

Evaluation of Selection Criteria for Patients Indicated for Fixed Orthodontic Appliance Treatment

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Abstract

This study aimed to assess selection criteria for patients treated with fixed orthodontic appliance at the College of Dentistry, University of Baghdad, and to set a protocol of treatment in accordance with the Index of Orthodontic Treatment Need (IOTN).

Medical records of 120 patients aged 10-30 years old, were retrieved, examined and scored according to IOTN.

Results showed that 69% of patients fall within the definite treatment group (i.e. scores 4 and 5), none was in the no need group, 21% in the moderate need group and only about 10 % of the sample was in the little need group. Females had the greater prevalence for each score, and the difference was much greater at scores 2 and 3.

The criteria for patient selection according to the IOTN-DHC were applicable to Iraqi sample in this study, therefore, it is recommended to use this index to identify patients in need for treatment with some suggested modifications.

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Introduction

Malocclusion is a group of deviations from normal occlusion that may in some cases affect the quality of life.¹ It is a common condition affecting almost half the world's population with varying prevalence in different countries, and sometimes within the same country.^{2,3}

One of the major concerns in studying malocclusion is the availability of an appropriate objective method for recording the occurrence and severity of orthodontic problems.⁴

Since the 1960s, many indices have been used to categorize malocclusions, some classified malocclusion into types, others recorded the prevalence of malocclusion in epidemiological studies, whereas others recorded the priority or need for treatment.⁵

The orthodontic treatment need indices are now globally accepted and are widely used in the United States and European countries.⁶

Examples of these indices are Handicapping Labio-lingual Deviation index

(HLD), Dental Aesthetic Index (DAI), Index of Orthodontic treatment Need (IOTN), and Index of Complexity, Outcome & Need (ICON).⁷ These indices help to prioritize treatment need, which will ensure that when limited orthodontic resources are available, individuals with the highest scores are assigned priority.^{5,8,9}

The Index of Orthodontic Treatment Need (IOTN) developed by Brook and Shaw in 1989, is one of the most accepted and used indices.⁶ What makes this index widely accepted and used for scientific studies is that it is simple, quick¹⁰ and reproducible.¹¹ Some universities like Cardiff University, gave IOTN in the third year of the dental curriculum, and it was shown that students had a substantial ability to apply IOTN to study models.¹²

According to the British Orthodontic Society, the National Health Service (NHS) orthodontic treatment will be provided to individuals with an IOTN-DHC 4 or 5, or those with a DHC of 3 with at least an Aesthetic Component (AC) of 6 (usually referred to as 3.6).¹³

The demand for orthodontic treatment is increasing in Iraq as in other countries. In Iraq, the College of Dentistry, University of Baghdad, is the only college that provides orthodontic treatment, during its Master degree program.

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Fixed orthodontic appliance is the main core of the course. Therefore, there are long waiting times for the patients applying for orthodontic treatment. That is why it is important to determine patients in great need of treatment and assign them as a high priority in order to achieve a high standard for orthodontic treatment and reduce the waiting times. This study will assess patient selection criteria for those treated with fixed orthodontic appliance and set a protocol of treatment need in accordance with IOTN.

Materials and methods

The records of a convenient sample of 120 patients were selected from the archive of the orthodontic department at the college of dentistry, University of Baghdad, of patients treated with fixed orthodontic appliances.

1. The inclusion criteria were: Age: 10-30 years.
2. No history of previous treatment.
3. The dental casts are intact and suitable for making the required measurements.

Both the Dental health component and Aesthetic component were measured. The IOTN-DHC consists of a hierarchical scale of five levels: level 1 represents no need for treatment and level 5 represents a great need for treatment. It evaluates the malocclusion by means of five characteristics: tooth loss, overjet, crossbite, displacement of the contact point, and overbite. Aesthetic Component consists of 10-grade standard reference photographs representing different grades of dental attractiveness.⁵

The IOTN-DHC scores were recorded by one examiner. A caliper and a clear plastic ruler were used. The scores were then grouped according to IOTN-DHC grades.

The IOTN-AC was examined for patients with grade 3 only, to check their need for treatment, and it was done by the same examiner also.

To assess reproducibility, 23 models (25% of the total sample) were examined by the same examiner on two occasions, with an interval of 30 days between examinations.

Intra-examiner reliability was assessed by calculating kappa statistics. The linear weighted Kappa value of intra-examiner reliability was 0.81, which means a very good strength of agreement.

Results

A total sample of 93 patients met the inclusion criteria. Females dominated the sample with 61.7%. The frequency and distribution of IOTN-DHC scores among males and females are shown in table 1.

	DHC 1	DHC 2	DHC 3	DHC 4	DHC 5	Total (%)
Female	0	7	14	27	9	57 (61.7)
Male	0	2	6	21	7	36 (38.3)
Total	0	9	20	48	16	93 (100)

Table 1. Distribution IOTN-DHC.

While the majority of patients fall within the definite treatment group (i.e. scores 4 and 5), none was in the no need group and only about 10 % of the sample was in the little need group (Figure 1).

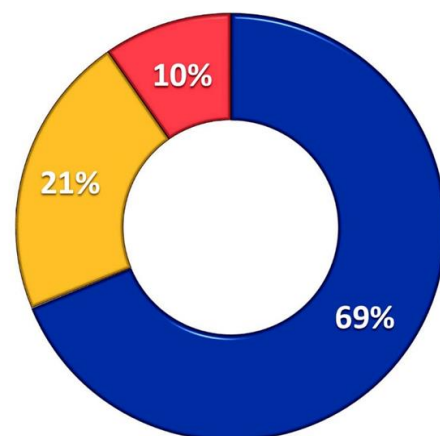


Figure 1. The distribution of the sample according to the degree of the need of treatment.

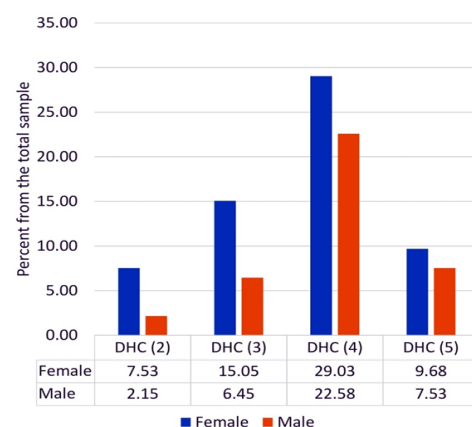


Figure 2. Prevalence of DHC scores for the total sample. Values presented as percentage.

On the other hand, when the distribution of DHC scores is viewed in reference to the total sample in both genders, we can see that females had the greater prevalence for each score, and the difference was much greater at scores 2 and 3 (Figure 2).

The prevalence of IOTN-DHC scores within each gender is shown in Table 2.

Distribution of DHC scores within each gender						
		DHC 2	DHC 3	DHC 4	DHC 5	Total
		Females	No.	7	14	27
	Prev.	12.3	24.6	47.4	15.8	100
Males	No.	2	6	21	7	36
	Prev.	5.6	16.7	58	19	100

Table 2. Distribution of DHC scores within each gender.

Cases with score 3 representing the moderate need for treatment made up 21% of the total sample. These cases were later distributed according to their IOTN-AC score into needing treatment (with AC score of ≥ 6) and little need for treatment (with AC score ≤ 5) in accordance with NHS criteria. The final distribution of the sample in terms of treatment need can be summarized in Figure 3.

Suggested criteria for patient selection (modified from Burden et al)		
Dental health component	Cases where treatment is needed	
	High priority	Lower priority
Missing teeth	<ul style="list-style-type: none"> Hypodontia requiring pre-restorative orthodontics or orthodontic space closure Submerged deciduous teeth 	
Overjet	<ul style="list-style-type: none"> Increased overjet more than 6mm Reverse overjet more than 3.5 mm Reverse overjet 1.1-3.5 mm with masticatory or speech difficulties 	<ul style="list-style-type: none"> Increased overjet between 3.6-6 mm with incompetent lips. Reverse overjet 1.1-3.5 mm.
Crossbite	<ul style="list-style-type: none"> Anterior or posterior crossbite with more than 2 mm discrepancy between retruded and intercuspal position Posterior lingual crossbite 	<ul style="list-style-type: none"> Anterior or posterior crossbite with 1.1- 2 mm discrepancy between retruded and intercuspal position
Displacement of contact points	<ul style="list-style-type: none"> Impacted teeth (except 3rd molar) Displacement greater than 4 mm Partially erupted teeth tipped and impacted against adjacent teeth. Supernumerary teeth 	<ul style="list-style-type: none"> Displacement of 2.1-4 mm
Overbite	<ul style="list-style-type: none"> Lateral or anterior open bite greater than 4mm Traumatic overbite (palatal &/or gingival) 	<ul style="list-style-type: none"> Lateral or anterior open bite between 2.1-4 mm Deep complete overbite without trauma
Cleft lip and palate	<ul style="list-style-type: none"> Unilateral or bilateral 	

Table 3. Suggested criteria for patient selection (modified from Burden et al).

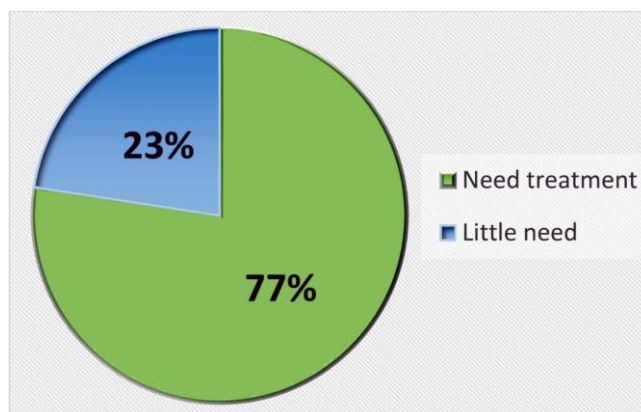


Figure 3. Distribution of the sample according to treatment need.

Discussion

The department of orthodontics at the College of Dentistry, University of Baghdad, has fixed appliance treatment as the main core of clinical training for the Master degree program. The number of patients to be treated has to be limited to the number of cases each student can see during his/her study, and the available resources. It is, therefore, a better practice to prioritize patients according to their need.

The current guidelines solely depend on occlusal indices (e.g. Angle's classification), and the type of tooth movement needed to determine patients who need fixed orthodontic appliance treatment. This, however, has the drawback of high subjectivity, while the IOTN is objective and specific.

Out of the 120 records examined, only 93 met the inclusion criteria, the main reason for exclusion was fractures of the dental casts.

Although about 90 percent of the cases were in the treatment need zone (i.e. DHC scores 3, 4, and 5), only 77% of the treated patients had an IOTN ≥ 3.6 (Figure 3), this means that almost one-quarter of the provided treatment could have been given to patients in greater need. However, this may be attributed in part to the lesser sensitivity of IOTN towards class III occlusion (up to 3.5 mm reverse overjet - which is not associated with masticatory or speech difficulties- is considered a DHC score 3),¹⁴ and that it does not consider mid-line shifting¹⁵ or spacing (generalized or localized) as a need for treatment, yet they were among the treated cases. Another factor to be considered is that the IOTN-AC depends on the esthetic aspect of malocclusion in the frontal view only, so the

quality of frontal photo plays a role in addition to the subjective nature of the measurement. The greater percentage of females within the sample and the difference between the distribution of IOTN-DHC scores within genders and within the total sample can be attributed to that females are usually more concerned and aware about their esthetic needs than males.¹⁶⁻¹⁸ That may explain why DHC score 2 prevalence in females was more than a triple of that in males. The difference gets lesser with higher scores, which may reflect that the true need for treatment is something comparable between the two genders.

Burden et al. in 2001 modified the IOTN for use in oral health surveys. The aim was to simplify the use of IOTN, so that only those malocclusions with definite dental health and esthetic need for treatment are recorded. He suggested the acronym MOCDO (Missing, overjet, crossbite, displacement, and overbite) to aid memorizing the criteria.¹⁹ In other words, the classification was no treatment and definite treatment. Considering that Burden et al modification of IOTN made it easier to recall and apply the index, and that IOTN-DHC is more objective; a modified classification can be used (as shown in table 3), depending on IOTN-DHC alone to increase objectivity and reduce the subjectivity associated with the IOTN-AC.

In this modification the criteria of inclusion were classified into lower priority (IOTN-DHC grade 3), and high priority (IOTN-DHC grades 4 and 5), and cleft lip and palate were added as a separate entity, within the high priority class. The reason for inclusion of grade 3 is that as a teaching hospital, our students need a comprehensive training program including all types of malocclusion severity. Additionally, we have no obligation to treat all patients who meet the inclusion criteria -with its financial burden-like the NHS; however, prioritization according to the need is still important. Although Burden et al 19 justified the removal of cleft lip and palate section by that the affected patients are already under treatment and that it is most possible they would develop an occlusal discrepancy which is already included in the criteria; we believe that it is necessary to have these patients as a single entity. Even if they have similar discrepancies like reverse overjet, crowding, hypodontia and crossbite, their treatment is usually more demanding and would take more time and effort, in addition, it would be easier to follow up and

assess in any future study when they have their own classification category.

This study sets the baseline for future audits. Audits and periodic investigations are of utmost importance to measure quality²⁰ and they will also aid clinicians to uncover changing demands of orthodontic patients.²¹

One limitation of the study was that some casts were without reference for occlusion and not properly trimmed (which made it more difficult to assess open bite and overjet). Another limitation was the quality of frontal photographs, which were not standardized.

Conclusions

- The criteria for patient selection according to the IOTN-DHC were applicable to Iraqi sample in this study, therefore, it is recommended to use this index to identify patients in need for treatment .
- A modified classification is suggested (table 3) for selecting patients to be treated with fixed orthodontic appliance at the College of Dentistry, University of Baghdad, with a basic standard that "All patients should be categorized as IOTN-DHC score 3 or higher".

Declaration of Interest

The authors report no conflict of interest and the article is not funded or supported by any research grant.

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