The Reliability of Orthodontic Treatment, According to the Needs of Patients Using the Dental Aesthetic Index

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Abstract

Objectives: Malocclusion was and remains one of the most common problems which affects the psyche and social status of the individual, so the estimation of the malocclusion severity and needs a percentage of orthodontic treatment of Iraqi patients is the aim of this study.

Method: A randomly selected 150 pairs of study models (48 male and 102 female) were involved in this study for patients attending an orthodontic clinic at College of Dentistry/ University of Baghdad seeking for treatment. The DAI scores were collected according to WHO guidelines directly from the study model with a digital caliper, score was calculated using the regression equation of 10 occlusal traits. The dental casts were classified into four groups to determine the treatment needs. SPSS software version 25 was used to analyze the results.

Results: 8.7% of orthodontic treated patients were with normal or mild malocclusion (DAI≤25) and did not need treatment, while 56% of them were handicapped and needed mandatory treatment. In between them, patients with definite and severe malocclusion were 18.7% and 16.6% respectively. Molar deviation (72.6%) represents a high prevalence rate among occlusal traits, while negative overjet (7.3%) is the least one.

Conclusions: Not all patients who are treated in an orthodontic clinic are really in need, and it must be the implementation of treatment need index to determine the treatment priority for patients.

Keywords: *Dental aesthetic index, Treatment need, Study model, Orthodontic patient.*

Introduction

Malocclusion is and remains one of the most common problems which affects the psyche and social status of individual. In addition, a good appearance of the teeth improves acceptance among peer group and increase successful life outcomes in comparison with people of less attractiveness.[1,2,3] One of the major problems in the evaluation of malocclusion is the presence of suitable and objective method to assess and record the severity, complexity, prevalence of malocclusion and the treatment needs.[4] For that this reason many orthodontic indices have been developed since for decades.[5]

William Shaw and colleagues in 1995 classified occlusal indices into five groups;[6] Diagnostic indices, Epidemiologic indices, Orthodontic treatment need indices, Orthodontic Treatment Outcome indices and Orthodontic Treatment Complexity Indices.[7] The Dental Aesthetic Index (DAI) is one of treatment need indices, developed by Cons et al (1986, USA), It has been adopted as a cross-cultural index by the World Health Organization (WHO), a number of researches revealed that the DAI is valid and reliable.[8,9] The index show single score which combine subjective, objective and clinical esthetic factors with a threshold limit (i.e. 31 or higher) to regularize with the needs for orthodontic treatment according to the severity of malocclusion.[10,11] It has been used in several researches within different countries in clinical and epidemiological studies of malocclusion.[12]

The purpose of this study was to estimate severity of malocclusion and needs percentage for orthodontic treatment of Iraqi patients who seek treatment in orthodontic clinic using DAI to know whether they have serious orthodontic problems or not.

Method

Data for this project were retrospectively collected from the orthodontic clinic at College of Dentistry/ University of Baghdad for attending patients who received treatment during the period of September 2017 to January 2019.

A randomly selected 150 pairs of study models (48 male and 102 female) were involved in this study. The patients age ranged from 18 to 25 years with no previous orthodontic treatment, cleft lip and palate, great restorations/crown and/or prosthetic treatment.

The DAI scores were collected according to WHO guidelines directly from the study model with a digital caliper;[13] the index consists of 10 occlusal characteristics including; visible tooth loss, crowding in the incisor region, spacing in the region of incisors, diastema, anterior maxillary misalignment, anterior mandibular misalignment, anterior maxillary overjet, anterior mandibular overjet, vertical anterior open bite and anteroposterior molar relationship.

The core was calculated using the regression equation of 10 occlusal traits: "(visible missing teeth x 6) + (crowding) + (spacing) + (diastema x 3) + (anterior maxillary misalignment) + (anterior mandibular misalignment) + (anterior maxillary overjet x 4) + (anterior mandibular overjet x 4) + (anterior vertical open bite x 4) + (anterioposterior molar relationship x 3) + 13".[14]

Then the dental casts were classified into four groups to determine the treatment needs: Those with score of ≤25 were considered as normal or mild occlusion with little or no need for treatment, scores of 26-30 were defined as malocclusion with elective need for treatment, 31-35 were considered as severe malocclusion with highly desirable need for treatment and if the score

≥36 then it was considered as very severe or disabling malocclusion with mandatory treatment.[15,16]

Statistical analyses. The results were analyzed using SPSS software version 25. The statistics will be:

1) Descriptive statistics: including frequency and percentage.

2) Chi square: To test genders differences.

Calibration: To estimate the reproducibility and validity of the research, 20 dental casts were examined by a specialist orthodontist, and re-examined by the same orthodontist with an interval of 2 weeks to realize intra-examiner accuracy in the employment of the DAI. The intrarater correlation coefficient for repeated examinations was 0.96 ($P < 0.001$), indicating high accuracy.

Results

From the hundreds of patients seeking ~~for~~ treatment, who visited orthodontic clinic at college of dentistry every year, 150 pairs of dental casts for pretreated patients have been used for this study. Chi-Square test showed no significant difference between male and female at a p-value (0.412) as shown in table 1.

The DAI scores were explained in Table 1 and 2, 8.7% of casts with normal or mild malocclusion (DAI≤25), 18.7% of casts with definite malocclusion (DAI 26-30), 16.6% of casts with severe malocclusion (DAI 31-35) and finally 56% of casts with handicap malocclusion (DAI ≥35). The distribution of the total sample according to their DAI scores is illustrated in Table 2, the lowest DAI score recorded was 18 (0.67%) ,while the highest DAI score registered was 91 (0.7%) and the most commonly recorded DAI score was 34 (7.3%).

The distribution of malocclusion components according to the DAI show molar deviation, crowding and anterior maxillary misalignment is the most common among patients which represent 72.6%, 68.7% and 66.7% respectively, and the negative overjet is the lowest among patients (7.3%) as explained in Table 3 and 4.

Table 1 Malocclusion evaluation according to Dental Aesthetic Index. And Gender differences

Dental Aesthetic Index	Female		Male		Total		Malocclusion Severity	Treatment requisite
	n	(%)	n	(%)	n	(%)		
≤25	10	6.6	3	2	13	8.7	Normal or mild occlusion	Little or no need
26-30	18	12	10	6.6	28	18.7	Defined malocclusion	Elective
31-35	17	11.3	8	5.3	25	16.6	Severe malocclusion	Highly desirable
≥35	57	38	27	18	84	56.2	Very severe or disabling malocclusion	Mandatory
Total	102	68	48	32	150	100		
Chi square(X^2) 46.449 P= 0.412								

Table 2 Distribution of the total sample according to their DAI scores

DAI Grade	DAI	n	%	Cumulative %	DAI Grade	DAI	n	%	Cumulative %
Normal or mild occlusion	18	2	1.3	1.3	Very severe or disabling malocclusion	43	3	2	67.3
	20	1	0.7	2		44	3	2	69.3
	22	1	0.7	2.7		45	3	2	71.3
	23	2	1.3	4		46	8	5.3	76.7
	24	3	2	6		47	4	2.7	79.3
	25	4	2.7	8.7		48	2	1.3	80.7
Defined malocclusion	26	5	3.3	12		49	2	1.3	82
	27	2	1.3	13.3		50	3	2	84
	28	4	2.7	16		51	3	2	86
	29	7	4.7	20.7		52	1	0.7	86.7
	30	10	6.7	27.3		53	2	1.3	88
Severe malocclusion	31	3	2	29.3		54	3	2	90
	32	3	2	31.3		57	1	0.7	90.7
	33	2	1.3	32.7		60	2	1.3	92
	34	11	7.3	40		62	1	0.7	92.7
	35	6	4	44		63	3	2	94.7
Very severe or disabling malocclusion	36	8	5.3	49.3		64	2	1.3	96
	37	2	1.3	50.7		65	1	0.7	96.7
	38	7	4.7	55.3		66	1	0.7	97.3
	39	3	2	57.3		70	1	0.7	98
	40	4	2.7	60		74	1	0.7	98.7
	41	4	2.7	62.7		82	1	0.7	99.3
	42	4	2.7	65.3		91	1	0.7	100

Table 3 Distribution of dentition, occlusion and space components according to DAI

DAI components	Present n	%	Absent n	%
Dentitions				
Tooth loss	30	20	120	80
One tooth	20	13.3		
Two tooth	9	6		
Three tooth	1	0.7		
Space				
Crowding	103	68.7	47	31.3
Single jaw	46	30.7		
Both jaw	57	38		
Spacing	54	36	96	64
Single jaw	31	20.7		
Both jaw	23	15.3		
Median Diastema	29	19.3	121	80.7
Anterior Maxillary Misalignment	100	66.7	50	33.3
1-3 mm	66	44		
4-6 mm	32	21.3		
≥7mm	2	1.3		
Anterior Mandibular Misalignment	81	54	69	46
1-3 mm	72	48		
4-6 mm	9	6		
≥7mm				
Occlusion				
Overjet (> 4mm)	67	44.7	83	55.3
Negative overjet	11	7.3	139	92.7
Anterior open bite	21	14	129	86

Table 4 Distribution of molar relationship component according to the DAI

Molar relationship	Present		Absent	
	n	Percent%	N	Percent%
Deviation from the normal molar relationship	109	72.6	41	27.3
Half cusp	62	41.3		
One cusp	47	31.3		

Discussion

The orthodontic clinic at the college of dentistry receives a large number of patients annually from across the country due to lack of specialist orthodontists and the cost of treatment.

In this research, measurements were performed on studying models instead of patients in order to examine a wide variety of patients within a short time,[17] in addition to knowing the patients who visit the orthodontics clinic, the eligible ones for treatment.

The DAI has been supported by WHO due to its simplicity, reliability and wide use in researches,[18] in addition to its high sensitivity in predicting the high proportion of persons requiring orthodontic treatment correctly as well the no-treatment need.[19]

The components of the DAI show the percentage of malocclusion traits and those results can highlight the most commonly presented one as explained in Table 3.

Only one Iraqi study of Kurdish people [20] and few studies of other populations have DAI analysis of malocclusion traits.[9,21,22] Also, because this study is the first study carried out for orthodontic patients who attend the orthodontic department so the results were completely different from previous Iraqi studies. Besides the differences in genetics and race, lead to differences from other populations.

Concerning orthodontic treatment needs, 8.7% of treated patients represent mild or normal occlusion with little or no need for treatment (DAI≤25), while 16.6% (DAI 31-35) of patients have severe malocclusion and 56.2% (DAI≥35) are considered as a being handicapped and in need of mandatory treatment. The female represents 68% of the total sample and that indicate the concern of female about their occlusion and appearance more than male.[23]

Regarding the handicapped malocclusion, the results of our study is close to the results of Poonacha et al. (55%) and Goyal et al. (51%);[9,24] While, it differs from Uzuner et al. (27.8%), Maumela PM and Hlongwa p (41.7%) , Cardoso et al. (39%) and Pop et al. (more than 25%).[21,22,25,26]

But what attracts attention is that orthodontic patients with (DAI≤25) are clearly different from those of other studies which depends on patients who visited the clinic in general. While, our study uses the study models of previously treated patients.

The percentage of each parameter of DAI is explained in Table 3. Where tooth loss was present in 20% of total samples, Crowding in 68.7%, spacing in 36%, median diastema 19.3%, anterior maxillary misalignment 66.7%, anterior mandibular misalignment 54%, overjet (> 4mm) 44.7%, negative overjet 7.3%, anterior openbite 14% and molar deviation from the normal relationship 72.6%.

As we have clarified, the result of each anomaly show much higher rate in comparison with other studies because it harmonious with the fact that the sample was composed entirely of patients referred to an orthodontics clinic with malocclusion, in addition to the racial, genetic, social behaviors, cultural differences and the most common effects are economic and political reasons.

Conclusion

Not all treated patients in the orthodontic clinic are with a true need for treatments, but few of them are with mild malocclusion and no need for treatment; since the therapeutic possibilities are minimally available and poor economic situation for most of the people, the treatment needs should be provided for patients who really deserve.

The DAI is the simplest and easiest index to be used by a general dentist for examination of attending to patients and assessing the severity of their malocclusion to be treated as a priority treatment need.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both environmental and health and higher education and scientific research ministries in Iraq

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