Original Article

Normative and Subjective Need for Orthodontic Treatment within Different Age Groups in a Population in Turkey

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ABSTRACT

Objective: To evaluate and compare the normative and subjective need for orthodontic treatment within different age groups in Turkey. **Methods:** One thousand and sixteen patients from seven different demographic regions of Turkey (Marmara, Black Sea, East Anatolia, Southeastern Anatolia, Mediterranean, Aegean, and Central Anatolia Region) (mean age ± SD: 12.80 ± 3.57 years) were randomly selected and divided into six age groups (7–8,9–10,11–12,13–14,15–16, and 17–18 year-olds) and categorized according to the dental health component (DHC) of the index for orthodontic treatment need (IOTN). Additionally, the patients were asked to indicate the photograph that was most similar to their own dentition from the 10-point scale of the aesthetic component of IOTN. **Results:** The DHC of IOTN was not significantly different between the six age groups ($P > 0.05$). However, no/slight need (aesthetic component 1–4) for orthodontic treatment according to AC of IOTN was significantly higher in 13–14,15–16, and 17–18 age groups than 7–8, 9–10, and 11–12 age groups ($P < 0.05$). No sex differences were found in both DHC and aesthetic component of IOTN between age groups ($P > 0.05$). **Conclusion:** The normative need distribution was homogeneous within all the age groups according to DHC. However, the subjective need for orthodontic treatment was higher in the younger age groups.

KEYWORDS: *Orthodontic treatment need, IOTN, DHC, aesthetic component*

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INTRODUCTION

Orthodontic treatment need is one of the most discussed topics in the field of orthodontics over the last decade. Treatment need has been classified from the dental professional's viewpoint through several indexes that assess the severity and also the aesthetic impairment of the malocclusion.[1-3]

A widely used index is the index of orthodontic treatment need (IOTN), which ranks occlusal traits in terms of the component of dental health (DHC) and of aesthetics.[4] However, a normative need assessed by professionals is not always the critical factor for an individual's decision related to orthodontic treatment. The demand for consumer treatment is equally as important as the normative need.[5,6] The timing of orthodontic treatment depends on general and dental development and on the readiness of the aware patient to proceed.[7] The DHC of IOTN represents the normative need for orthodontic treatment based on occlusal characteristics, whereas the aesthetic component assesses the need using aesthetic parameters. If the patients evaluate their aesthetics themselves, aesthetic component could identify the ability of the patient to recognize and classify their malocclusion; that is, the subjective need for orthodontic treatment. The self-decision for orthodontic treatment may also improve cooperation and motivation.[8-10] In several studies the normative treatment need was reported higher than patient-defined subjective need.[11,12] Professionals usually classify the normative need for

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treatment, whereas the subjective need for orthodontic treatment may also be assessed by the layperson. The needs of patients are frequently associated with visible types of malocclusions such as overjet, crowding, and spacing. Previous knowledge regarding malocclusion types, the psychological status and social environment of the patient and also individual motivation plays a major role in this perception. However, it is still uncertain, whether the need for orthodontic treatment and the awareness are affected by patient sex and age. Epidemiological and genetic studies have indicated insignificant sex differences in the prevalence and severity of malocclusions.[13,14] However, it has been found that a predominantly higher number of female patients seek orthodontic treatment.[15] Women are more critical of their occlusion and assign greater importance to their appearance and, therefore, are more realistic in their assessment of orthodontic treatment need.[16,17] Alternative studies have reported no sex difference associated with a self-perceived need for orthodontic treatment.[18,19] Researches directed at the influence of age on normative and subjective treatment need have also been performed.[20,21] However, few have assessed a diverse age group. Therefore, the aim of the present study was to evaluate and compare the normative need for orthodontic treatment and the subjective aesthetic recognition of physical dental appearance of patients at different age levels.

Subjects and Methods

The present study was approved by the Ethic Committee of Yeditepe University and guidelines of Helsinki Declaration have followed. Moreover, the National Ministry of Education and also each Head of School were contacted to obtain permission to evaluate the students.

Study sample

The study was a part of an oral health survey conducted on 3040 individuals in Turkey. The participants were selected from the seven different demographic regions of Turkey (Marmara, Black Sea, East Anatolia, Southeastern Anatolia, Mediterranean, Aegean, and Central Anatolia Region) and evaluated by a team of health professionals (Orthodontia, Periodontology, Maxillofacial Radiology, and Public Health). In each demographic region, the survey team visited at least two schools in downtown, as well as rural regions and subject selection was performed by a randomized sampling strategy: the first, third, fifth, seventh, and ninth student on the name list of each class were evaluated. Participants were excluded from the study according the following reasons: first, who were already undergoing or had history of orthodontic treatment (n = 34), second, who were younger than 7 years (n = 20), and third, who were older than 18 (n = 2070).

A total of 1016 participants (494 female, 522 male) with a mean age of 12.80 ± 3.57 were enrolled. The study group was divided into six subgroups according to chronological age: Group A (7–8 years), Group B (9–10 years), Group C (11–12 years), Group D (13–14 years), Group E (15–16 years), and Group F (17–18 years). The normative and subjective need was determined using the DHC and aesthetic component of IOTN, respectively. One orthodontist (R.B.N.Y.) evaluated the dental health component clinically. The students, sitting in ordinary class chairs, were evaluated under blue–white color light by using a plane mouth mirror. To determine the normative orthodontic treatment need (DHC) a number of variables such as missing teeth, overjet, crossbite, displacement of contact points, and overbite were recorded [Table 1]. At the same time, the students were given time to examine their dental appearance using a mirror and afterwards they were also asked to categorize their dental appearance by using the 10-point scale of the aesthetic component series of illustrative photographs according to attractiveness. Both components of IOTN have five categories (1. No need, 2. Slight need, 3. Borderline, 4. Need, and 5. Severe need for orthodontic treatment), which can be summarized into three as slight/no need, borderline, and need/severe need for orthodontic treatment. DHC grades 1–2 and aesthetic component grades 1–4 represent *slight/no need*, DHC grade 3 and aesthetic component grades 5–7 show borderline need and DHC grades 4–5 and AC grades 8–10 demonstrate *need/severe need* for orthodontic treatment.

Statistical analysis

The data were evaluated using Statistical Package for Social Sciences 15.0 for Windows. To analyze the data, descriptive statistical methods (mean value, prevalence ratio, and standard deviation) were performed. A chi-square test was applied to evaluate any significant differences between the categories of DHC and aesthetic component according to age and also sex. For all statistical analyses, P value less than 0.05 was considered as statistically significant.

Results

In all age groups, approximately, half (45.9–57.6%) of the sample had need/severe need, whereas between

Table 1: Dental health component of the index of orthodontic treatment need

DHC	
Grade 5 (Severe)	Defects of cleft lip and/or palate.
	Increased overjet greater than 9 mm.
	Reverse overjet greater than 3.5 mm with reported masticatory or speech difficulties.
Grade 4 (Need)	Impeded eruption of teeth (with the exception of third molars) due to crowding, displacement, the presence of supernumerary teeth, retained primary
	teeth, and any other pathological cause.
	Extensive hypodontia with restorative implication (more than one tooth missing in any quadrant) requiring pre-restorative orthodontics.
Grade 3 (Borderline)	Increased overjet greater than 6 mm but less than or equal to 9 mm.
	Reverse overjet greater than 3.5 mm with no reported masticatory or speech difficulties.
Grade 2 (Slight)	Reverse overjet greater than 1 mm but less than or equal to 3.5 mm with reported masticatory or speech difficulties.
	Anterior or posterior crossbites with greater than 2 mm displacement between retruded contact position and intercuspal position.
Grade 1 (None)	Posterior lingual crossbites with no occlusal contact in one or both buccal segments.
	Severe displacement or teeth greater than 4 mm.
	Extreme lateral or anterior open bite greater than 4 mm.
	Increased and complete overbite causing notable indentation on the palate or labial gingivae.
	Patient referred by colleague for collaborative care, for example, periodontal, restorative, or TMJ considerations.
	Less extensive hypodontia requiring pre-restorative orthodontics or orthodontic space closure to obviate the need for a prosthesis (not more than one tooth missing in any quadrant).
	Increased overjet greater than 3.5 mm but less than or equal to 6 mm with incompetent lips at rest.
	Reverse overjet greater than 1 mm but less than or equal to 3.5 mm.
	Increased and complete overbite with gingival contact but without indentations or signs of trauma.
	Anterior or posterior crossbites with less than or equal to 2 mm but greater than 1 mm displacement between retruded contact position and intercuspal position.
	Moderate lateral or anterior open bite greater than 2 mm but less than or equal to 4 mm.
	Moderate displacement of teeth greater than 2 mm but less than or equal to 4 mm.
	Increased overjet greater than 3.5 mm but less than or equal to 6 mm with competent lips at rest.
	Reverse overjet greater than 0 mm but less than or equal to 1 mm.
	Increased overbite greater than 3.5 mm with no gingival contact.
	Anterior or posterior crossbites with less than or equal to 1 mm displacement between retruded contact position and intercuspal position.
	Small lateral or anterior open bites greater than 1 mm but less than or equal to 2 mm.
	Pre-normal or post-normal occlusions with no other anomalies.
	Mild displacement of teeth greater than 1 mm but less than or equal to 2 mm.
	Other variation in occlusion including displacement less than or equal to 1 mm.

Reproduced from [4]

1/4 and 1/3 (24.332.9%) had no or slight need for orthodontic treatment according to the DHC. The no/slight, borderline, and need/severe need category for orthodontic treatment need according to the DHC of IOTN did not show a significant difference between the six age groups and sexes ($P > 0.05$) [Tables 2 and 3]. In contrast, no/slight, borderline, and need/severe need category for orthodontic treatment need groups according to aesthetic component of IOTN showed significant differences among the age groups ($P < 0.05$) [Table 4]. No/slight need for orthodontic treatment was significantly higher in groups D (13–14 years), E (15–16 years), and F (17–18 years) compared with group A (7–8 years),

Table 2: Assessment of dental health component (index of orthodontic treatment need) among different age groups

Chronological Age	DHC			p
	No/Slight need (DHC 1-2) *n* (%)	Borderline (DHC 3) *n* (%)x	Need/Severe need (DHC 4-5) *n* (%)	
Group A (7-8 years)	28 (32.9)	18 (21.2)	39 (45.9)	0.638
Group B (9-10 years)	44 (24.3)	34 (18.8)	103 (56.9)	
Group C (11-12 years)	58 (30.2)	31 (16.1)	103 (53.6)	
Group D (13-14 years)	57 (28.2)	32 (15.8)	113 (55.9)	
Group E (15-16 years)	41 (29.5)	24 (17.3)	74 (53.2)	
Group F (17-18 years)	65 (30.0)	27 (12.4)	125 (57.6)	

*Chi-square test

Table 3: Comparison of gender in dental health component (index of orthodontic treatment need)categories among age groups

Age groups	DHC					
	Need/Severe need (DHC 1-2)		Borderline (DHC 3)		Need/Severe need (DHC 4-5)	
	Female *n* (%)	Male *n* (%)	Female *n* (%)	Male *n* (%)	Female *n* (%)	Male *n* (%)
A	10 (35.7)	18 (64.3)	7 (38.9)	11 (61.1)	18 (46.2)	21 (53.8)
B	22 (50.0)	22 (50.0)	17 (50.0)	17 (50.0)	51 (49.5)	52 (50.5)
C	29 (50.0)	29 (50.0)	16 (51.6)	15 (48.4)	51 (49.5)	52 (50.5)
D	31 (54.4)	26 (45.6)	12 (37.5)	20 (62.5)	49 (43.4)	64 (56.6)
E	22 (53.7)	19 (46.3)	14 (58.3)	10 (41.7)	38 (51.4)	36 (48.6)
F	41 (63.1)	24 (36.9)	13 (48.1)	14 (51.9)	53 (42.4)	72 (57.6)
P	0.267		0.662		0.740	

A: 7-8 years, B: 9-10 years, C: 11-12 years, D: 13-14 years, E: 15-16 years, F: 17-18 years. *Chi-square test

Table 4: Assessment of aesthetic component (index of orthodontic treatment need) among different age groups

Chronological Age	AC			*p*
	No/Slight need (AC 1-4) *n* (%)	Borderline (DHC 5-7) *n* (%)	Need/Severe need (DHC 8-10) *n* (%)	
Group A (7-8 years)	70 (82.4)	10 (11.8)	5 (5.9)	0.010*
Group B (9-10 years)	153 (84.5)	20 (11.0)	8 (4.4)	
Group C (11-12 years)	157 (81.8)	22 (11.5)	13 (6.8)	
Group D (13-14 years)	177 (87.6)	16 (7.9)	9 (4.5)	
Group E (15-16 years)	129 (92.8)	8 (5.8)	2 (1.4)	
Group F (17-18 years)	204 (94.0)	10 (4.6)	3 (1.4)	

Chi-square test, *P<0.05

B (9–10 years), and C (11–12 years) ($P < 0.05$). No differences were recorded between groups D (13–14 years), E (15–16 years), and F (17–18 years) and also between A (7–8 years), B (9–10 years), and C (11–12 years) ($P > 0.05$) for no/slight, borderline, and need/severe need for orthodontic treatment categories according to the aesthetic component. Similarly to DHC, no sex difference was found in aesthetic component categories among age groups ($P > 0.05$) [Table 5].

Table 5: Comparison of gender in aesthetic component (index of orthodontic treatment need) categories among age groups

Age groups	AC					
	No/Slight need (AC 1-4)		Borderline (AC 5-7)		Need/Severe need (AC 8-10)	
	Female	Male	Female	Male	Female	Male
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
A	29 (41.4)	41 (58.6)	5 (50.0)	5 (50.0)	1 (20.0)	4 (80.0)
B	72 (47.1)	81 (52.9)	12 (60.0)	8 (40.0)	6 (75.0)	2 (25.0)
C	80 (51.0)	77 (49.0)	9 (40.9)	13 (59.1)	7 (53.8)	6 (46.2)
D	83 (46.9)	94 (53.1)	7 (43.8)	9 (56.3)	2 (22.2)	7 (77.8)
E	69 (53.5)	60 (46.5)	4 (50.0)	4 (50.0)	1 (50.0)	1 (50.0)
F	102 (50.0)	102 (50.0)	4 (40.0)	6 (60.0)	1 (33.3)	2 (66.7)
P	0.622		0.850		0.248	

A: 7-8 years, B: 9-10 years, C: 11-12 years, D: 13-14 years, E: 15-16 years, F: 17-18 years. *Chi-square test; *Chi-square test

Discussion

The best age at which orthodontic treatment should be started is a matter of debate. Both physiological and psychological issues should be considered for the delivery of enhanced treatment outcomes. Nevertheless, one of the most critical but always overlooked criteria governing the success of orthodontic treatment is the cooperation of the patient.[22] If the patient determinate his need for orthodontic treatment, the cooperation and the success of treatment may be increased. Therefore, one of the main objectives of professionals should be to integrate patient-based and professional-based need for treatment and to determine the ideal age for the onset of orthodontic treatment. Firs, the differences in normative need for the commencement of treatment from childhood through adolescence to adulthood should be identified. If discrepancies and disagreement are stated, treatment should start at an age when the shift of normative need from 'borderline' to 'severe need' occurs. If agreement for normative need between age groups is evident, the age, at which subjective need and awareness of the patient about dental appearance arises may be applied to determine the onset of orthodontic treatment. Therefore, the aim in this study was to compare normative and subjective need for orthodontic treatment within different age groups using both components of the IOTN.

The IOTN ranks various occlusal traits and aesthetic impairment using the DHC and aesthetic components, respectively.[23] Borzabadi-Farahani[24] stated that orthodontic treatment need indices are important in epidemiological studies and resource planning. However, the same author added that apart from very severe malocclusions such as malocclusions with cleft lip/palate or impacted teeth, the hierarchy that was used in the DHC of the IOTN is not evidenced based and there is no strong evidence that patients in other categories of IOTN (DHC grade of 1–4) will put their oral health at risk, if they turn down orthodontic treatment. The determined DHC as a represents the normative treatment need, whereas the aesthetic component can be performed by the professionals or patients themselves to reveal their self-perceived or subjective need. The aesthetic perception is of subjective nature and depends on multiple factors such as the attitude of the participants, the social environment, and the economic status of the family. Of course, variable perceptions of attractiveness and orthodontic need are also present among cultures and countries, which is a limitation of the aesthetic component and DHC of the IOTN.[24,25] For example, a study investigated the orthodontic treatment need in Iranian schoolchildren[26] and another in an adolescent population of Tirana[27] mentioned lower objective and higher subjective severe orthodontic treatment need (DHC 4–5, aesthetic component 8–10) compared with our findings. Further, Borzabadi-Farahani[28] suggested to use a short version of hard or soft tissue profile analyses instead of aesthetic component to assess the aesthetic aspect of the malocclusions to make the aesthetic assessment more objective. However, despite the aforementioned shortcomings, IOTN is popular, worldwide used, and has been taken into account by creating further indexes such as the index of orthognathic functional treatment need.[29-31] In addition, several studies have suggested using the subjective aesthetic component to assess a patient's awareness of his/her dental appearance and the motivation for orthodontic treatment.[8-10]

In the present study, individuals were divided into six subgroups according to age as: 7–8, 9–10, 11–12, 13–14, 15–16, and 17–18 years. According to the findings, the younger age groups (7–8, 9–10, and 11–12 years) reported significantly more self-perceived need for orthodontic treatment by their higher mean scores in

the aesthetic component of IOTN than the older age groups (13–14, 15–16, and 17–18 years). Moreover, no significant difference between 7–8, 9–10, and 11–12 years age groups nor 13–14, 15–16, and 17–18 years age groups could be found for the aesthetic component.

Preadolescent children seek a model role, usually one of the parents. Therefore, they are more influenced by their family rather then their peers and easily adapt to established daily rules. Tung and Kiyak[7] examined the psychological issues for the decision to initiate orthodontic treatment in preadolescent patients. The younger age group (9–12 years) was found to be aware of their physical appearance and that of their peers. Pre-adolescents were identified as more future-orientated, whereas adolescents focused on the present time period. Therefore, preadolescents had more interest in functional and aesthetic oral improvements. Moreover, the patients of this age group had fewer concerns about the opinions of their peers compared with adolescents and were ideal candidates for orthodontic treatment. In a consideration of treatment adherence, Southard *et al*.[32] advised to start orthodontic treatment after the age of 6 years and to complete before the onset of puberty. However, adolescence is a time associated with concern about personal identity and acceptance by adults and peers. Adolescence is the usual time for seeking orthodontic treatment despite awareness of the malocclusion is reduced.[7] Chen and Hunter[33] also concluded that the prevalence of psychological impacts resulting from dental teasing were more frequent in children than adulthood. Normative treatment need was not significantly different between the age groups. Birkeland *et al*.[20] reviewed 157 untreated children from 11 years (T1) to 15 years (T2). The changes between T1 and T2 according to DHC were summarized as: improvement in 22 children, worsening in 52 children, and in the majority minimal changes was noted (only one DHC grade). Similarly, Chi *et al*.[34] assessed 152 children when they were 10 (T1) and 13 (T2) years old using the DHC and stated that many of them remained within the same category of DHC classification. Similarly, in the present study, the severity of malocclusion defined according to the DHC did not show significant differences between the age groups. It may be concluded that the categories of the DHC are homogeneously distributed between the age groups selected from childhood to adulthood. Both DHC and aesthetic component classification showed no significant sex differences between the current age groups. Similarly, several epidemiologic studies have documented no or little differences in the prevalence of malocclusion or need for orthodontic treatment between women and men,[11,26,35,36] whereas alternative studies identified sex differences especially for the aesthetic component of IOTN.[25,37,38]

The present study was a part of an oral health survey conducted in seven demographic regions of Turkey. The participants were evaluated sequentially by several professionals from various departments clinically and consequently the examination duration was extended. Therefore, to shorten the evaluation time per participant, normative orthodontic treatment need was classified into three basic groups and the 31 oral features of the DHC were not recorded severally. The changes of these features with age should be investigated in further research to reveal information to augment the present study.

In summary, the following were found:

- No sex differences were identified for the aesthetic component and DHC classifications
- Normative need distribution was homogeneous between the age groups according to the DHC
- Based on aesthetic component of IOTN, the subjective/self-perceived need for orthodontic treatment was higher in 7–8, 9–10, and 11–12 age groups than 13–14, 15–16, and 17–18 age groups according to the aesthetic component.

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Conflicts of interest

There are no conflicts of interest.

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