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ORIGINAL ARTICLE

Orthodontic Treatment Need among Nepalese High School Students

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ABSTRACT

Objective: To assess the need for orthodontic treatment among Nepalese high school students. **Material and Methods:** This is a quantitative, cross-sectional descriptive study. The sample comprises 938 children (537 males and 401 females) with an age group above 14 years. The subjects were selected voluntarily from seven different schools of Kathmandu valley using a multistage sampling technique. The Index of Orthodontic Treatment Need comprises two components: Dental Health Component (DHC) and Aesthetic Component (AC). Two trained and calibrated examiners performed the oral examination. **Results:** On analysis of the DHC component, it was found that 21% had no need, 18.1% had mild/little need, 24.3% had moderate/borderline need, 35.8% had severe need, and 0.7% had extreme treatment need. Similarly on analysis of AC component, it was found that 33% were AC-1, 30.8% were AC-2, 7.2% were AC-3, 8.2% were AC-4, 2.1% were AC-5, 3.6% were AC-6, 1.8% were AC-7, 7.4% were AC-8, 1.8% were AC-9, and 3.9% were AC-10. **Conclusion:** The Index of Orthodontic Treatment Need can be used as a tool for planning dental health resources and prioritizing the treatment need of different populations.

Keywords: Index of Orthodontic Treatment Need; Malocclusion; Students.

Introduction

Malocclusion is a deviation from an ideal occlusion, many of which are within the range of normal biologic variation [1]. There is an increase in the prevalence of orthodontic anomalies, leading to an increase in the need for orthodontic treatment [2-7]. Some deviations negatively influence dentofacial development, contributing to impaired oral functions, susceptibility to traumatic facial injuries, and development of caries, periodontal problems, and psychosocial problems related to impaired/altered dentofacial esthetics [8-14]. Malocclusion affects not only oro-facial aesthetics but also affects functional needs and causes various other problems like speech defects, mandibular dis-functions, and psychological ill-being of an individual [15,16].

Orthodontic treatments comprise a large proportion of dental treatment, and in most cases, they are carried out during adolescence and early adulthood to solve malocclusion problems [8]. Therefore, planning orthodontic treatment within a public health system requires information on the orthodontic treatment needs of the population [17,18].

Most orthodontic patients are children and adolescents, and information on the orthodontic treatment prevalence among this category allows national budget planning in the most convenient way. Orthodontic anomalies, besides functional limitation, cause psychological effect, too [19], thus emphasizing the importance of treatment. Information about the prevalence of malocclusion and early detection of malocclusion, as a result, the early orthodontic treatment allows better national funds allocations. The main reasons for orthodontic treatment are usually an improvement in facial or dental aesthetics [20].

A previously published study indicates an encouraging awareness of the psychosocial benefits of orthodontic treatment [21]. In various European countries like Denmark, Finland, Great Britain, The Netherlands, Norway, and Sweden, where dental health services are subsidized by the government as part of the National Health Service or national health insurance system, various treatment need indexes have been used to plan the provision of orthodontic treatment.

With the growing demand for orthodontic treatment, various clinician-based indices have been developed to classify various types of malocclusion and determine their need for orthodontic treatment [4,20]. These indices can be used in estimating orthodontic treatment need, prioritizing treatment need in patients referred for orthodontics, particularly where there are limited resources for orthodontics among public health care services, and safeguarding the patients [20,22].

The primary purpose of orthodontic treatment need indexes is to assess the priority for treatment, that is, to select which patients to treat. However, the use of indexes has been limited in countries where publicly funded dental health services are not generally available. However, treatment need indexes are also important tools for recording the prevalence and severity of malocclusions in epidemiological studies [23].

In the past, various indices have been developed to assess the need of orthodontic treatment, like Handicapping Labio-lingual Deviation index (HLD) [24], Swedish Medical Board Index [25,26], Dental Aesthetic Index (DAI) [27], Index of Orthodontic treatment Need (IOTN) [28], Index of Complexity, Outcome & Need (ICON) [29,30].

One of the most commonly used indices that assess the orthodontic treatment needs among children and adults is the Index of Orthodontic Treatment Need (IOTN), which was developed by Brook and Shaw. The IOTN has two separate components, the aesthetic (AC) and dental health components (DHC), which rank malocclusion in increasing priority according to aesthetic considerations and dental health implications [28].

Various studies on the determination of orthodontic treatment needs were carried out on the basis of IOTN by different authors: Brook and Shaw [28], Burden and Holmes [31], Mandall et al. [32], Kok et al.

[33], Holmes and Willmot [34], and in different countries: England [28,35,36], Norway [37], Switzerland [38], Turkey [39], Iran [40,41] and Pakistan [42].

Various studies have used the index of orthodontic treatment need (IOTN) for measuring the degree of malocclusion and the need for orthodontic treatment in different population sectors. For instance, the prevalence of orthodontic treatment need using IOTN-DHC was 21.3% in France [43], 22% in Tanzania [44], 28% in Kuwait [45], 34.2% in Brazil [46], 34% in Jordan [47], 36.1% in Iran [48], 38.8% in Turkey [39], and 71.6% in Saudi Arabia [49]. Despite the fact that the need for orthodontic treatment is a prior concern among youngsters, there has been no study done so far among high school students of Kathmandu; hence this study is proposed. This study aimed to assess the need for orthodontic treatment among high school students of Kathmandu valley.

Material and Methods

Study Design and Sampling

It is a cross-sectional descriptive study. The study population included adolescents studying in high schools in all three districts of Kathmandu Valley. A multistage sampling process was adapted for the study sample, and a final sample size of 938 was derived out of 1097 screened that met the inclusive criteria.

Exclusion Criteria

Subjects with craniofacial anomalies (clefts and syndromes) and non-Nepali nationals were excluded from the study).

Data Collection Method and Tools

Quality assurance was done by training and calibration of examiners. Two trained and calibrated examiners performed the oral examination. Before the survey, 60 students were examined by each of the two investigators to assess inter-examiner reliability, and Kappa values for both examiners were found to be 0.87 and 0.88, respectively. A survey format was developed to record the general background and findings of dental screening regarding the status of occlusion that includes the Index of Orthodontic Treatment Need (IOTN) [50].

Clinical Examination

The students were examined at the schools, in a quiet classroom without external interference, under natural or artificial illumination. The examination lasted approximately 15 minutes per child, following the World Health Organization guidelines [51]. The assessment of dental occlusion was carried out using latex gloves, dental mouth mirrors, and mill metric rulers. The students were examined by using a dental probe and a plane mouth mirror. Sufficient numbers of autoclaved instruments were made available to avoid interruption during the study. After each day of examination, the entire instruments were autoclaved.

IOTN comprises two components: Dental Health Component (DHC) and Aesthetic Component (AC). Dental Health Component (DHC) can be examined either clinically or in the study model. In the present study, the dental stone study model was used to determine the DHC. Study models were examined and graded by the specialist to determine the DHC of the IOTN. The grades of DHC are based on occlusal characteristics: overjet, overbite, crossbite, contact point displacement, missing teeth, and other occlusal abnormalities. Dental Health Component (DHC) comprises of 5 grades: Grade 1 - no treatment need, Grade 2 - slight/ little

treatment need, Grade 3 - moderate/borderline treatment need, Grade 4 - great treatment need, and Grade 5 - very great treatment need.

The Aesthetic Component (AC) consists of 10-grade standard reference color photographs representing different grades of dental attractiveness. Grade 1 represents the most attractive, and Grade 10 the least attractive dentitions. Intraoral frontal view color photographs of referred orthodontic patients were used in order to determine the Aesthetic Component (AC) of the index. The examiner assessed the patient's photograph and compared it with the 10-grade reference photos, and gave a score to each patient, which was considered as the subjective need of the patient.

Furthermore, to make the IOTN quicker and easier to use and improve its reliability, the DHC and AC grades were reduced to three scales. This was proposed in 1993 and was accepted and approved by the Manchester team, which had originally developed IOTN. The DHC Grade 1-2 was scaled as little or no need, Grade 3 was scaled as borderline need, and Grade 4-5 was scaled as the great or severe need for orthodontic treatment. Similarly, the AC Grade 1-4 was scaled as little or no need, Grade 5-7 was scaled as borderline need, and Grade 8-10 was scaled as the great or severe need for orthodontic treatment.

Statistical Analysis

Firstly, data were coded and entered into an Excel sheet. To maintain the data quality (validity), rechecking and cross-checking were done during the data entry phase. After the data entry into the excel sheet, the necessary data cleaning was done. Secondly, data were transformed into SPSS 16.0 version, where further cleaning, coding, recoding, cross-checking, processing, and analysis were done. Primarily, univariate and bivariate analyses were done to measure the prevalence of malocclusion and various other occlusal traits.

Ethical Clearance

Ethical clearance was obtained from the Ethical Review Board of IOM (Reference 118(6-11)E2 077/078). Each study individual was informed about the objective and benefit of the study. The informed consent form was signed to ensure the consent of each study.

Results

On analysis of the DHC component of IOTN, it was found that out of 938 students,197 students (21%) had no need, and seven students (0.7%) had extreme treatment need for orthodontic treatment (Table 1).

Table 1. Frequency of dental health component grading.

Grade DHC	N	%
1 - No Treatment Need	197	21.0
2 - Little Treatment Need	170	18.1
3 - Moderate or Borderline Treatment Need	228	24.3
4 - Great Treatment Need	336	35.8
5 - Very Great Treatment Need	7	0.8
Total	938	100.0

Therefore, according to DHC, the majority of students, i.e., 367 (39.12%), fall in little/no need of treatment category (Grade1 and 2), 228 (24.30%) students in the borderline need of treatment category (Grade 3) and 343 (36.56%) students in great/severe need of treatment category (Grade 4 and 5) (Table 2).

Table 2. Grading by dental health component.

Grading by DHC	N	%
1 and 2 (Little/No Need)	367	39.12%
3 (Borderline Need)	228	24.30%
4 and 5 (Great/Severe Need)	343	36.56%

Similarly, on analysis of the AC component of IOTN, it was found that out of 938 students, 310 students (33%) were AC-1, and 37 students (3.9%) were AC-10 (Table 3).

Table 3. Frequency of aesthetic component grading.

Grade AC	N	%
1	310	33.1
2	289	30.8
3	68	7.3
4	77	8.2
5	20	2.1
6	34	3.6
7	17	1.8
8	69	7.4
9	17	1.8
10	37	3.9
Total	938	100.0

Therefore, according to AC, the majority of students, i.e., 744 (79.32%) students fall in little/ no need of treatment category (Grade 1-4) and 123 (13.11%) students in great/severe need of treatment category (Grade 8-10) (Table 4).

Table 4. Frequency of grading as per aesthetic component.

Grading by AC	N	%
1-4 (Little/No Need)	744	79.32
5-7 (Borderline Need)	71	7.57
8-10 (Great/Severe Need)	123	13.11
Total	938	100.0

Discussion

The present study was designed to provide information about orthodontic treatment needs among 14- to 16-year-old high school children. This age range was chosen since it represents the majority of school-going children requiring orthodontic treatment. IOTN was used in this study due to various advantages, like the validity and reliability of the IOTN have been verified [3,52,53]. The index defines specific, distinct categories of treatment need, whilst including a measure of function [54]. The DHC of IOTN helps in determining manpower requirements for planning Orthodontic treatment need [55]. The Aesthetic component of IOTN reflects the social and psychological need for Orthodontic treatment need [56]. Our study showed the highest frequency (39.12%) for grade 1 and grade 2 of DHC (little/no need of treatment). The study results were similar to Brook and Shaw [28], Burden and Holmes [11] and Hamdan [56], while it is contrary to So and Tang [57], Camilleri and Mulligan [58], Padisar et al. [41], Singh and Sharma [59], Shrestha and Shrestha [60] and Gyawali et al. [61] which showed a greater number of subjects fall under Grade 4 and 5 (great/severe need). This variation might be due to differences in the source of sample collection [41,59-61] (Table 5). The least percentage, i.e., 24.3%, falls into Grade 2 (Little treatment need) of DHC, which were similar to findings by Brook and Shaw [28], Burden and Holmes [31], Hamdan [56], Camilleri and Mulligan

[58] and Singh and Sharma [59] (Table 5). On the other hand, 36.56% sample falls under Grade 3 (great/severe need) of DHC, which was similar to the findings of Brook and Shaw [28], Burden and Holmes [11], and Hamdan [56]. Other IOTN studies [41,57-61] revealed an increasing trend toward great/ severe treatment need (Table 5).

Table 5. Comparison of DHC of IOTN in various referred population.

Study	Grade 1 and 2 (Little/No Need)	Grade 3 (Borderline Need)	Grade 4 and 5 (Great/Severe Need)
So and Tang (Turkey) [57]	23.0%	25.0%	52.0%
Hamdan (Jordan) [56]	50.3%	22.2%	27.5%
Camilleri and Mulligan (Malta) [58]	29.05%	28.87%	42.08%
Padisar et al. (Iran) [41]	6.0%	28.5%	65.50%
Shrestha and Shrestha (Central Nepal) [60]	16.0%	19.9%	64.1%
Singh and Sharma (Eastern Nepal) [59]	29.75%	24.08%	46.17%
Gyawali et al. (Eastern Nepal) [61]	10.15%	24.15%	65.7%
Present Study	39.12%	24.31%	36.57%

The aesthetic component of IOTN reveals that the majority of samples (79.31%) do not seek orthodontic treatment. This finding was similar to the findings of DHC in the present study, which suggests that most of them do not require treatment. Furthermore, the finding is comparable to a study by Ucuncu and Ertugay [39] in Turkey, where most children (90.4%) did not feel any need for Orthodontic treatment. This finding is contrary to the study conducted by Abu Alhaija et al. [47] in Jordan, where he found that 49% of children wanted orthodontic treatment despite only 34% exhibiting a definite need for treatment.

Conclusion

According to DHC, the majority of students fall in little/no need of treatment category (Grades 1 and 2), and 36.56% of students in great/severe need of treatment category (Grades 4 and 5). According to AC, the majority of students (79.32%) students fall in little/no need of treatment category (Grades 1-4), and 13.11% of students in great/severe need of treatment category (Grades 8-10).

Authors' Contributions

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All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

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None.

Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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