The Use of Orthodontic Treatment Need Index (IOTN) in a Referred Iranian Population

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Abstract: IOTN index has been used in different countries for assessment of orthodontic treatment needs in recent years. This index has 2 components, an Aesthetic Component (AC) and a Dental Health Component (DHC). The aim of this study, was assessment of orthodontic needs on the basis of IOTN index in those people who had come for orthodontic treatment. We used IOTN index in order to assess the orthodontic treatment needs of 343 applicants (262 females and 81 males) with a mean age of 18.1 years. Who had come for treatment during a certain period of time. For determining the AC we used a set of 10 pictures graded on the basis of aesthetical features of teeth. The DHC Component of Index that has 5° was determined bases on study casts with standard preparation. If necessary and for more ACPuracy panoramic radiographies of patients were also used. The analysis of the obtained data was performed using Kappa, chi-square and Spearman's tests. The results with determination of subjective needs on the basis of AC by patient's perceived need indicate a lock of significant relation between gender and the patients' perceived need for AC ($p<0.05$). Most of these patients had determined their AC to be between grade 1-4, the results of AC determination through normative need assessment were the same as the results of perceived need Assessment. Which, in case of DHC determination it was revealed that most subjects had a grade between 4 and 5 and there was a significant relation between DHC and type of malocclusion ($p<0.05$). Subjective data of IOTN index alone can not be considered an appropriate indicator of orthodontic treatment needs determination.

Key words: IOTN, aesthetic component, dental health component, AC, DHC, Iranian

INTRODUCTION

Effective control of oral and dental health requires collecting accurate data on the needs of a society in this regard. Having accurate epidemiologic information about orthodontic treatment needs is a necessity for public health centers like dentistry school. Various studies on determination of orthodontic treatment needs are carried out on the basis of IOTN (Index of Orthodontic Treatment Need) in different countries, such as Brook and Shaw (1989), Burden and Holmes (1994), Mandall *et al.* (1999), Kok *et al.* (2004), Holmes and Willmot (1996), Norway (Stenvik *et al.*, 1996; Birkeland *et al.*, 2000), USA (Searcy and Chisick, 1994) Turkey (Ucuncu and Ertugay, 2001), Netherlands (Klages *et al.*, 2004), Sweden (Josefsson *et al.*, 2007) and Iran (Hedayati *et al.*, 2007). This index, which was first developed in Britain by Brook and Shaw (1989) as a system for grading malocclusions, has 2 components, AC (Aesthetic Component) that shows patient's subjective needs and DHC (Dental Health Component) that reveals objective needs for orthodontic treatment. It seems that IOTN's grading reflects its superiority over other methods in clinical judgment (Profit and Fields, 2007). The aesthetic component has its own limitations, one of the most serious of which is lack of effect of an individual's motivations in relation with orthodontic treatment needs. Kok *et al.* (2004) records this component of aesthetic needs of teeth for orthodontic treatment using the 10 standard rated photos (Hassan, 2004). According to some studies in social-psychology, it has been shown that physical beauties (appearance) of an individual play an important role in his/her social relations and facilitate obtaining social skills (Birkeland *et al.*, 2000).

Paying attention to an individual viewpoint regarding attractiveness of the teeth before orthodontic treatment is very important. Gender, socio-economic backgrounds and age are those factors that influence one's perceived needs in orthodontic treatment (Abu Alhaija *et al.*, 2005). Men were more satisfied with their teeth's appearance and had less perceived needs for orthodontic treatment compared with women. Some studies on adults have

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revealed that >1/3 of them had moderate to high perceived need for orthodontic treatment (Soh and Sandham, 2004).

The AC indicator in 12 years old shows the aesthetic characteristics of their teeth in average (Grzywacz, 2003). The 2nd component of the index, namely DHC, as an occlusal indicator, show's the clinician's view on orthodontic treatment needs. This component of the index. Grades malocclusions on the basis of teeth irregularities into 5 grades (Grzywacz, 2003). Burden and Holmes (1994) has shown that during adolescence, significant changes occur in individuals' occlusal pathern and some alterations in overjet could cause a decrease in their request for orthodontic treatment (Tarvit and Freer, 1998). The aim of this study, was to determine orthodontic treatment needs on the basis of IOTN.

MATERIALS AND METHODS

A group of 343 patients (262 female and 81 males) with the mean age of 18.1 years, who had applied for orthodontic treatment, were studied in this cross sectional study to determine their orthodontic treatment needs on the basis of IOTN. Intraoral photography was performed by a specialist in order to determine the Aesthetic Component (AC) of index (Normative Need), the study casts with standard preparation were used to determine the Dental Health Component (DHC). When in doubt, panoramic radiography was used to increase the accuracy of the study's results. The 10 color photos used to grade the appearance of the teeth were applied by each patient to attain his/her perceived need. Prior to showing these photos to the patient it was explained to her/his that they are graded from number 1, the best and most beautiful situation, to number 10, the worst situation in terms of tooth aesthetics and she/he should compare her/ his teeth with these photos and give a score to teeth (ACP)*. The given score was taken as that individual's perceived need. Then specialists with a reasonable degree of agreement, after seeing a photograph of the anterior arch view of the patient taken by a single person from the same distance, compared it with the 10 standard photos and gave a score to each patient (ACE)**, which was considered as the normative need of that patient. Choosing photos number 1-4 shows little or no need for orthodontic treatment, which selecting photos number 5-7 indicates borderline need and selecting photos number 8-10 shows severe need for orthodontic treatment. Study casts were also evaluated and graded by specialists to determine the DHC of this index. According to this index DHC has 5 grades, which are based on occlusal characteristic, occlusion and regularity of the teeth. Those who are in grade one need no orthodontic treatment and those in grade 5 seriously

need orthodontic treatment. The degree of agreement between the 2 specialists (0.756) was obtained through Kappa analysis. Also to determine reproducibility of the data by the 2 orthodontists, the AC of 30 patients was determined again by them after one month that showed its reproducibility (Kappa = 0.735).

Chi-square (χ^2) and spearman's correlation coefficient tests were used to analyze the data.

RESULTS

Distribution of malocclusion by class was as follows:

- Cl I = 2.66%
- Cl II = 4.27%
- Cl III = 4.6%

And its distribution by gender was

Males:
- Cl I = 5.5%
- CLII = 4.36%
- Cl III = 9.1%

Females:
- Cl I = 69.7%
- Cl II = 4.24%
- Cl III = 5.9%

In these individuals, perceived need was: no need in 66.6% moderate need in 15.8% and severe need in 17.6% Determining AC in these individuals had no significant relation with different malocclusions (p>0.05) (Fig. 1).

Chi-square (χ^2) analysis in order to determine normative need showed that 39.7% of them had little or no need for treatment, 37.3% needed treatment and 22.2% had a sever need for treatment, 42.9% of this latter group were in Cl III. There was a significant relation between normative need and type of malocclusion (p<0.05) (Table 1).

Determining DHC showed that 9% of these groups were in grade one, 5% in grade 2, 28.6% in grade 3, 55.8% in grade 4 and 9.7% in grade 5 (Fig. 2).

There was also, a significant relation between DHC and type of malocclusion (p<0.05). Those who had little or no need for treatment were 84.2%, while 0% was in Cl II and 15.8% in Cl III.

By determining perceived need of the patient's subjective needs in AC of IOTN, it was revealed that 66.6% those patients had little or no need for treatment, of which 80.2% were female and 19.8% were male, while
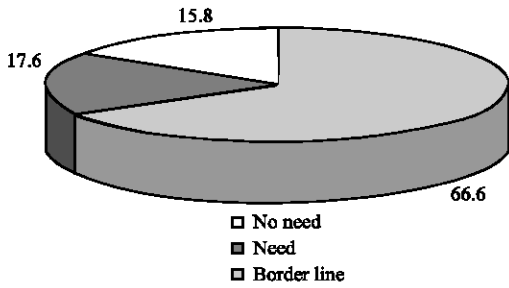
15.8

17.6

66.6

☐ No need
■ Need
☐ Border line

Fig. 1: Frequency distribution of eathetic component

9.7 1 5

28.6

55.8

☐ Grade 1 ☐ Grade 4
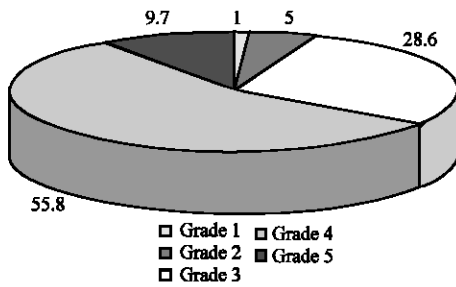■ Grade 2 ■ Grade 5
☐ Grade 3

Fig. 2: Frequency distribution of dental health component

70.9% of those who needed orthodontic treatment (had selected photos number 5, 6 or 7) were female and 29.1% of them were male and among those who had a sever need for orthodontic treatment 69.5% female and 30.5 were male. There was no significant relation between these individual's gender and their perceived need for treatment (p>0.05) (Table 2).

However, there was a significant relation between normative need and perceived need (p = 0.000).

In determining subjective need, as compared with objective needs, or in other words, comparing the 2 components of IOTN, it was shown that from among those with little or no need for orthodontic treatment (option 1-4) the DCH of 1.3% of them was in grade one and 5.7% of them had a DHC in grade 2 (namely, 8.8% of them had little or no need for treatment, 34.5% were in grade 3 with borderline need for treatment and 56.6% were in grades 4 or 5 with sever need for orthodontic treatment.

Of those who had, in determining AC, selected photos number 5-7 for themselves, in determining DHC, 0.0% were in grades 1 or 2, 6.8% were in grade 3 and 91.3% were in grades 4 or 5, having severe need for treatment. Those who had, in determining AC, selected photos number 8, 9 or 10 for themselves and considered themselves as having a sever need for orthodontic treatment, in determining DHC, none were in grades 1 or 1, 8.6%, with borderline need, were in grade 3 and 1.53%, with severe need for treatment, were in grades 4 or 5.

Table 1: Frequency distribution of ACE ACP ording to malocclusion type

ACE	Class			Total
	1	2	3	
Count	1	0	0	1
Within ACE	100%	0%	0%	100%
Within class	5%	0%	0%	3%
Count	24	6	0	30
Within ACE	80%	20%	0%	100%
Within class	11%	6.7	0%	9.1
Count	41	19	5	65
Within ACE	63.10%	29.2	7.70%	100%
Within class	18.80%	21.1	23.80%	19.8
Count	25	7	3	35
Within ACE	71.40%	20%	8.60%	100%
Within class	11.50%	7.80%	14.30%	10.60%
Count	25	8	2	35
Within ACE	71.40%	22.90%	5.70%	100%
Within class	11.50%	8.90%	9.50%	10.60%
Count	23	13	1	37
Within ACE	62.20%	35.10%	2.70%	100%
Within class	10.60%	14.40%	4.80%	11.20%
Count	30	22	1	53
Within ACE	56.60%	41.50%	1.90%	100%
Within class	13.80%	24.40%	4.80%	16.10%
Count	38	11	5	54
Within ACE	70.40%	20.40%	9.30%	100%
Within class	17.40%	12.20%	23.80%	16.40%
Count	2	0	2	4
Within ACE	50%	0%	50%	100%
Within class	9%	0%	9.50%	1.20%
Count	9	4	2	15
Within ACE	60%	26.70%	13.30%	100%
Within class	4.10%	4.40%	9.50%	4.60%
Total				
Count	218	90	21	329
Within ACE	66.30%	27.40%	6.40%	100%
Within class	100%	100%	100%	100%

Table 2: Frequency distribution of ACP ACP or ding to gender

Sex	ACP			Total
	No./little need	Border line need	Great need	
Male				
Count	45	16	18	79
Within ACE	57%	20.30%	22.80%	100%
Within class	19.80%	29.10%	30.50%	23.30%
Female				
Count	182	39	41	262
Within ACE	69.50%	14.90%	15.60%	100%
Within class	80.20%	70.90%	69.50%	76.80%
Total				
Count	227	55	59	341
Within ACE	66.60%	16.10%	17.30%	100%
Within class	100%	100%	100%	100%

There was a significant relation between the patient's AC and DHC (p = 0.000), as well as between normative need and DHC.

DISCUSSION

Various studies on IOTN had different results which were possibly due to differences in sample size and

methods of determining DHC that seems to need more accuracy and begin based on study casts. In this study, a group of 343 individuals, who had applied for orthodontic treatment (similar to most studies using study casts to determine DHC), was used.

In our study, there was no significant relation between perceived need and different types of malocclusion (p>0.05). In a study by Birkeland *et al.* (2000), untreated students expressed more satisfaction even when their malocclusion had increased although, their parents did not indicate any difference.

Our results showed that there was a significant difference between normative need and perceived need (p = 0.000). In other studies, such as those of Hamdan (2004), Lindsay and Hodjkins (1983) and Kerosuo *et al.* (2004), there was a similar difference between these 2 types of need.

In the study conducted by Hedayati *et al.* (2007), no significant relation was seen between these 2 components in female and males separately as well as in combination of the two. There was also a weak but significant relation in the study by Abu Alhaija *et al.* (2005) between the AC determined by individuals under study and the AC determined by their examiners Normative need.

In Mandall *et al.* (1999) study, there was only 54% agreement between the AC determined by the individual and the examiner.

In the study, carried out by Josefsson *et al.* (2007), it was shown that the mean value determined by the orthodontist was significantly higher than that determined by the patient, which are similar to the results of Kok *et al.* (2004).

The results of our study showed that there was no significant relation between these individual gender and perceived need (p>0.05), which is similar to the results of nearly all studies in this regard. Also, in our study, like most of other studied in this field, it was shown that males had more need for treatment, which determining perceived need revealed the fact that in males the teeth had a worse situation and they had a greater need for orthodontic treatment. From the 17.2% individuals having severe need for treatment, 22.8% of males and 6.15% of females were in such a condition, but more females applied for treatment than males (23.2% of males vs 76.8% of females), which is similar to other studies. In a study by Abu Alhija *et al.* (2005), 3% of females and 6% of males had selected severe need for orthodontic treatment for themselves and examiners determined that AC with grades 8-10 was more in males than in females, 13 and 8%, respectively.

In Hedayati's *et al.* (2007) study, too males had greater need for orthodontic treatment than females.

Comparing the 2 components of IOTN (AC, DHC) in our study revealed a significant relation between these 2 (p = 0.000). In a study by Souames *et al.* (2006), too, there was a significant relation between these 2 components of IOTN. Also, in the study by Kerosuo *et al.* (2004) there was an agreement between DCH and perceived need. However, in the study by Hassan (2004) like the study by Soh and Sandham (2004), no significant relation was observed between objective and subjective needs.

The relation between the AC determined by examiners and DHC in our study was significant (p = 0.000), which was similar to the result of Hamdan's (2004) study (p<0.05). There was also a significant relation between these 2 parameters in the study by Souames *et al.* (2006) (r = 0.76, p>0.001).

In the studied individuals, severe need for orthodontic treatment on the basis of specialists AC and DHC, were 65.5 and 17.3%, respectively, while in Hedayati's *et al.* (2007) study in Iran (Shiraz), they were 18.4 and 5.31%, respectively (11-14 years olds). These figures in Hamdan's (2004) study (mean age of subjects = 15.3 years, which was closer to that of our group) were 71% for DHC and 21% for AC.

In Hassan (2004) study on those who were referred to the Dental School for treatment, 16.1% on the basis of perceived need, 71.6% on the basis of DHC had severe need for orthodontic treatment. Burden's study also showed that severe need for treatment was similar in Sheffield and Manchester and equal to 33%.

Regarding DHC, the majority of studied individuals (189 persons, 55%), had a DHC = 4 and also among males and females the same situation existed (141 females (54%) and 48% males (61.5%) were in grade 4). In Hamdan's (2004) study, normative need's data and in DHC the majority (60 persons) had a DHC = 4. Also, in Hassan's (2004) study, the majority had a DHC = 4, similar in both studied centers.

In Ucuncu's and Ertugay (2001) study, the group referred for treating a DHC = 4 in the subjects, compared with the school's population, had an over whelming difference. But in Burden's study, the majority of those with a DHC = 2 were in Manchester and those with a DHC = 3 in Sheffield.

In this study, the subjects were adolescents (11-12 years old) selected randomly from among school students. The same results can be seen in Hedayati's *et al.* (2007) study, where those with a

DHC = 2 are the majority among boys (47.7%) and girls (48.8%). In Mandall's *et al.* (1999) study in England, also grades 1, 2 and 3 in DHC covered the majority of subjects (274 persons, 82%), all indicating the type of sampling and difference between individuals in request for orthodontic treatment.

In our study, the AC determined by subjects, indicated that most in divides considered themselves to be in the AC = 1-4, which were confirmed by the specialists.

The same situation existed in other studies, such as those of Burden and Holmes (1994), Mandall *et al.* (1999), Hassan (2004) and Hamdan (2004), indicating that what determines individuals need for orthodontic treatment is based on regularity and alteration of the anterior segments of jaws. Even in specialists views when determining the need for orthodontic treatment, these results are concealed and again the majority will into the group with an AC = 1-4.

CONCLUSION

Those referred for orthodontic treatment often have a DHC = 4, without and difference between males and females.

The subjective data of IOTN can not be a good indicator to determine the need for orthodontic treatment, per se; however, it is very important in those applying for orthodontic treatment and shows that most individuals decide about treatment of their teeth on the basis of what they see in the anterior segment of their dental arch.

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