Comparison of orthodontic treatment need and demand between 12 and 17 years old school students in Abade /Iran

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Abstract

Objective: An orthodontic treatment planning program in a specific society requires information on the orthodontic treatment needs of the population. The aims of this study were to compare the student, parent and clinician normative need and demand for orthodontic treatment between 12 and 17 years old groups in a sample of Iranian students using the IOTN.

Material and Methods: A sample of 846 students including 419 students of 12 years old and 427 students of 17 years old was selected randomly from schools in Abade. A questionnaire of family socioeconomic status was proposed to the parents. All the students were examined according to the Aesthetic and Dental Health components (AC and DHC) of Index of Orthodontic Treatment Need. Students' and parents' perceived need was also assessed using AC. Then the measurements of IOTN in both groups were compared in each component and the demands of each group were also compared with each other.

Results: According to DHC classification, 22.3% of 12 years old students and 18.7% of 17 years old students were categorized in the "no need" group; 29.5% of 12 years old and 35.6% of 17 years old students in the "border line" group and 48.2% of 12 years old group and 45.7% of 17 years old group in the "definite need" group. According to AC, in 12 years old students, the "no need", "border line" and "definite" groups included 61.9 %, 29% and 9.1% of students in turn. On the other hand, the same categories in 17 years old students assessed by the dentist were 66%, 30.2% and 3.7% respectively. ($p<0.05$).

Conclusion: The treatment need based on DHC and AC scores of IOTN did not differ between 12 and 17 years old groups significantly but the demand for orthodontic treatment in "definitive need" category was more in 12 years old group

Key Words: Health component, Aesthetic component, Index of orthodontic treatment need, Orthodontic demand

A large number of indices have been developed to assess malocclusion in order to estimate orthodontic treatment needs in particular population. These indices quantify and summarize a set of clinical data to obtain a final quantitative score or qualitative categorization.[1,2]

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They have been used to select the patients who can be treated in a certain dental care system and establish priorities in private environments. There is not any unique method to classify the individual characteristics and occlusal features that should be assessed in order to objectively establish treatment need [3]; however, in the recent literature, epidemiological studies of malocclusion in different countries have used these indices which have overlap with each other in many ways.

The Index of Orthodontic Treatment Need (IOTN), as defined by Brook and Shaw [4], has

gained popularity in recent years because of its validity, reliability and ease of use. 5-8 The IOTN has two parts: Aesthetic (AC) and Dental Health (DHC) components. The AC defines the perception of a person about the attractiveness of his/her dentition. It uses 10 photos with the first photo showing the most attractive and the last one demonstrating the least attractive case. [4-9] The DHC evaluates 10 traits of malocclusion: overjet, reverse overjet, overbite, open bite, cross-bite, crowding, impeded eruption, defects of cleft lip and palate as well as any craniofacial anomaly, Class II and Class III buccal occlusions, and hypodontia. According to Shaw et al [1], Brook and Shaw [4], and So and Tang [5], the DHC shows the worst occlusal trait that is harmful to the dentition and its grades identifies the priorities in this regard. The index has also been modified to guarantee greater reliability, especially when used by non-specialists in oral health surveys.[8] According to earlier studies, about one-third to half of young adult Asians needs orthodontic treatment 11-14, but there are little information regarding this need in developing countries like Iran. The desire for orthodontic treatment is primarily influenced by demand rather than need. [15] Although the parents are main decision makers for their children [16, 17] and may have different opinions.[18] Few studies have been performed regarding their concerns about orthodontic treatment need. It has also been reported that parents are the most powerful factor in motivation for treatment. 19 Espeland et al. using a newly introduced Norwegian IOTN, studied the orthodontic concern among potential patients and their parents. 16 The investigations by Birkeland et al [17] also showed that parents are usually more concerned and eager about orthodontic treatment. Although there is relatively long time from its introduction, IOTN has still been used in many epidemiological studies. [20-22]

The evaluation of self-perception of dental attractiveness was recently evaluated among 12-15-year-old students using Dental Aesthetic Index (DAI), and a significant correlation was found between DAI scores and a subject's awareness of malocclusion and their satisfaction with dental appearance.[23] In Iran, Safavi et al. measured Orthodontic treatment need in 14-16 year-old Tehran high school students and found about 20 percents of the population needed orthodontic treatment (IOTN Grades 4 and 5). [24] In another study Borzabadi-Farahani et al. evaluated orthodontic treatment needs in an 11-14 years old sample of urban Iranian population using IOTN and found approximately one-third of Iranian school children were in need of orthodontic treatment.[25] Finally Orthodontic treatment needs of 12-15-year-old students was evaluated by Danaei et al. and they found that Iranian youth from Shiraz had better dental appearance and needed less orthodontic treatment than other populations. [26]

As it is obvious, there are many investigations in IOTN in different age groups but there is not any independent study comparing these age groups with each other.

The aim of this study was to compare the orthodontic treatment need by IOTN index between 12 and 17 years old students and parents in urban and rural areas and to analyze the data according to sex and socio-economic status.

Materials and Methods

In total, 846 students including 419 (211 male, 208 female) students of 12 years old and 427 (211 male, 216 female) students of 17 years old were randomly selected by cluster sampling method from 14 representative public schools in Abade (middle Iran, population 100000). Of all the cases 374 (87.6%) students were selected from urban and 53 (12.4%) from rural area during January to March 2005. The people are almost indigenous with low immigrants, have traditional culture and lower income comparing to five major cities of Iran (Tehran, Isfahan, Tabriz, Shiraz and Mashhad). The students were selected from a list obtained from the Directorate of Education in Abade health center. For the purpose of the study, the schools in the list were categorized according to the state, private or talented student schools. Two schools were also selected from rural areas. Students who had orthodontic treatment or were currently wearing an orthodontic appliance were not included in this study. All students were asked to produce birth certificates, Maternal and Child Health birth cards, or any other evidence for age verification.

Subsequently, parents of all the children participating in the study were asked to participate in the present study. It was also requested that wherever possible, mothers should accompany the students at the dental

examination. If it was not possible for the mother or female guardian to accompany, then the father or male guardian was suggested as an alternative. Approval was obtained from ministry of education in Abade, the individual schools principal and the parents and children were informed in writing, after which both could decide whether to participate in the study. A questionnaire was given to the parents to refer to the demographic characteristics of the respondents. This form consists of children's inhabitat (rural or urban), parents' education status, occupation, working hours, time that parents dedicate to their children's education and finally family income.

Then a full clinical examination was carried out using a mouth mirror and a periodontal probe in Health Center dental office in natural daylight, followed by taking alginate impression for each student together with a wax bite which was poured to fabricate dental casts the same day by a technician. Each malocclusion was also re-examined using the poured stone models. If the clinical and the model examinations did not match, the model examination was preferentially recorded. The examination was carried out by one author who had been previously trained and calibrated in the use of IOTN.

Each student was assessed using the IOTN. The DHC of the IOTN records the various occlusal traits into five grades according to severity and the need for orthodontic treatment. Grade 1 and 2 represent 'no need for treatment', grade 3 'borderline' and grades 4 and 5 are considered to be a definite need for orthodontic treatment. The aesthetic component has a scale of 10 colored photographs showing different levels of dental attractiveness, with grade 1 representing the most attractive and grade 10 the least attractive. According to Richmond et al. [27], grade 1-4 represent no or little need, grade 5-7 borderline need and grades 8-10 a definite need for orthodontic treatment. A digital photograph of teeth when a lip retractor was applied was taken of each student and students' dental attractiveness was assessed by dentist, parents and students accordingly using 10 pictures of IOTN.

With patients and parents kept apart, the former were asked to choose the photograph they thought 'best looked like' their teeth from the AC of the IOTN. [9] Similarly, the parents were then asked to score the AC of the IOTN and perceived need for their child. All scoring was carried out blind and patients and parents were not allowed to see each other's scores. To evaluate the demand for orthodontic treatment, students and parents were asked verbally 'if it is necessary, would you like to have your teeth straightened'.

Sixty of students (Thirty from each group) were re-examined 1 month after their initial examination. Kappa value for DHC and AC were 0.82 and 0.86, respectively, indicating good agreement. 28

Data were analyzed using Kruskal-Wallis and Mann-Whitney U test and ordinal regression and Spearman's correlation coefficient were used for correlation and prediction assessment SPSS Ver. 13 software was used in this study.

Results

Treatment Need: The survey revealed that in group of 12 years old students, 93 students (22.3%) were placed in category of "no need" for orthodontic treatment with the DHC; 123 students (29.5%) went to "borderline" group; and 201 (48.2%) students were located in definite need for orthodontic treatment. In group of 17 years old, 80 (18.7%) students had "no need" for orthodontic treatment with the DHC; 152 (35.6%) students had a borderline need for orthodontic treatment with the DHC. The number of students with the definite need for orthodontic treatment was 195 (45.7%) (Table 1). The differences between groups of 12 and 17 years old in all categories of "no need", "border line" and "definitive need" were not significant (P value> 0.05).

When AC of the IOTN was applied, the results were dramatically different with DHC; so in 12 years old students, the "no need" category (represents pictures 1 to 4) was 61.9 percent, the "border line" group (pictures 5-7) was 29 percent and the "definite" group (pictures 8-10) was 9.1 percent. On the other hand, in 17 years old students, the percent of students in categories "no need", "border line" and "definite" were 66%, 30.2%, and 3.7% respectively (Table 2). Interestingly, the difference between two groups of 12 and 17 years old in this criterion also was not significant in 3 different categories (i.e. no need, borderline and definitive need) (P value> 0.05).

When the students were asked to assess their dental appearance to the AC of IOTN, in 12 years old group, 77.9 percent found themselves in "no need" category while 14.4 and 7.7 percent thought they best fit in "border line" or "definite need" categories respectively. In 17 years old group, students categorized themselves as 79.9 percent in "no need", 16.9% in "border line", and 3.3% in "definite need" group. The AC assessments of the students by their parents were a bit closer to the dentist (P<0.05). Statistical analysis showed that there were not any significant differences between 12 years old and 17 years old groups in students' assessment to the AC (P value> 0.05).

AC of IOTN assessed by the dentist showed a good relation to the patient and parents demand as in 12 years old group patients' demand in "no need", "moderate need" and "severe need" categories were 26.6, 56.6, and 84.2 percent respectively; and for parents' demand they were 67.2, 40.2 and 21.1 percent respectively. (Table 3)

In 17 years old group also it was 19.9, 51.9 and 81.3 percent for parents' demand as well as 16.3, 45.7 and 93.8 percent for students' demand respectively to the "no need", "moderate need" and "severe need" categories. (Table 4) When comparing students' demand between 12 and 17 years old groups, there were not any significant differences in either 3 categories. (P value>0.05) Also, parents' demands between these two groups were in accordance with each other and the differences between them in all categories were not significant (P value> 0.05).

Treatment Demand: When the students were proposed with the orthodontic treatment opportunity with an orthodontist, their demand for treatment was highly correlated to their perception of their teeth according to AC as 92.9 percent of the "definite need" students asked for treatment, while the "border line" and "no need" groups were 62.5 and 18.2 percent respectively. (Table 5)

Table1. DHC assessment of 12 and 17 years old students made by the dentist

	DHC score		
	No need	Borderline	Definite need
12 years old	22.3%	29.5%	48.2%
17 years old	18.7%	35.6%	45.7%

Table2. AC assessment of 12 and 17 years old students made by the dentist

	AC score		
	No need	Borderline	Definite need
12 years old	61.9%	29%	9.1%
17 years old	66%	30.2%	3.7%

Table 3. The relationship between patient- parent demand and AC component assessed by dentist in 12 years old group

		AC score			
Demand		**No need n (%)**	**Border line n (%)**	**Definite need n (%)**	**Total**
Student's demand	**No**	190 (73.4%)	53 (43.4%)	6 (15.8%)	249 (59.4 %)
	Yes	69 (26.6%)	69 (56.6%)	32 (84.2%)	170 (40.6%)
	Total	259 (100%)	122 (100%)	38 (100%)	419 (100%)
Parent's demand	**No**	174 (67.2%)	49 (40.2%)	8 (21.1%)	231 (55.1%)
	Yes	85 (32.8%)	73 (59.8%)	30 (78.9%)	188 (44.9%)
	Total	259 (100%)	122(100%)	38 (100%)	419 (100%)

Table 4. The relationship between patient- parent demand and AC component assessed by dentist in 17 years old group

		AC score			
Demand		**No need n (%)**	**Border line n (%)**	**Definite need n (%)**	**Total**
Student's demand	**No**	236 (83.7%)	70 (54.3%)	1 (6.3%)	307 (71.9 %)
	Yes	46 (16.3%)	59 (45.7%)	15 (93.8%)	120 (28.1%)
	Total	282 (100%)	129 (100%)	16 (100%)	427 (100%)
Parent's demand	**No**	226 (80.1%)	62 (48.1%)	3 (18.8%)	291 (61.8%)
	Yes	56 (19.9%)	67 (51.9%)	13 (81.2%)	136 (31.9%)
	Total	282 (100%)	129 (100%)	16 (100%)	427 (100%)

Table 5. The students and parents' demand according to their AC assessment in 17 years old group

		AC score			
Demand		**No need N (%)**	**Border line N (%)**	**Definite need N (%)**	**Total**
Student's demand	**No**	279 (81.8%)	27 (37.5%)	1 (7.1%)	246 (79.1 %)
	Yes	62 (18.2%)	45 (62.5%)	13 (92.9%)	65 (20.9%)
	Total	341 (100%)	82 (100%)	14 (100%)	309 (100%)
Parent's demand	**No**	291 (68.1%)	3(20.0%)	42 (41.6%)	246 (79.1%)
	Yes	136 (31.9%)	12(80.0%)	59 (58.4%)	65 (20.9%)
	Total	427 (100%)	15(100%)	101 (100%)	309 (100%)

The "definite need" group in DHC scoring, unlike AC, was not correlated to the students demand as only 36.9 percent of 17 years old and 51.2% of 12 years old students asked for orthodontic treatment. Here, more 12 years old students' demand for treatment than 17 years old group and this difference was significant. (P value< 0.05)

Although the parents were a bit pessimist about their children's dental appearance but the same result were found when orthodontic demand was proposed; their attitude toward treatment were highly correlated to the AC of the DHC but did not correlated to the DHC.

When the results were analyzed according to the students' gender, in 12 years old students there were not any significant differences, however, in 17 years old group the AC of IOTN showed a significant different need between boys and girls assessed by parents, dentist and students. (P value< 0.05). Although orthodontic treatment demand requested by parents was almost the same in either sex, female students had a higher demand for treatment comparing to the males (35.2% verses 20.9%). DHC showed a significant difference in orthodontic treatment need between rural and urban students in both 12 and 17 years old groups (P<0.048). AC of the IOTN failed to show a significant difference between rural and urban orthodontic need assessed by dentist, students and parents in both groups (P value> 0.05). When the students were categorized according to the private or state schools they study, both DHC and AC revealed a better oral hygiene concern among private school students. Orthodontic treatment demand was highly related to the family income (P<0.05) as most of the low income parents and students denied to accept this treatment.

Discussion

In the present study in Abade the population consisted of urban and rural areas which were mixed with the endogenous residents of the area who are not very developed both socially and economically and cultural gap between these people and the population in large cities is considerable. First permanent molars are the major victims of extraction due to caries in adolescents in this area as most people mistakenly take them as primary teeth; resulting in hypodontia (the incidence of minor hypodontia as a result of first molar extraction was as high as 12.9%). We selected 2 age groups of 12 and 17 years old in order to compare the difference in need and demand to orthodontic treatment between them. The cause of selecting these age groups is related to different psychosocial situation in these ages. When a 12 years old adolescent grows to 17 years old, the lifestyle, motivations and self-confidence have significantly changed and we wanted to evaluate whether this change could include his/her motivation to treatment or not.

Approximately half of 12 year old (48.2%) and 17 year old (45.7%) of students in Abade were found in definite need of orthodontic treatment using the DHC. This estimate of 17 year old students in need of orthodontic treatment is higher than other figures reported by Safavi SM et al. [24] Borzabadi-Farahani et al. [25] in Iranian children; Holmes [29], Burden and Holmes [30] and Shaw et al 1 for British children, as well as Abu Alhaija et al [31] for Jordanian children. In a research study about this issue in connection with the Iranian population Need (Shiraz 2007), the study group consisted of 2000 school children in Shiraz, aged between 11 and 14 years. The result of this study showed that 7.63% students were in the category of no need, 45.1% in little need, 25.8% in border line need, 12.72% in the severe and 5.69% were in the category of very severe need. While the survey in Abadeh revealed that 18.7 percent of the students had "no need" for orthodontic treatment with the DHC and 35.6 percent had a borderline need for orthodontic treatment with the DHC.[32] In this study, the percent of students with the definite need for orthodontic treatment was 48.2 % for 12 years old and 45.7% for 17 years old group

which are more than 44.2% of the population and are still more than findings from the above study. The difference between AC and DHC assessment was noticed by Hamdan [33] in Jordanian students and almost the same results was found here.

When AC was applied, about two thirds of the students were categorized in "no need" group (61.9 in 12 years old and 66% in 17 years old group) and much lower percents were in definite need (9.1 and 3.7 in two groups respectively), while parents and students were even more satisfied with the teeth appearance (e.g. 72.8 and 79.9 percent in 17 years old thought they do not need orthodontic treatment). This could be justified by the early extraction of decayed teeth D, E and first molar in some occasions.

This study reveals that DHC of IOTN was not a good predictor for both students' and parents' concern about orthodontic treatment need. Most of the people in such areas do not search for dental care till they find their tooth badly damaged because of lack of knowledge and insufficient dental care. But surprisingly, they seem to be very cautious about their dental appearance and anterior teeth.

Of all "definite need" students assessed by DHC only 30.7 percent of 12 years old and 36.9 percent of 17 years old students were enthusiastic about orthodontic treatment while the parents were more cautious about the problem (38% and 40% in turn), so the DHC is not a good predictor for orthodontic treatment demand in this group of students.

By contrast, AC score was a precise predictor for orthodontic demand in "no need" category as almost all the students and their parents (97.5% and 93.8% respectively) think they have no demand for orthodontic treatment.

The difference in DHC and AC score was not significant between 12 and 17 years old groups (P value> 0.05). This shows that in this specific region, the environmental factors which influence malocclusion, did not change considerably during 12 to 17 years in these children. On the other word, the orthodontic treatment need in both ages and likely between them may be surprisingly the same. Unfortunately there was not any similar study comparing these two age groups and this study is somehow unique in this field.

In present study, the demand for orthodontic treatment was found to be 40.6 and 44.9 percent in 12 years old group and 28.1 and 31.9 percent in 17 years old group for parents and students, respectively (tables 3,4). This was less than that reported by Holmes [34] for UK children. He found that 86 percent of the children examined were willing to accept orthodontic treatment. In Kenya and Hong Kong, Ng'ang'a et al 35 and Wang et al 36 reported less demand for orthodontic treatment, 33 and 40 percent, respectively.

As expected, differences in the need scores showed no differences between male and female samples in both age groups which is in agreement with previous study. [37-39] Students' gender was not a main factor in orthodontic demand in 12 years old group; in contrast, in 17 years old, girls had twice as many requests for orthodontic therapy as boys. So it shows that girls at the age of 17 are more concerned about their appearance and are more willing to accept such treatments even in low developed societies. This is also reported by Elham et al [27] and as Hedayati et al 32 Roberts et al [37] found that girls were more frequently treated than boys.

Orthodontic demand is related to family income as in both rural and urban areas, rich families were enthusiastic about this treatment because firstly they could afford it and secondly they were familiar with such treatments via television or satellite programs.

Conclusion

According to this study, the treatment need based on DHC and AC scores of IOTN did not have any significant differences between 12 and 17 years old groups but the demand for orthodontic treatment in "definitive need" category was more in 12 years old group.

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