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Gender-Based Assessment of Orthodontic Treatment Need among Dental Students of Bilad Alrafidain University Using the IOTN (DHC)

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Background: Epidemiologic data is useful for estimating overall need and demand for orthodontic care services and this leads to increased interest in oral health services especially need of orthodontic treatment. Malocclusion affects a person's functional needs and psychological well-being, which results in a variety of oral health issues. **Objective:** to assess the degree of orthodontic treatment needed in a group of Iraqi university students by using dental health component of Index of Orthodontic treatment Need (IOTN). **Population and methods:** The study is a descriptive study done in the orthodontic department clinics of the University of Bilad-Alrafidain / College of dentistry in November, 2024. The study included one hundred fresh dental students (second stage dental college which are not seeking orthodontic treatment (61 females and 39 males) selected by simple random sample technique. IOTN was used to assess the degree of orthodontic treatment needed. **Results:** Only 4% of the participants had high demand for orthodontic treatment due to missing > 3 teeth and 14% require moderate demand due to minor increase in overjet, and only 1% had high increase in overjet. Normal values (0-3.5 mm) were detected in 85% of cases. About 6% require moderate demand for orthodontic treatment due to lateral or anterior open bite, while (16%) showed increase in overbite more than normal range. It was found that 31% of the studied group had high demand for orthodontic treatment grade 4, 13% grade 3 and 7% with mild demand grade 2, while 49% of the subjects do not require any orthodontic treatment with no statistical difference between male and female students. **Conclusion:** Malocclusion is an important oral problem; therefore, early attention should be paid to oral health. Even that half of the participants do not need any orthodontic treatment but 31% of subjects reported high demand for orthodontic treatment.

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INTRODUCTION:

Concerns regarding dental function and appearance, particularly in children, have grown in recent years. Malocclusion, a developmental disease marked by misalignment between teeth and the dental arches, is one major problem impacting both appearance and function¹. Malocclusion is the third most common oral health problem, behind periodontal disease and dental cavities, according to the World Health Organisation (WHO)².

Malocclusion affects functional requirements and compromises dentofacial aesthetics, speech, mandibular function, and psychological well-being, all of which contribute to a variety of oral health issues³. Before scheduling orthodontic treatment, malocclusion correction must be assessed. An essential part of organizing orthodontic treatment is assessing different kinds of malocclusions. Orthodontic indices are a method used by epidemiologists to assess the frequency and severity of different kinds of malocclusions⁴. In order to classify malocclusions into different groups based on their severity, numerous orthodontic indices were created. Summers' Occlusal Index, the Treatment Priority Index (TPI), the Handicapping Malocclusion Assessment Record8, the Need for Orthodontic Index, and the Index of Orthodontic Treatment Need (IOTN) have been the most often used indices⁵. The index of orthodontic treatment need (IOTN) is one of these various techniques for grading and evaluating malocclusion. It is an indicator designed to evaluate the complexity of orthodontic treatment. Based on the degree of malocclusion, it offers a summary score⁶. International awareness of the IOTN as a technique for impartially determining treatment needs has been growing. It is a trustworthy epidemiological instrument that helps local health services manage their budget and enhance service focus by encouraging more consistency and standardization in the evaluation of orthodontic treatment needs⁷. Fewer papers explicitly address the need and demand concerns for orthodontic treatment of dental college students, despite the fact that numerous studies have examined the prevalence and severity of malocclusion for particular ethnic groups, age distribution, and country-specific populations. So the current study aimed to assess of the degree of orthodontic treatment needed in a group of Iraqi university students by using dental health component of Index of Orthodontic treatment Need.

MATERIALS AND METHODS:

Study design and setting”

The present study is a descriptive study was done in the orthodontic department clinics of the University of Bilad-Alrafidain / College of dentistry in November, 2024.

Population:

The study included one hundred fresh dental students (second stage dental college which are not seeking orthodontic treatment (61 females and 39 males).

The selection of the samples for the study was simple random sample technique randomized by the use of Microsoft Excel sheets by giving each

student a randomized number formula and then sorting the whole row ascending or descending according to the random number given to each student.

Materials:

The following materials and devices were used in the study:

Intra-oral scanner (Helios 500 eightieth intraoral scanner)

Personal computer (MacBook M1 Pro macOS Sequoia)

3shape ortho 3D Viewer application (Figure 1)

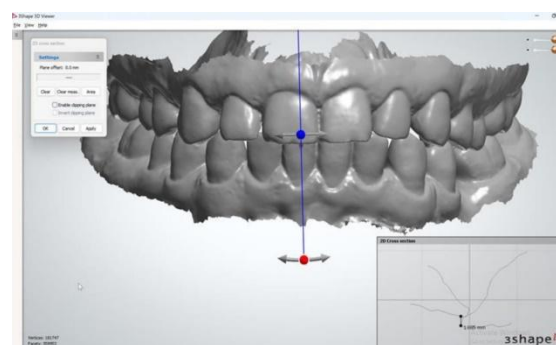


Figure 1: 3 shape ortho 3D Viewer application

Methods:

The process of gathering student data began with a complete scan of the upper and lower arches, followed by occlusion bites on the left and right sides.

Following the completion of data collection, measurements were made using the 3shape Ortho 3D Viewer application to determine the number of missing, impacted, or ectopic teeth (Figure 2), overjet by measuring the horizontal distance (in millimetres) from the incisal edge to the most protruding upper central incisor to the opposing labial surface (Figure 3), and cross bite by measuring the distance (in millimetres) from the functional cusp to the intercuspal position. Overbite is assessed by measuring the vertical overlap (in millimeters) from the incisal edge of the most protruded upper central incisor to the incisal edge of the opposing (Figure 3).

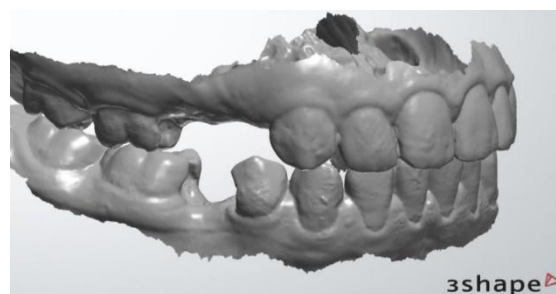


Figure 2: 3shape ortho 3D Viewer application



Figure 3: Assessment of Overjet on the left picture and assessment of Overbite on the right picture

Index of Orthodontic Treatment Need (IOTN):

In the UK, Brook & Shaw created the Index of Orthodontic Treatment Need in 1989. Initially known as the Index of Orthodontic Treatment Priority, it was subsequently renamed as IOTN ⁸. In order to compare populations, this clinical index prioritizes and categorizes malocclusion based on treatment requirements. The IOTN index was created by modifying the Swedish Dental Health Board's index, which was used to record the need for orthodontic treatment based on functional and dental health factors. The Dental Health Component (DHC), a clinical component, and the Aesthetic Component (AC) are the two distinct parts of the IOTN. AC is not coupled with DHC. This index is used to rank malocclusions based on perceived aesthetic impairment and other occlusal features. The objective is to identify those who could benefit most from orthodontic treatment. ⁹

Dental Health Component (DHC):

Using a specially made ruler on a dental cast, the DHC notes the worst occlusal aspect of the malocclusion that affects dental health. The worst feature is determined using a hierarchical scale. (Fig. 4) To lessen the influence on dental health, they are: Tooth loss > Overjet > Crossbite > Contact point displacement > Overbite. This hierarchical scale can be recalled by using the acronym MOCDO. The malocclusion can be categorized into five grades once the worst occlusal characteristic has been noted. Five IOTN ratings are grade 1, meaning no therapy is required, Grade 2: minimal need for medical attention Grade 3: modest treatment requirement Grade 4 indicates a high need for treatment, whereas Grade 5 indicates a very high requirement.

Index of Orthodontic Need (IOTN)
 WESSEX ORTHODONTIC MANAGED CLINICAL FRAMEWORK

Patient Name: _____ Date of Birth: _____

Please complete this form for any patient requiring NHS orthodontic treatment that meets the following criteria. Patients must meet the requirements of the Index of Treatment Need (IOTN) 4, 5 and 3 with an aesthetic component of 6 or above to be eligible for NHS treatment. Patients must be under the age of 18 at the point of referral.

PLEASE TICK THE APPROPRIATE COLOURED BOX

IOTN SCORE	5	4	3	2
NEED FOR TREATMENT	Very Great	Great	Moderate	Little
a Overjet	>9mm	6-9 mm	3.5-6mm Incompetent lips	<3.5mm Competent lips
b Reverse overjet		>3.5mm	1-3.5mm	<1mm
c Cross bite		>2mm	1-2mm	<1mm
d Tooth displacement		>4mm	2-4mm	<2mm
e Open bite		>4mm	2-4mm	<2mm
f Over bite		Increased complete & trauma	Increased/complete & no trauma	<1.5mm Incomplete no trauma % and discrepancy
g Pre/post normal occlusion				
h Hypodontia	>1 tooth per quadrant	Less severe		
i Impeded eruption	Due to crowding, displacement, pathology			
l Posterior/lingual cross bite		No functional Occlusion		
m Reverse overjet	>3.5	1, 3.5		
p Cleft lip & palate	Yes No			
s Deciduous teeth	Submerged			
t Partially erupted		Tipped or Impacted		
x Supplemental		Supplemental		
IOTN N/A	Caries or trauma prognosis	with doubtful	Monitoring Growth	Orthognathic

Patients in blue (very great need) zones – referral to hospital
 Patients in green (great need) zones – referral specialist practice for assessment
 Patients in yellow (moderate need) zones – referral to specialist practice for assessment where aesthetic component is 6 or above
 Patients in red (little/no need) zones are not eligible for NHS treatment

Figure 4: Index of Orthodontic Treatment Need

Ethical considerations: Before the intra-oral scan, the students gave their verbal agreement and were fully informed about what would happen and how the data would be handled at random.

RESULTS:

The study included one hundred dental students who are not seeking orthodontic treatment (61 females and 39 males). The results shown in the (Table 1), illustrated that only (4%) of the sample with high demand for orthodontic treatment due to missing more than 3 teeth and requiring pre-restorative orthodontic treatment. About 71% of the sample has no missing teeth. As illustrated in table in (Table 2), only (14%) require moderate demand for orthodontic treatment due to minor increase in overjet, and only 1% require high need for

orthodontic treatment due to high increase in overjet. Normal values (0-3.5 mm) were detected in 85% of cases. The results in (Table3), showed (13%) high demand for orthodontic treatment due to anterior or posterior cross bite more than 2 mm deviation from the intercuspal position. The last component in this index showed in (Table 4). The data showed that only 6% require moderate demand for orthodontic treatment due to lateral or anterior open bite, while (16%) showed increase in overbite more than normal range while normal range was reported in (78%) of participants. It was found that 31% of the studied group had high demand for orthodontic treatment, 13% with moderate need for orthodontic treatment and 7% with mild demand, while 49% of the subjects do not require any orthodontic treatment with no statistical difference between male and female students (Table 5)

Table 1: Frequency distribution of missing teeth among studied group

Total missing teeth	Male (n=39)		Female (n=61)		Total	
	N	%	N	%	N	%
Zero	30	77	41	67.2	71	71
1	8	20.5	7	11.5	15	15
2	1	2.5	9	14.8	10	10
≥3	0	0	4	6.5	4	4

Table 5: Five grades of IOTN

IOTN		Gender		Total	X ²	P value
		Male	Female			
Grade 1.00	N	21	28	49	6.2	0.098
	%	53.8%	45.9%	49.0%		
Grade 2.00	N	1	6	7		
	%	2.6%	9.8%	7.0%		
Grade 3.00	N	2	11	13		
	%	5.1%	18.0%	13.0%		
Grade 4.00	N	15	16	31		
	%	38.5%	26.2%	31.0%		

Chi square (x²) test p>0.05 non-significant

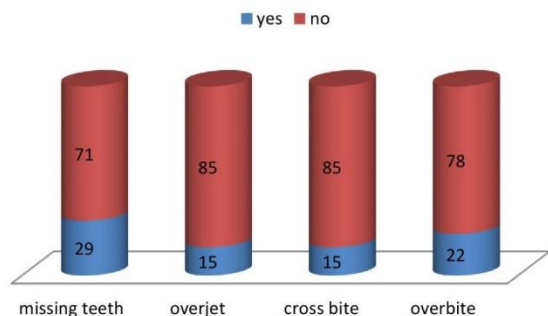


Figure 5: Frequency distribution of different defects detected by IOTN

DISCUSSION:

Dentofacial aesthetics, speech, mandibular function, and psychological well-being are all compromised by malocclusion, which also impacts functional requirements and contributes to a number of oral health problems. In the present

Table 2: Frequency distribution of overt jet among studied group

Overt jet	Male (n=39)		Female (n=61)		Total	
	N	%	N	%	N	%
6.1-9mm	0	0	1	1.6	1	1
3.6-6 mm	4	10.3	10	16.4	14	14
0-3.5 mm	35	89.7	50	82	85	85

Table 3: Frequency distribution of Cross bite among studied group

Cross bite	Male (n=39)		Female (n=61)		Total	
	N	%	N	%	N	%
Zero	31	79.6	54	88.5	85	85
<1 mm	0	0	0	0	0	0
1.1-2 mm	2	5	0	0	2	2
≥2 mm	6	15.4	7	11.5	13	13

Table 4: Frequency distribution of over bite among studied group

Over bite	Male (n=39)		Female (n=61)		Total	
	N	%	N	%	N	%
>3.5 mm	8	20.5	8	13.2	16	16
0-3.5 mm	31	79.5	47	77%	78	78
(-0.)1- (-1) mm	0	0	2	3.2	2	2
(1.1)-(-2) mm	0	0	4	6.6	4	4

study, about 71% of participants have no missing teeth (41 female and 30 male) which might be related to the fact that most of the dental students especially females has taken good care for their teeth, and this is especially true for private university which reflects the higher socioeconomic status of most of the dental students. Regarding overjet, most of the patients (85%) was within the normal range (0-3.5 mm), and does not require any orthodontic treatment. Both the anterior and posterior teeth underwent crossbite measurements, which are the third DHC component of IOTN. The number of subjects with crossbite was collectively 15 patients (15%), whereas subjects without crossbite were 85 patients (85%). In this study, 16 participants (16%) had deep bites with or without damage to gingival palatal or labial tissue, while only 6 subjects (6%), all female, had open bites. Approximately half of the sample in the current study did not require any orthodontic treatment,

whereas 31% of patients had high demand, 13% had moderate need, and 7% had mild demand. Comparable results were reported by the study of Rashid et al.,¹⁰ which reported treatment needed among Iraqi children but at lower age group. Most of them had mild treatment needs (Grade 2: 36.2%), followed by no treatment required (Grade 1: 31.3%) and moderate needs (Grade 3: 24.5%). With Grades 4 and 5 (8.1%), severe cases were less frequent. Overjet was the least common malocclusion that needed treatment, but overbite was the most common. No significant gender differences were identified ($p > 0.05$), which is consistent with our findings. Overbite and cross bite were the most common malocclusions that needed treatment, ranging from mild to moderate. According to another study, 12.5% had highly desirable treatment, and 10.3% had necessary treatment (handicapping malocclusion). Equal numbers of males and girls were determined to require highly desirable or necessary therapy¹¹. Similarly, Omer & Karim's study¹² found that while 52.7% of children aged 12 to 15 exhibit malocclusion with variable treatment needs, 47.1% of them do not require orthodontic treatment. Approximately 30.4% of children had severe or very severe treatment needs, 8.8% had borderline needs, and 13.5% had mild needs. Boys require more orthodontic treatment than females, according to DHC. According to a study by Jasmin et al.¹³, more than half of participants (59.7%) were men, with 61.7% of them being men. According to DHC-IOTN assessments, 67.7% of students had normal or moderate instances, while 9.7% had severe cases. Only 9.0% of the children required orthodontic treatment, according to the DHC. In this study, Angle Class I malocclusion was more common than other malocclusions (65.2%), with crowding occurring in 62.7% of the participants¹⁴. According to the study, of the 250 children tested, 134 (53.6%) were male and 116 (46.4%) were female. Males were shown to require more orthodontic treatment than females. The percentage of boys and females that required grade 5 treatment was 11.9% and 7.8%, respectively¹⁵.

CONCLUSION:

The present study provided information on the prevalence of malocclusion among dental college students. Even that half of the participants did not need any orthodontic treatment but 31% of subjects reported high demand for orthodontic treatment. This demonstrates that malocclusion is a significant oral issue that requires early intervention, even in young children. The risks of malocclusion in early childhood should be highlighted in addition to the current primary concern, and the variables that contribute to malocclusion should be avoided. As a result, this study serves as a guide for future

research aimed at preventing malocclusion at an earlier stage.

LIMITATIONS:

Single place study with specific population.

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