



# The Use of IOTN in Determining Orthodontic Treatment Needs of Turkish Adolescents

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## Abstract

**Background:** To evaluate orthodontic treatment need (OTN) in a juvenile populace, utilizing the Index of Orthodontic Treatment Need (IOTN), including sexual orientation contrasts evaluation.

**Methods:** The example involved 2250 young people, 13.1 - 17.4 years of age (mean age, 14 years and 6 months). The examinations were done on the study models and all encompassing radiographs taken from every subject. The dental health (DHC) and aesthetic (AC) segments of the IOTN were applied as an evaluation measure of the requirement for orthodontic treatment. The agreement (kappa measurements) was ascertained to examine the understanding between the DHC and the AC of the IOTN.

**Results:** Utilizing the DHC of the IOTN, the extent of subjects assessed to have an incredible or extremely extraordinary treatment need was 28.7%, and 16.7% were in need (grades 8 - 10) as indicated by the AC (IOTN). No sexual orientation contrasts were noted, with the exception of no need class of the IOTN (more successive in young men) as per the DHC (chi-square: 6.83, df: 1, P = 0.01). There was a moderate agreement between the DHC and the AC of the IOTN (kappa = 0.49, 95% CI, 0.47 - 0.63).

**Conclusions:** Using the IOTN, approximately a third of the adolescent school children were being found to be qualified for treatment in open programs.

**Keywords:** Orthodontic Treatment Need, Adolescent, IOTN

## 1. Background

Malocclusion is viewed as a biologic variety, and legitimization for treatment need is every now and again arranged as much on psychosocial misgiving as on oral health dangers, for the most part, traceless to malocclusion (1). The criteria for recognizing who gets or needs orthodontic treatment are disputable. These components make it particularly troublesome for the general dental practitioner to recognize for whom orthodontic treatment is demonstrated, however, the ordinary path to orthodontic care take place in the dental professional's office. Shaw et al. (2) have expressed that extensive quantities of orthodontic patients basically were encouraged to look for an orthodontic cure by their dental practitioners. The study by Richmond et al. (3) delineated that a board of 74 dental specialists could not agree on what formed an IOTN on the premise of dental health (1).

Lists of administration need are utilized to distinguish orthodontic necessity in light of aesthetic ailments, likely for backward impact on dental health, and float from a standard occlusion. These records have reported varied

in kids and teenagers in various populations (4). Thirty-three percent of British kids inspected have demonstrated an awesome requirement for orthodontic treatment (5-7). In Central Anatolia, Güray et al. (8) reported 72.26% of 483 students required orthodontic treatment in an elementary school with a poor financial standard, while Ugur et al. (9) discovered 37.77% of 572 students in an elementary school with a high socioeconomic canonical. Kamak et al. (10) expressed that treatment need was found in 65.9% in 138 Turkish students. Hamdan (11), utilizing the dental health segment (DHC) of the IOTN, demonstrated an extraordinary requirement for orthodontic treatment in 28% of Jordanian kids of age 14 - 17 years. In an urban Iranian populace of adolescent kids, 36.1% had a clear need (DHC 4 or 5) for orthodontic treatment, 20.2% marginal need (DHC 3) In another Iranian populace, it was found that the DHC demonstrated 28.6% in grade 3, 55.8% in grade 4 and 9.7% in grade 5 while the AC indicated a direct need in 15.8% and serious need in 17.6% (12). In Dubai school adolescents, Al Jeshi et al. (13) reported that assessment of the IOTN grade by sexual orientation showed essentially higher male than female, males and females from India had the greatest OTN

in Dubai open and tuition based schools.

The Index of Orthodontic Treatment Need (IOTN), with the dental health (DHC) and the aesthetic components (AC), is the most frequently utilized apparatus for measuring treatment need (14, 15). As per Brook and Shaw (15), the duplicability of the DHC of the original IOTN is dependable in ideal clinical settings. For the AC of the original IOTN, they informed wellinter and intraexaminer reproducibility when a dental specialist evaluated a kid for aesthetic debasement. Padisar et al. (16) found a critical relationship between's the AC, the DHC, and dental aesthetic index in the evaluation of orthodontic treatment needs of 11 - 14 years of age schoolchildren in Qazvin.

Otuyemi et al. (17) studied OTN among provincial Nigerian youths utilizing the IOTN. The outcomes showed that one-seventh of the populace was in objective OTN. de Oliveira and Sheiham (18) made an evaluation of the relationship between a conventional clinical measure of OTN and two measures of oral health-related life quality in Brazilian youths between age 15 - 16 years. They demonstrated that the unification of the IOTN index with both of the two oral health-related personal satisfaction measures utilized as a part of this study guaranteed more information about the young people's appreciated fulfillment with their view than the IOTN on its own (19).

## 2. Objectives

Considering the constrained data on the orthodontic need of Anatolian youths, the point of this study was to evaluate orthodontic treatment need in connection to gender by utilizing the IOTN in a collection of the Anatolian teenagers.

## 3. Methods

This study has an ethical approval from the University of Kirikkale Ethical Committee. A youthful specimen of 2250 subjects (1100 boys, 1150 girls; mean age, 14 years and 6 months) who have direct financial status was randomly chosen from 3 different central schools in the city of Kirikkale (populace 250,000) in the center of Anatolia, Turkey. Every examination was completed with the individual setting in a dental unit, utilizing an assessment reflection under normal lighting. This system was trailed by alginate impressions with a wax bite for every subject. The subjects were welcome to the Kirikkale dental healthservice for taking their panoramic radiographs when hypodontia or other dental inconsistencies were suspected. Every malocclusion was re-examined utilizing the dental casts as a result of study models of the subjects gave a tri-dimensional

survey. The discoveries served to indicate "OTN" as per the IOTN (7) which comprises of the DHC and the AC. Contemplations as to "no treatment need", "marginal need", or "great need" depended on five grades in the DHC and 10 grades in the AC.

Every one of the examinations was acknowledged within 1.5 years by an inspector (IEG) who had been formerly trained and set in the utilization of IOTN. For testing intraexaminer reproducibility, 30 subjects were reconsidered 4 weeks after their first assessment. Kappa values for the DHC and AC were 0.74 and 0.70, individually. Kappa values above 0.6 show significant agreement (20).

### 3.1. Statistical Analysis

All students in the three centers were analyzed; both to enhance study applicability, and so as not to segregate among students in the ratio of the specimen in the entire populace were calculated for the example and for young ladies and young men independently. The kappa statistics were utilized to break down the agreement between the DHC and the AC of the IOTN.

The level of agreement was characterized by utilizing the accompanying scale (21): Poor agreement, less than 0.20; fair agreement, 0.20 to 0.40; moderate agreement, 0.40 to 0.60; good agreement, 0.60 to 0.80; and very good agreement, 0.80 to 1.00. A number of subjects who were analyzed as no treatment need/need (n) and its pervasiveness ( $n/N \times 100$ , where N is the quantity of subjects inspected) was given. The information was investigated with the SPSS software package (variant 13.0, SPSS Inc., Chicago, Ill., USA). The chi-square statistic was utilized to evaluate the statistical importance between the proportions of the young men and young ladies.  $P < 0.05$  was considered statistically significant.

## 4. Results

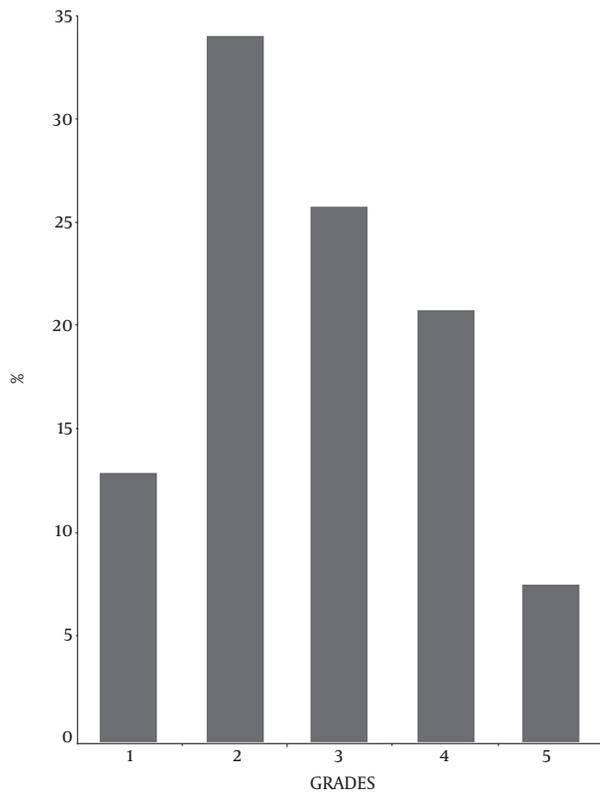
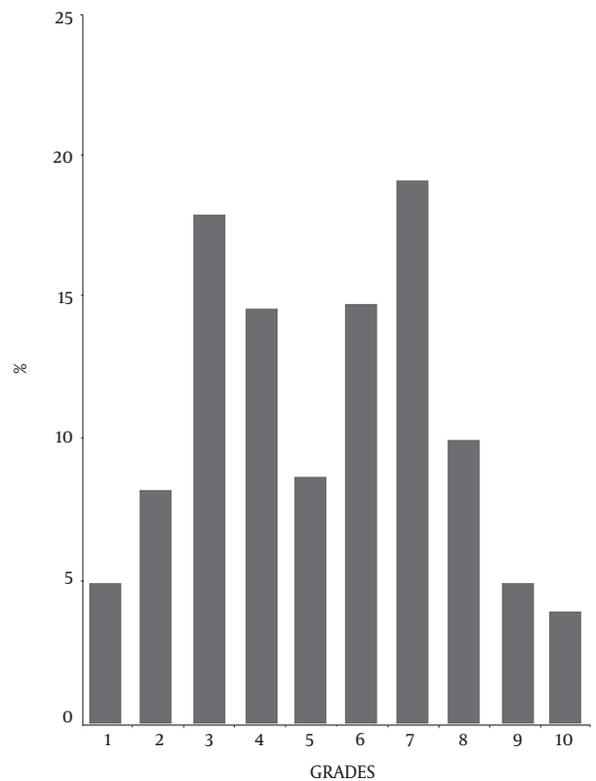
In this study, the IOTN indicated "no treatment need" in 45.6% utilizing the DHC, for the most part, saw in young men ( $P < 0.05$ ) and to 43.1% with the AC, however It was not statistically noteworthy (Figures 1 and 2, and Tables 1 and 2). At the point when the marginal cases were contemplated, the treatment need was determined in 25.7% to have the DHC and in 40.2% with the AC, both are higher on young ladies than young men but statistically not. The quantity of subjects with the requirement for orthodontic treatment was 648 (28.7%) utilizing the DHC and 376 (16.7%) with the AC. When we distinguished the agreement between the DHC and the AC of the IOTN, the kappa measurement was 0.49 (95% CI, 0.47 - 0.63), for the diagnostic agreement, representing the moderate agreement.

**Table 1.** The DHC of IOTN Statistics of Boys and Girls. (Grades 1 and 2, 'No Need'; Grade 3, 'Borderline Need'; Grades 4 and 5, 'Definite Need')<sup>a,b</sup>

Occlusal Anteroposterior Relationships	Boys	Girls	Total	P Value	
No need	531 (48.3)	492 (42.8)	1023 (45.6)	< 0.05	0.01
Borderline need	263 (23.9)	316 (27.5)	579 (25.7)	Not significant	0.054
Need	306 (27.8)	342 (29.7)	648 (28.7)	Not significant	0.328
Total	1100 (100)	1150 (100)	2250 (100)		

<sup>a</sup> Values are expressed as No. (%).<sup>b</sup> Chi-square, 6.83; df, 1.**Table 2.** The AC of IOTN Statistics of Boys and Girls. (Grades 1 - 4, 'No Need'; Grade 5 - 7, 'Borderline Need'; Grades 8 - 10, 'Definite Need')<sup>a</sup>

Occlusal Anteroposterior Relationships	Boys	Girls	Total	P Value	
No need	492 (44.6)	478 (41.6)	970 (43.1)	Not significant	0.136
Borderline need	437 (39.6)	467 (40.7)	904 (40.2)	Not significant	0.699
Need	171 (15.4)	205 (17.9)	376 (16.7)	Not significant	0.142
Total	1100 (100)	1150 (100)	2250 (100)		

<sup>a</sup> Values are expressed as No. (%).**Figure 1.** Dental health component grades of the Index of Orthodontic Treatment Need in Anatolian adolescents (grades 1 and 2, 'no need'; grade 3, 'borderline need'; grades 4 and 5, 'definite need')**Figure 2.** Aesthetic component grades of the Index of Orthodontic Treatment Need in Anatolian adolescents. (grades 1 - 4, 'no need'; grade 5 - 7, 'borderline need'; grades 8 - 10, 'definite need')

## 5. Discussion

Officers of the ministry of health need a substantial estimation route for deciding the orthodontic treatment

need (22, 23). The index of complexity outcome and need (ICON) therefore have been utilized as a part of the Turkey clinic for a long time (10). The priority of orthodontic treat-

ment owing to national care plans in the European nations has been a noteworthy ingredient behind the improvement of indexes, for instance, the IOTN. Occlusal indexes in the western nations have frequently been connected with endeavors to convey access to finance orthodontic care by the government. There has been a minimal motivating force for specialists to acclimatize the utilization of indexes and surrender professional decision-making autonomy to insurance. At the point when the occlusal files breaking points are utilized to make fine separations between patients looking for the care they will be uncovered.

The certainty level is much greater when the IOTN index is utilized in light of the fact that it places patients as a part of more extensive groups. In the dental health component the grades of 4 contrasted and 3 under the IOTN dependable characterizes a patient in more prominent OTN (1).

The orthodontic need has been shown in different studies utilizing distinctive indices for defining OTN TN (24, 25). In this research, the classification by the IOTN was utilized as one of the author's best known for IOTN. Because of IOTN's prevalence, another index has additionally been gotten from IOTN, evaluating the orthognathic useful treatment need (IOFTN) (26, 27).

In various nations, populaces and societies, there are typically a few levels of treatment need in light of financial racial contrasts and occlusal indices utilized. In any case, as indicated by facial angle, social elements have a solid impact, i.e. an irregularity judged as tastefully unsatisfactory in one populace might be satisfactory and even an indication of excellence in another (25). The estimate of one-third of the subjects needing orthodontic treatment is like the figures covered in the permanent dentition utilizing the DHC of the IOTN for British (4-7), for Jordanian (11, 26), for Colombian (25), for Senegalese (27), for Iranian (12, 28) children however lower than the reported gauges by Beglin et al. (29) for the United States youngsters and higher than the evaluated requirement for the Nigerian teenagers (17).

In Turkey, there are a couple of epidemiologic surveys. Güray et al. (8) utilized the treatment need index (TPI) and discovered 72.26% of 483 students required orthodontic treatment in an elementary school with a low financial standard from the Konya area (Anatolia). Ugur et al. (9) were discovered 37.77% of OTN utilizing the TPI as a part of 6-10-year-old 572 Turkish elementary school children with a high financial standard in Anatolia. Kamak et al. (10, 30) utilized the ICON and discovered normal %65 of 130 adolescent required orthodontic treatment. Exhibit study was done in a wide juvenile example, that had moderate financial status and the treatment need estimate was lower than these two studies.

This study likewise identified a distinction between sexual orientations for OTN just for no need classification in light of the DHC (IOTN). Be that as it may, the treatment need did not vary fundamentally as a consequence of sexual orientation.

The discoveries of this study are an indication that IOTN can be utilized to survey the need for orthodontic treatment in the public eye by the ministry of health. The IOTN may now be seen not just as a substantial and solid occlusal index but as a persuasive solution for dental instruction (1) and bases for other new innovative indices (26, 27).

Two years prior, each adolescent even grown-up could get free orthodontic treatment in Turkey. In any case, a portion of people who truly need to the treatment did not request these treatments. The discoveries reported in this article will be a manual for the future studies, which will address the reasons why adolescent who needs orthodontic treatment don't get treatment in Anatolia notwithstanding when the treatment is freely given by the state.

### 5.1. Conclusions

Almost one-third of the assessed populace would have a compulsory need for orthodontic treatment if the DHC scores are utilized as the primary model for such decisions.

If the AC scores are utilized, the need would lessen to one-fifth of the specimen.

### Footnotes

**Conflict of Interests:** The author confirms that this article content has no conflict of interest.

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### References

1. Bentele MJ, Vig KW, Shanker S, Beck FM. Efficacy of training dental students in the Index of Orthodontic Treatment Need. *Am J Orthod Dentofacial Orthop.* 2002;**122**(5):456-62. doi:10.1067/mod.2002.126895. [PubMed: 12439472].
2. Shaw WC, Gbe MJ, Jones BM. The expectations of orthodontic patients in South Wales and St Louis, Missouri. *Br J Orthod.* 1979;**6**(4):203-5. [PubMed: 297468].
3. Richmond S, O'Brien KD, Roberts CT, Andrews M. Dentists variation in the determination of orthodontic treatment need. *Br J Orthod.* 1994;**21**(1):65-8. [PubMed: 8199167].
4. Burden DJ, Pine CM, Burnside G. Modified IOTN: An orthodontic treatment need index for use in oral health surveys. *Community Dent Oral Epidemiol.* 2001;**29**(3):220-5. [PubMed: 11409681].
5. Holmes A. The prevalence of orthodontic treatment need. *Br J Orthod.* 1992;**19**(3):177-82. [PubMed: 1390573].

6. Burden DJ, Holmes A. The need for orthodontic treatment in the child population of the United Kingdom. *Eur J Orthod.* 1994;**16**(5):395-9. [PubMed: 7805813].
7. Shaw WC, Richmond S, O'Brien KD. The use of occlusal indices: A European perspective. *Am J Orthod Dentofacial Orthop.* 1995;**107**(1):1-10. [PubMed: 7817954].
8. Güray E. Treatment priority index (TPI) uygulaması (Epidemiologic calisma). *Turk Ortodonti Derg.* 1994;**7**:195-200. doi: 10.13076/1300-3550-7-2-195.
9. Ugur T, Ciger S, Aksoy A, Telli A. An epidemiological survey using the treatment priority index (TPI). *Eur J Orthod.* 1998;**20**(2):189-93. [PubMed: 9633172].
10. Kamak H, Gelgor IE, Keklik H. Determination of orthodontic treatment need for individuals in pubertal growth period and effects of different variables on the treatment needs with using the ICON index. *Turk J Orthod.* 2012;**25**(2):113-21. doi: 10.13076/1300-3550-25-2-113.
11. Hamdan AM. Orthodontic treatment need in Jordanian school children. *Community Dent Health.* 2001;**18**(3):177-80. [PubMed: 11580095].
12. Padisar P, Mohammadi Z, Nasseh R, Marami A. The use of orthodontic treatment need index (IOTN) in a referred Iranian population. *Res J Biol Sci.* 2009;**4**(4):438-43.
13. Al Jeshi A, Al-Mulla A, Ferguson DJ. Orthodontic treatment need in Dubai school adolescents: A study of 20,000 school-age adolescents in 66 public and private schools comparing orthodontic treatment need by gender and ethnicity. *Oral Health Dent Manag.* 2014;**13**(3):857-65. [PubMed: 25284571].
14. Evans R, Shaw W. Preliminary evaluation of an illustrated scale for rating dental attractiveness. *Eur J Orthod.* 1987;**9**(4):314-8. [PubMed: 3480231].
15. Brook PH, Shaw WC. The development of an index of orthodontic treatment priority. *Eur J Orthod.* 1989;**11**(3):309-20. [PubMed: 2792220].
16. Padisar P, Naseh R, Babakhani A, Jalayer S. Comparing dental aesthetic index (DAI) and IOTN in determining the orthodontic treatment needs of Qazvin students. *Iran J Orthod.* 2016;**11**(2). e6231. doi: 10.17795/ij0-6231.
17. Otuyemi OD, Ugboko VI, Adekoya-Sofowora CA, Ndukwe KC. Unmet orthodontic treatment need in rural Nigerian adolescents. *Community Dent Oral Epidemiol.* 1997;**25**(5):363-6. [PubMed: 9355773].
18. de Oliveira CM, Sheiham A. The relationship between normative orthodontic treatment need and oral health-related quality of life. *Community Dent Oral Epidemiol.* 2003;**31**(6):426-36. doi: 10.1046/j.1600-0528.2003.00002.x.
19. Borzabadi-Farahani A. A review of the oral health-related evidence that supports the orthodontic treatment need indices. *Prog Orthod.* 2012;**13**(3):314-25. doi: 10.1016/j.pio.2012.03.002. [PubMed: 23260543].
20. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics.* 1977;**33**(1):159-74. [PubMed: 843571].
21. Altman DG. *Practical statistics for medical research.* CRC press; 1990.
22. Jenny J, Cons NC. Comparing and contrasting two orthodontic indices, the Index of Orthodontic Treatment Need and the dental aesthetic index. *Am J Orthod Dentofacial Orthop.* 1996;**110**(4):410-6. [PubMed: 8876493].
23. Borzabadi-Farahani A, Borzabadi-Farahani A. Agreement between the index of complexity, outcome, and need and the dental and aesthetic components of the Index of Orthodontic Treatment Need. *Am J Orthod Dentofacial Orthop.* 2011;**140**(2):233-8. doi: 10.1016/j.jajodo.2010.09.028. [PubMed: 21803261].
24. DeGuzman L, Bahiraei D, Vig KWL, Vig PS, Weyant RJ, O'Brien K. The validation of the peer assessment rating index for malocclusion severity and treatment difficulty. *Am J Orthod Dentofacial Orthop.* 1995;**107**(2):172-6. doi: 10.1016/S0889-5406(95)70133-8.
25. Thilander B, Pena L, Infante C, Parada SS, de Mayorga C. Prevalence of malocclusion and orthodontic treatment need in children and adolescents in Bogota, Colombia. An epidemiological study related to different stages of dental development. *Eur J Orthod.* 2001;**23**(2):153-67. [PubMed: 11398553].
26. Abu Alhaja ES, Al-Nimri KS, Al-Khateeb SN. Orthodontic treatment need and demand in 12-14-year-old north Jordanian school children. *Eur J Orthod.* 2004;**26**(3):261-3. [PubMed: 15222709].
27. Ngom PI, Diagne F, Dieye F, Diop-Ba K, Thiam F. Orthodontic treatment need and demand in Senegalese school children aged 12-13 years. An appraisal using IOTN and ICON. *Angle Orthod.* 2007;**77**(2):323-30. doi: 10.2319/0003-3219(2007)077[0323:OTNADI]2.0.CO;2. [PubMed: 17319769].
28. Borzabadi-Farahani A, Borzabadi-Farahani A, Eslamipour F. Orthodontic treatment needs in an urban Iranian population, an epidemiological study of 11-14 year old children. *Eur J Paediatr Dent.* 2009;**10**(2):69-74. [PubMed: 19566372].
29. Beglin FM, Firestone AR, Vig KW, Beck FM, Kuthy RA, Wade D. A comparison of the reliability and validity of 3 occlusal indexes of orthodontic treatment need. *Am J Orthod Dentofacial Orthop.* 2001;**120**(3):240-6. doi: 10.1067/mod.2001.116401. [PubMed: 11552122].
30. Kamak H, Çağlaroglu M, Catalbas B, Keklik H. Evaluation of the orthodontic treatment need of middle anatolian region using by icon index. *Ataturk Univ Dental J.* 2012;**22**(2):150-4.