Original Article

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Evaluation of Orthodontic Treatment Needs in a Population of Iranian Schoolchildren Using the IOTN in 2010

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ABSTRACT

Statement of the Problem: Malocclusion is a developmental problem, which results in social, psychological and functional problems for patients.

Purpose: The aim of this study was to evaluate the need for orthodontic treatment using the Index of Orthodontic Treatment Need (IOTN) among the 11–14-year-old students of Hamadan schools in 2010 and to find the correlation between Dental Health Component (DHC) and Aesthetic Component (AC).

Materials and Methods: A cross-sectional descriptive study was conducted on 721 students who had not undergone orthodontic treatment. The subjects were randomly selected (361 males and 360 females). DHC was assessed by a calibrated examiner. AC was determined using 10 standard photographs shown to students. Data were analyzed using chi-squared test to determine differences in treatment needs between subgroups of the subjects. The two components were evaluated using Spearman's correlation and kappa tests.

Results: According to DHC, of 721 cases surveyed, 48.7% had mild need for treatment; 25.1% had moderate need; and 26.2% had definite need. The most frequently observed malocclusion was contact point displacement. According to AC, 88.1% of students had mild need for treatment; 7.8% had moderate need and 4.2% had definite need. Comparison of DHC and AC showed no agreement between them (kappa value=0.069).

Conclusion: According to DHC of the IOTN, approximately one-third of the population had a definite need for orthodontic treatment, and contact point displacement was the most prevalent malocclusion. Although IOTN is a valid screening tool, patient's perception of orthodontic treatment does not always correlate with professional assessment. According to the result of this study, it is advisable not to use AC instead of DHC in epidemiological studies.

Keywords: Malocclusion, Index of Orthodontic treatment needs, IOTN.

INTRODUCTION

Malocclusion, a developmental condition, can create social, psychological and functional problems.[1–3] Severe abnormalities can be regarded as social handicaps while regular teeth and beautiful smile create self-confidence in social interactions.[1,4] To determine the need for orthodontic treatment, researchers have used several indices, such as DAI,[5–8] occlusal index,[9] and Eisman index.[10] In 1986, Shaw et al presented an index for orthodontic treatment need (IOTN) to rank abnormalities and to determine the need for orthodontic treatment.[9]

This index consists of two independent components to record the priorities and need for orthodontic treatment; the first (DHC) determines the need for treatment based on

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dental health and its functional aspects,[11] taken from the index of Swedish Public Dental Health System, and the second (AC) is used to make a judgment about treatment based on examiner's or the individual's opinion (Figure 1).[10,11] There are numerous studies about validity of IOTN index. In most epidemiological studies to determine the need for orthodontic treatment, like those in Iran, this index has been used to determine the priorities of the need for orthodontic treatment.[16–18,32–34]

To understand the problems related to dental and jaw abnormalities, planning public health promotion, determining the priorities of treatment and distributing the treatment facilities suitably, we need to know the epidemiology and distribution of dental and jaw abnormities. This study aimed at assessing the need for orthodontic treatment by IOTN index in 11–14-year-old students of in Hamadan in 2010.

MATERIALS AND METHODS

This descriptive/analytical study was carried out on 720 male and female students aged 11–14, who were chosen randomly from secondary schools of Hamadan. The Research Committee approved the research protocol.

The sample size was estimated to be 680 subjects regarding the minimum need for treatment; however, 720 subjects were evaluated.

Randomized cluster sampling was used to select 30 schools (equally boys' and girls' schools) from 62 secondary schools in Hamadan. Then 24 students were randomly selected from each school.

Inclusion criteria were absence of any previous or present orthodontic treatment at the time of examination. The students were examined in a naturally lit room using disposable gloves and mirrors. Clinical examinations were carried out without radiography and diagnostic dental casts. Clinical examination was carried out to assess DHC of IOTN index by a calibrated examiner. Before the study was instituted, the intra-examiner agreement was investigated with the examination of 15 students by the examiner and its repetition after two weeks. The intra-examiner correlation coefficient was 0.923 for DHC.

The Aesthetic Component (AC) was recorded after the students were shown the 10 case photographs and they chose the photographs in collaboration with the examiner.

FIGURA 2 - Componente Estético (AC) do IOTN[7].

Data were analyzed with SPSS 15, using chi-squared test to determine differences in treatment needs between the subgroups of subjects. Spearman's correlation coefficient and kappa tests were used for agreement analysis between AC and DHC. Wilcoxon's test was applied to compare AC from students' and examiner's points of view. The results were presented by descriptive statistical methods as graphs and tables. Grades 1 and 2 were designated as no/ little need, grade 3 as moderate/ borderline need and grades 4 and 5 as extreme/definite need.

RESULTS

The present study was carried out on 721 students of secondary schools (360 girls and 361 boys) of Hamadan in 2010. According to DHC, 16%, 32.7%, 25.1%, 24.1% and 2.1% had no, mild/little, moderate/borderline, severe and extreme need, respectively. Table 1 presents the prevalence of orthodontic treatment needs by gender. There were

significant differences between boys and girls according to DHC (chi=21.141, P<0.001).

In AC from examiner's point of view (ACe), 78.9%, 13.2%, and 7.9% had no, moderate and extreme need for orthodontic treatment. In AC from students' point of view (ACs), 88.1%, 78%, and 4.2% had no, moderate and extreme need for orthodontic treatment (Table 2). There were no significant differences between boys and girls according to ACe (chi=3.58, P=0.162) and ACs (chi=0.218, P=0.897).

In group 3 with extreme need for orthodontic treatment photograph 8 was the most frequently chosen picture. According to DHC, the most frequent malocclusions, in descending order, were:

1) Contact point displacement (71.3%)
2) Abnormal molar occlusion (50.7%)
3) Increased overjet (21.9%)
4) Increased overbite (7.5%)
5) Posterior lingual crossbite (4.2%)

In the present study, only one subject had cleft palate and no one had submerged and supernumerary teeth.

A total of 51% of the subjects who did not need orthodontic treatment according to AC, did not need it either according to DHC; 23.2% of the subjects who had moderate need for orthodontic treatment according to AC needed treatment according to DHC, too; 70% of the subjects with severe need for orthodontic treatment according to AC also had extreme need for treatment according to DHC. Spearman's correlation coefficient and kappa value were calculated to be 0.163 and 0.069, respectively, both of which showed non-agreement between AC and DHC in determining the need for orthodontic treatment. Table 3 shows the means ± SDs and mean ranks of ACe and ACs. There was a significant difference between the examiner's opinion and the students' opinions for AC according to Wilcoxon's test (P<0.001).

Table 1: Need for orthodontic treatment based on DHC

	No/little need	Moderate/borderline need	Extreme/definite need
DHC total	48.7%	25.1%	26.2%
Female DHC	41.4%	26.4%	32.3%
Male DHC	56%	33.8%	20.2%

Table 2: Need for orthodontic treatment based on AC

	No need		Moderate need		Extreme need	
	ACs	ACe	ACs	ACe	ACs	ACe
AC all	88.1%	78.9%	7.8%	13.2%	4.2%	7.9%
Female AC	88.6%	76.1%	7.5%	15.3%	3.9%	8.6%
Male AC	87.5%	81.7%	8%	11.1%	4.4%	7.2%

Table 3: Means ± SDs and mean ranks of ACs and Ace

	N	Mean ± SD	Mean rank	P
ACs	721	1.161±0.467	70.13	0.001
ACe	721	1.290±0.604	77.45	

DISCUSSION

The present study was carried out on 721 students aged 11–14 in Hamadan. The rate of need for treatment was 26.2% (based on DHC), which was almost similar to studies in Italy (27.3%),[16] Norway (26.1%)[17] and Kuwait (29.3%).[18] The value obtained in this study was less than those in Brazil (34.2%),[19] Senegal (42.6%),[20] Asians men (50.1%),[21] Turkey (38.8%),[22] Jordan (34%),[23] and was greater than those in France (21.3%),[24] Shiraz (18.4%),[25] Harrow & Hillingdon (15%),[26] Spain (21.8% for 12-year-olds and 17.1% for 15–16-year-olds),[27] and Colombia (20%).[28] Differences in the results might be attributed to the sample size. The sample sizes were 703 in Italy,[16] 480 in Norway,[20] 407 in Brazil,[19] 339 in Asian men,[21] 250 in Turkey,[22] 1002 in Jordan,[23] 511 in France,[24] 2000 in Shiraz (Iran)[25] and 655 in Spain.[27] The age range in most of these studies was the same as that of the present study while it was 17–22 for Asian men, 15–17 for Colombia and 15–16 and 12 for Spain. One of the advantages of the present study was reducing the risk of error using a calibrated examiner, while the number of examiners were 2 in Italy, France, Shiraz and Turkey studies, 4 in Colombia, and 6 in Spain.[16,22,24,27,28,29] In 3 studies in Turkey, Asian men and Norway, diagnostic casts were used, and in Jordan, diagnostic casts and radiography were used while panoramic

radiography was used in Colombia.[17,21] We focused on clinical examination in the present study.

The most common malocclusions related to DHC were contact point displacement (CPD), abnormal molar relationship, overjet and augmented overbite, respectively. In other studies, CPD was the most common malocclusion (Brazil, Italy, France, and Jordan).[16,19,23,24]

The most common malocclusions according to CPD were crossbite and increased overjet in Brazil, abnormal molar occlusion, increased overjet and overbite in Italy, increased overjet and overbite in France and interferences with tooth eruption, hypoplasia and increased overjet in Jordan.[16,19,23,24] Therefore, the results of this study were similar to those in Italy.

The high incidence of CPD and abnormal molar occlusion can be explained by high incidence of decay damages and early deterioration of deciduous molars, which result in the migration of permanent first molars and their rotation. Oral health instruction and early intervention can prevent the discrepancies of arch length and tooth emergence. Probably this is one of the underlying factors for DHC variation observed between Shiraz study and this study since there are no ethnic differences between these regions but variations in oral heath protocols and cultural backgrounds may affect it.

Using IOTN index is a safe and fast method, which can determine the need for orthodontic treatment and can be employed by general dentists and pedodontists to refer patients to orthodontists. The widespread use of IOTN in epidemiological studies can be used in comparing treatment needs in different societies and an effective tool in planning society-oriented programs.

DHC is defined and rated in terms of the worst occlusal feature making its use simple and a reliable index. Its drawback is that it ignores the accumulative effect of some minor problems. Consequently, using DHC causes some people's malocclusion severity to be assessed lower than the real value.

Regarding AC, the results of this study (4.2%) were similar to those in France (7%), Sweden (2.2–3.9%), Jordan (7%), Shiraz (Iran) (4.1%) and Italy (3.2–8.6%).[24,25,30,31]

The variations between the present AC scores and those found in the literature may be attributed to possible cultural differences regarding the esthetics perceived by different populations.

The agreement between the two components of the IOTN was very low. A weak correlation was also found in other Iranian populations[25] and presumably, in most of the studies cited above, as the treatment need percentages differ considerably depending on whether the DHC or AC was used.

The significant differences observed between DHC and AC scores regarding the number of children needing orthodontic treatment is mostly due to the fact that AC assesses the patient's perception of his or her apparent situation while DHC is an objective analysis

of occlusal characteristics of the dental system. There are occlusal traits defined as malocclusion according to DHC, although no esthetic impairment is involved, such as posterior crossbite or absence of posterior teeth and unerupted or impacted canines and premolars. On the other hand, there are cases defined only by AC as being of great treatment need because certain malocclusions are believed to lead to esthetic problems, which are not evaluated by DHC, including anterior spacing. As AC is more subjective, it also leads to difficulties in assessing some parameters, such as degrees of overjet and overbite.

RECOMMENDATIONS

Since the most common malocclusion is CPD it is suggested that implementation of preventive programs such as oral health instruction and space management can reduce space loss problem at young ages. This necessitates that the first visit with orthodontic evaluation be simultaneous with the eruption of permanent teeth at age 6. Regarding the weak relationship between the two components of IOTN, it is important that they be used with each other to be complete.

A systematic study seems to be needed in different parts of the country based on IOTN to provide sufficient budget for orthodontic treatment in Iran.

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