or posterior crossbite with greater than 1mm but less than or equal to 2mm discrepancy between retruded contact position and intercuspal position. **3e** lateral or anterior openbite greater than 2mm but less than or equal to 4mm. **3f** Increased or complete overbite without gingival or palatal trauma.

**Grade 4 (great ) treatment require**

**4a** Increased overjet greater than 6 mm but less than or equal to 9mm. **4b** Reverse overjet greater than 3.5mm with no masticatory or speech difficulties. **4c** Anterior or posterior crossbite with greater than 2mm between retruded contact position and intercuspal position. **4d** Sever displacement of teeth greater than 4mm.

**4e** Extreme lateral or anterior openbite greater than 4mm. **4f** Increased or complete overbite with gingival or palatal trauma. **4h** Less extensive hypodontia requiring pre-restorative

orthodontics or orthodontic space closure to obviate the need for a prosthesis.

**4i** Posterior lingual crossbite with no functional occlusion contact in one or both

buccal segment . **4m** Reverse overjet greater than 1mm but less than 3.5 mm with recorded masticatory and speech difficulties .**4t** Partially erupted teeth, tipped and impacted against adjacent teeth **4x** Supplemental teeth.

**Grade 5 (very great)**

**5a** Increased overjet greater than 9mm.

**5h** Extensive hypodontia with restorative implication. **5i** Impeded eruption of teeth.

**5m** Reverse overjet greater than 3.5mm with recorded masticatory and speech difficulties.

**5p** Defect of cleft lip and palate.**5s** Submerged deciduous teeth.

**Statistical Analysis**

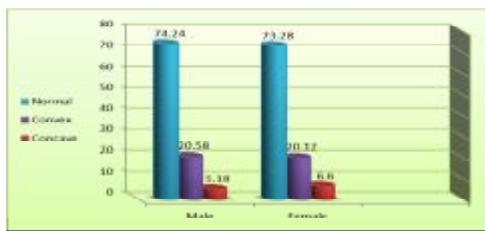
The data were processed and analyzed by using the statistics package for social sciences (SPSS Inc., version 17 for windows 7and excel 2010).The usual statistical methods were used in order to analyze and assess results include:- Descriptive Statistics, inferential Statistics, Z-test for comparison significant difference between two proportions. The following levels of significance are used:  $P \leq 0.05$  significant.

**RESULTS**

1- Distribution of facial profile and gender differences as shown in (Table, 1 and Figure, 8): The normal profile were presented in 2480 (73.76%) students (1244 (74%) males and 1236 (73.53%) females). A convex profile was presented in 684 (20.34%) students (344 (20.46%) males and 340 (20.23%) females). A concave profile were presented in 198 (5.9%) students (93(5.54%) males and 105(6.24%) females),there was no significant differences between both gender for all types of facial profile (  $P > 0.05$ ).

**Table 1. Distribution (%) of profile and gender differences Pr= profile, No= normal, Cx=convex, Cv=concave.**

Pr.	Total		Male		Female		P sig
	No	%	No	%	No	%	
No	2480	73.76	1244	74	1236	73.53	0.373 (NS)
Cx	684	20.34	344	20.46	340	20.23	0.431 (NS)
Cv	198	5.9	93	5.54	105	6.24	0.184 (NS)
T	3362	100	1681	100	1681	100	---

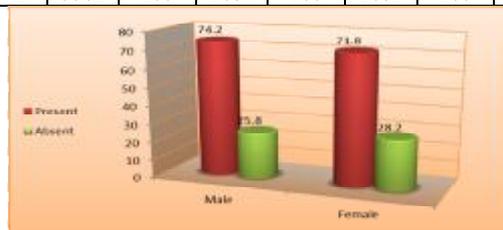


**Figure 8. Distribution (%) of profile and gender differences Pr= profile, No= normal, Cx=convex, Cv=concave.**

2- Distribution of malocclusion (any anomaly in sagittal occlusion, overjet, overbite, anterior crossbite , posterior crossbite ,scissorsbite, rotation and displacement spacing and crowding) and gender differences as shown in (Table ,2 and Figure ,9) :The malocclusion were presented in 2456 (73.05%) students (1235(73.46%) males and 1221 (72.64%) females) while there was no any anomaly in 906 (26.95%) students (446(26.54%) males and 460 (27.36%) females). there was no significant differences between both gender ( P>0.05).

**Table 2. Distribution (%) of malocclusion and gender differences, P= present, A = absent.**

M	Total		Male		Female		P sig
	No	%	No	%	No	%	
P	2456	73.05	1235	73.46	1221	72.64	0.281 NS
A	906	26.95	446	26.54	460	27.36	0.288 NS
T	3362	100	1681	100	1681	100	--



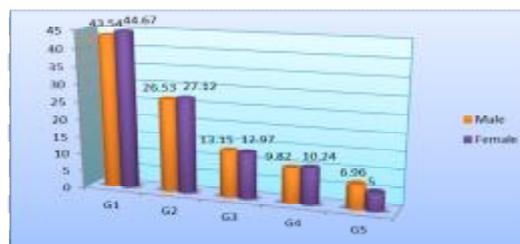
**Figure 9. Distribution (%) of malocclusion and gender differences, P= present, A = absent.**

3- Distribution of the treatment need and gender differences as shown in (Table 3 and Figure 10): The grade 1 (no treatment need) were presented in 1483 (44.11%) students (739(43.96%) males and 744 (44.25%) females), grade 2 (little treatment need) were presented in 902 (26.82%) students (449(26.71%) males and 453 (26.94%) females), grade 3 (moderate treatment need) were presented in 439 (13.06%) students (221(13.15%) males and 218 (12.97%) females), grade 4 (great treatment need) were presented in 337 (10.03%) students (165(9.82%) males and

172 (10.24%) females), grade 5(very great treatment need) were presented in 201 (5.98%) students (107(6.36%) males and 94 (5.6%) females), there was no significant differences between both gender for all types of treatment need (P>0.05).

**Table 3. Distribution (%) of IOTN and gender differences G1= grade 1, G2 = grade 2, G3= grade 3,G4= grade 4,G5= grade 5**

IOTN	Total		Male		Female		P sig
	No	%	No	%	No	%	
G1	1483	44.11	739	43.96	744	44.25	0.43 NS
G2	902	26.82	449	26.71	453	26.94	0.437 NS
G3	439	13.06	221	13.15	218	12.97	0.436 NS
G4	337	10.03	165	9.82	172	10.24	0.336 NS
G5	201	5.98	107	6.36	94	5.6	0.165 NS
T	3362	100	1681	100	1681	100	---



**Figure 10. Distribution (%) of IOTN and gender differences G1= grade 1, G2 = grade 2,G3= grade 3,G4= grade 4,G5= grade 5**

## DISCUSSION

The three types of facial profile showed no significant relation with gender: normal profile was presented in (73.76%) students (74%) males and (73.53%) females. Convex profile was presented (20.34%) students (20.46%) males and (20.23%) females. Concave profile was presented in (5.9%) students (5.54%) males and (6.24%) females) which is similar to Krogman <sup>(18)</sup>, Telle <sup>(19)</sup>, Helm <sup>(20)</sup>, on other hand, it is higher than Al-Dialaimi <sup>(21)</sup> and Al-Tae <sup>(22)</sup>. This difference may be due to race and variation in environmental factors in addition to age group and this can be explained according to Lines <sup>(23)</sup> and Bell et al <sup>(24)</sup> who reported that the patient with straight profile usually have normal occlusion or class I malocclusion, those with convex profile having an increase in the probability of having a class II malocclusion associated with retrusive mandible or a protrusive maxilla or both. Patient with concave profile having an increase in the probability of having a class III malocclusion associated with

retruded maxilla, protruded mandible or both. The prevalence of malocclusion (any anomaly in sagittal occlusion, overjet, overbite, anterior crossbite, posterior crossbite, scissorsbite, rotation and displacement spacing and crowding) showed no significant relation with gender: The malocclusion were presented (73.05%) students (73.46%) males and (72.64%) females, while there was no any anomaly in (26.95%) students (26.54%) males and (27.36%) females. which was much lower than those found by Cons<sup>(25)</sup>, Abdulla<sup>(26)</sup>, Batayine<sup>(27)</sup>; but was near to the findings of Kinaan<sup>(2)</sup>, Al-Huwaizi<sup>(28)</sup> and Rasheed<sup>(29)</sup> and higher than that of Corruccini and Lee<sup>(30)</sup> among Chinese. This due to difference in ethnic and age group or could be due to skeletal, dental, soft tissue factors and downward direction of mandibular growth. According to the Dental health component of index of the orthodontic treatment need (IOTN), The five grades of (IOTN) showed no significant relation with gender, the subjects with no need for treatment were about 44.11% table (3) which is more than that found by Van Kirk & Pennell<sup>(11)</sup>, Ingervall et al.<sup>(31)</sup>, Myrberg & Thilander<sup>(32)</sup> and Johnson & Harkness<sup>(33)</sup> and Al-Tae<sup>(22)</sup>. This difference is due to difference in the prevalence of malocclusion among the different ethnic and age group. According to (IOTN), the subjects who need little treatment were about 26.82%, 13.06% of the subjects who need moderate treatment, 10.03% great treatment need and about 5.98% very greatly treatment need.

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