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Evaluation of Orthodontic Treatment needs among 14-16 year old Students using IOTN in Rasht – 2014

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ABSTRACT
Awareness of orthodontic treatment needs is very important in hygienic planning and dentistry insurance. This study provides information about orthodontic treatment need in a group of 14⏢16-year-old high school students in Rasht, Iran. A total of 422, 14-16 year-old students were selected from 10 high schools of different areas of Rasht, Iran based on cluster sampling. Orthodontic treatment need was assessed by two components, including Dental Health Component (DHC) and Aesthetic Component (AC), which are subgroups of the Index of Orthodontic Treatment Need (IOTN). DHC was assessed by a general dentist on ordinary chairs under daylight. AC of the index was evaluated by high school students using the color standard photographs. Data were analyzed to assess the possible correlation between treatment need with sex and socioeconomic status using Chi-square test. Based on the results, 25.6% of students had grades 4 and 5 of DHC and needed definitive orthodontic treatment but according to AC, 1.6% of them needed orthodontic treatment. The orthodontic treatment need in boys was significantly more than that in girls (P=0.024). There was no statistically significant correlation between treatment need and socioeconomic status (P=0.14). There was poor correlation between objective orthodontic treatment need which was evaluated by the examiner using DHC and subjective orthodontic treatment need based on AC by high school students (rho=0.24, P=0.001). The most severely orthodontic problems were crowding, hypodontia and tooth impaction. Objectively, one fourth of 14⏢16-year-old students in Rasht had definitive orthodontic treatment need. Orthodontic treatment need in boys was more than girls but socioeconomic status did not affect orthodontic treatment need. Crowding was the most frequent orthodontic problems found in this study.
Key words: *14-16 year old, IOTN, treatment need, DHC, Iran.*

INTRODUCTION

Malocclusion is one of the most important dentofacial problem which induces side effects on nutrition, speech, periodontal health and self-confidence and predispose individuals to caries and trauma [1]. With early diagnosis of malocclusion and referral of patients for proper treatment many of the complications can be prevented [2].

A quantitative index is needed for assessing the need for treatment, determining the standards of treatment and evaluating the results of orthodontic intervention [3].

 Orthodontic treatment need indices were devised to minimize the subjectivity associated with the diagnosis, referral and complexity assessment of malocclusion.[4] These indices are the Dental Aesthetic Index (DAI)[4, 5], the Handicapping Labio-Lingual Deviation index (HLD) [6], the Index of Orthodontic Treatment Need (IOTN)[7], and the Index of Complexity, Outcome and Need (ICON) [4].

IOTN was first introduced by Brook and Shaw in 1989 and was later modified by Richmond [7]. Validity, reproducibility, simplicity and ease of use have made it more applicable than other indices [8-10]. Subjective psychosocial perceptions of patients may play an important role in orthodontics, and treatment might be more influenced by demand than by need [11]. Therefore, the importance of patients' perceptions regarding orthodontic treatment cannot be underestimated [12].

While treatment demand is affected by perceived need and cost, [13, 14] patients' concerns do not always coincide with professional assessments of their treatment need [15]. Controversial and diverse associations have been observed between self-perceived and normative treatment needs, [11, 14] ranging from moderate [16] to mild [17.

Based on previous studies, large variations in the rate of orthodontic treatment need have been reported in different countries; for example in 1973 in Sweden %11, in 1993 in China %52, in 1994 , in the United kingdom %22, in 2001 in Turkey %38.8 [7] of samples had definitive orthodontic treatment need [18-20].

Since Iran is one of the youngest countries of the world, it seems that epidemiological studies relating to dentofacial deformity of adolescence and young adults in terms of the health of the community, planning for health care and dentistry insurance are necessary. Besides, with increasing the people's awareness of their dentofacial problems, specialists can improve the level of health care and reduce treatment cost.

In the current study, the orthodontic treatment need was evaluated in 14-16 year old students in the private and public high schools of Rasht, Iran based on IOTN which both measures the orthodontic treatment need from the patients' perspective and clinicians' perspective. Data were analyzed to assess possible correlation between treatment need with sex and socioeconomic status.

MATERIAL AND METHODS

Permission to undertake the survey was obtained from the Ministries of Health and Education. The ethical approval was given by the Research Ethics Committee, Faculty of Community Dentistry, School of Dentistry, Gilan University of Medical Sciences.

Based on the pilot study, the sample size of this descriptive cross-sectional study was determined to be 384(192 men, 192 women). The participants were selected via the cluster sampling method from high schools of Rasht, Iran

To establish a range of socioeconomic status (SES), both public and private schools were included in the sampling procedure. Public schools are usually frequented by subjects with a low SES because they provide free tuition, whereas private schools that require high tuition fees are frequented by subjects with higher SES. (293 from public and 129 from private high schools).

A total of 436 students aged 14-16 (205 males, 217 females) were evaluated. The purpose of choosing this age range was that all the permanent teeth are erupted at this age and errors due to the delayed eruption, which can lead to unrealistic estimates of treatment need, will not occur.

The inclusion criteria were as follows: no systemic problems with a full permanent dentition excluding the third molars, all the subjects aged 14-16 without any orthodontic treatment history.

IOTN (DHC and AC): IOTN composed of dental health component (DHC) and aesthetic component (AC). DHC have 5 grades with grade 1 indicating no need for orthodontic treatment, grade 2 indicating slight need, grade 3 indicating moderate need, grade 4 indicating severe need and grade 5 indicating very severe need for orthodontic treatment. These grades are based on features of malocclusion properties, including overjet, open bite, deep bite, crossbite, contact displacement (crowding), supernumerary, ankylosed, impacted and missing teeth, cleft lip, cleft palate and lip, cleft palate, facial asymmetry and distorted buccal occlusion due to Cl II or Cl III malocclusion. This component can be evaluated from clinical observation or dental casts. The most severe grade of malocclusion was assigned to each patient [20].

AC consists of a ten-point scale illustrated by a series of photographs, which is rated for attractiveness, with the first graph exhibiting the least attractiveness and the last exhibiting the most [20].

Lunn *et al.* in 1993 suggested a major change in the aesthetic and dental health components of the IOTN. They found that the reliability of IOTN would have improved if both the dental health component and the aesthetic component were reduced to three grades. For the DHC, grade 1 and 2 do not need orthodontic treatment, grade 3 needs moderate and 4 and 5 definitely need orthodontic treatment [21].

For the AC, photographs 1 to 4 do not need treatment, 5 to 7 have moderate need and 8 to 10, have definitive need for orthodontic treatment [21].

After obtaining informed consents, the IOTN-DHC was assessed clinically on ordinary chairs under daylight, in a room, by a general dentist who had been trained by an orthodontist.

In addition, the participants were asked to look at their teeth in a mirror and select 1 of 10 colored photographs of the IOTN-AC which they felt most resembling their dental attractiveness (on a scale of 1 to 10).

Reliability of the methods: The IOTN scores of 40 patients who were randomly selected were re-assessed by an experienced orthodontist, the main observer, and the patients (for the IOTN-AC).

Statistical analysis: The frequency distributions of the scores were calculated. The correlations between DHC and AC were assessed using Spearman's correlation coefficient. The relationship between the variables was assessed using chi-square test. The level of significance was set at 0.05.

RESULTS

In this study 436 high school students were assessed, 14 of which were under orthodontic treatment or had a history of orthodontic treatment (13 females, 1 male), therefore, they were excluded from the study.

According to the Cohen's Kappa, the reliability of the inter-examiner findings and the main examiner scores were %80 and %83 respectively (P< 0.001).

The most important factors affecting orthodontic treatment need were determined as crowding, hypodontia and tooth impaction (table1).

On the basis of DHC of IOTN, 218 (51.7%) subjects had no need for orthodontic treatment, 96(22.7%) had moderate need and 108(25.6%) had definite need for orthodontic treatment (figure1).

On the basis of AC of IOTN, 395 (93.6%) subjects had no need for orthodontic treatment, 20 (4.8%) had moderate need and 7 (1.6%) had definite need for orthodontic treatment. (figure1)

According to Spearman correlation coefficient the scores of DHC and AC were significantly correlated with each other. (rho=0.24, P=0.001).

Orthodontic treatment need on the basis of DHC was greater in male than female (P=0.024) (figure2).

There was no significant difference between the students in private and public high schools. (P=0.14)(figure3).
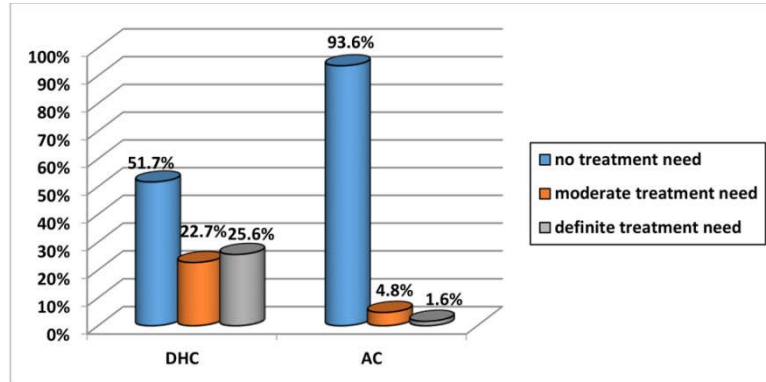

Figure1: Orthodontic treatment need base on dental health component and aesthetic componant
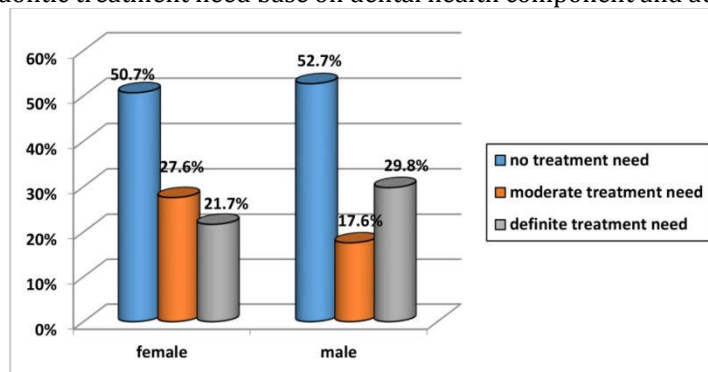

Figure2: Orthodontic treatment need base on dental health component in different genders
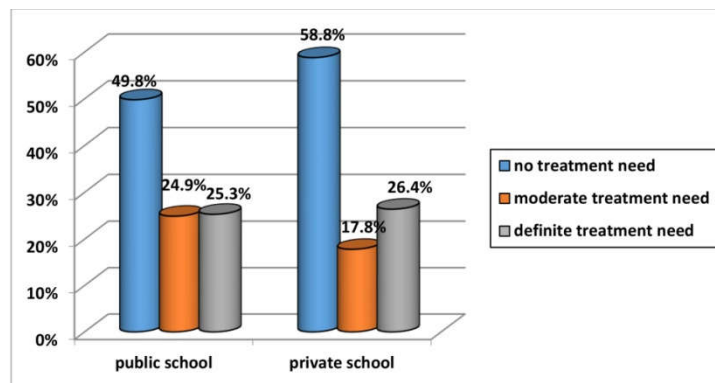
Figure3: Orthodontic treatment need base on dental health component in different high schools

Table1: Distribution of different occlusal traits based on grade 4 and 5 of dental health component

Occlusal trait	frequency	percent
Misssing(Hypodontia)	35	8.3
Increased overjet	15	3.5
Reverse Overjet	1	0.2
posterior Cross Bite	4	0.9
Crowding(contact tooth displacement)	37	8.8
Open Bite	6	1.4
Deep Bite	2	0.5
Supernumerary	3	0.7
partially Erupted Tooth	10	2.4
Tooth impaction	29	6.9
Cleft lip and palate	3	0.7
Submerged deciduous tooth	3	0.7

DISCUSSION

This study evaluated the orthodontic treatment need of 422 students between 14 to 16 years old of private and public high school in Rasht, Iran. Results indicated that nearly one fourth of the samples definitely need orthodontic treatment which is similar to the result of Hosseinikhah et al.[22] in Yazd, Iran which reported 25% of 420 male high school students had DHC of 4 and 5. Birkland et al.[23] reported that 26.1% of Norwegian students with age of 11 years old definitely need orthodontic treatment. However the value obtained in this study was different from some previous studies; Shahri *et al* [24] in 2013 showed that 36% of 395 school children aged 11-14 in Zahedan, Iran had definite need for orthodontic treatment also Borzabadi *et al* [25] in 2008 reported that 36% of 500 students of Esfahan, with average age of 12, definitely need orthodontic treatment which is higher than the result of the current study. The racial or geographical differences and different age range between the study samples might explain this difference. Ucuncu [7] found that 38.8% among 500 Turkish students aged 11-14 exhibited great need for orthodontic treatment. Burgersdijk *et al.*[26] reported that 39% of people in Netherlands aged 15 to 74, definitely need orthodontic treatment. The difference between the age range and the race of the samples of the studies could cause such a difference between the results.

In the current study there was poor correlation between DHC and AC of IOTN(rho=0.24) which indicates differences between the examiner and the participants' opinion with respect to orthodontic treatment need and students feeling less need for orthodontic treatment than the examiner similar to the study of Hedayati [9] and oshagh [27] In Iran. One of the most important reasons for this difference is that some individuals had problems in determining their need for orthodontic treatment through AC, because their dentition characteristics were not exactly portrayed on the photos. In addition, problems like crossbite, impacted teeth, and increased traumatic overbite do not affect the appearance of dentition whereas they influence the DHC grade. On the other hand, certain malocclusions critical to the individual might be considered normal according to the IOTN-DHC, or even be omitted from its criteria. These include gingival appearance and the presence of interdental spaces, which are considered important in some

individuals' opinions. A modified version of the IOTN-AC with more images on the attractive end might be advantageous for evaluating self-perception towards dental appearance with higher accuracy.

In the current study, the difference between the DHC values of males and females exhibited that males represented more need for definite orthodontic treatment than females (P =0.024). In 1994 Burden et al. [20] showed significantly greater need for orthodontic treatment in males than females which is consistent with our findings. Whereas there was more need for treatment in females than males in Mandall *et al.* [28] study sample. Ucuncu [7]http://www.jisppd.com/article.asp?issn=0970-4388;year=2007;volume=25;issue=1;spage=10;epage=14;aulast=Hedayati_-_ref11 found no significant difference between males and females in this respect. This difference between the results of the studies could be related to the fact that some of the samples which excluded from the studies due to present or previous history of orthodontic treatment might be eligible in each of two groups: moderate or definite need to orthodontic treatment. Since in the current study of all the girls, 13 girls (5.99%) had undergone orthodontic treatment, while just one boy (0.48%) was under treatment, this difference could influence the final results , in addition , this difference might show that the parents pay more attention to girls' than boys' dental aesthetics.

In the present study, socio- economic status (SES) did not affect orthodontic treatment need as in the study of Bernabe [29]and kerosue [11]. In the study of Badran *et al* [30] subjects of low SES exhibited greater normative and perceived treatment needs based on DHC an AC of IOTN, this differences can be related to different ways of classifying samples based on SES.

The most important factors affecting orthodontic treatment need in the present study from the higher to lower rank were crowding, hypodontia and impacted teeth, respectively. In a study by Burden [20] impacted teeth, crowding and increased overjet were the most important factors. Compared to other studies, hypodontia had higher incidence in present research. It could be explained by high incidence of first permanent molar extraction in this population that might be due to lack of dental knowledge and the high price of root canal therapy.

The decision to provide orthodontic treatment is based on many factors including severity of malocclusion, patient cooperation, cost, risks and cannot be made solely on the basis of indices. However the results of the present study are useful for public health planning and for the generation of hypotheses for future studies.

CONCLUSION

A total of 25.6% of 14⬚16-year-old students in Rasht, Iran, have definitive orthodontic treatment needs. Students felt tremendously less need for orthodontic treatment than the examiner. Orthodontic treatment need in boys was more than girls but socioeconomic status did not affect orthodontic treatment need. Crowding, hypodontia and tooth impaction were the most frequent orthodontic problems found in this study.

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