

Orthodontic Treatment Need in Higher Primary Schoolchildren of Central Bengaluru, India

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ABSTRACT

Aims and Objective: The aim of this study was to evaluate the orthodontic treatment need in 11–14-year-old schoolchildren of Central Bengaluru, India, using the index of orthodontic treatment need (IOTN) and to analyze the treatment needs between males and females and correlation between the esthetic to aesthetic (AC) and dental health component (DHC) of IOTN.

Materials and Methods: The sample comprised 500 schoolchildren (187 females and 313 males) who had not undergone orthodontic treatment. No radiographs, study casts, were used; IOTN was calculated from clinical examination and photographs. The data were analyzed using SPSS 20 IBM version.

Results: The results for DHC were as follows: 12% students in no need, 52.5% students in little need, 20.5% students in moderate or borderline, 11.5% students in severe need, and 3.5% students were in the category of very severe need for treatment. On evaluating AC components, 91.6% were in the category of no or little need, 2% students in moderate need, and 6.4% in great need category. Mild positive correlation ($r = 0.153$) between DHC and AC of IOTN was observed. The difference between the IOTN values of boys and girls was not statistically significant.

Conclusions: More than 50% of the population in our study showed little/no need category which undergoes undiagnosed and may not seek dental treatment at right time to prevent the future complications. This study provides baseline data on the need and demand for orthodontic treatment among the sample which is important for planning public orthodontic and dental services.

KEYWORDS: *Aesthetic component, dental health component, index of orthodontic treatment need*

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INTRODUCTION

Malocclusion is a common dental health problem and can affect psychosocial well-being in long term^[1] that describes a spectrum of deviation from the normal or ideal to very severe anomalies.^[2] In recent years, many researchers were carried out to measure the severity and prevalence of malocclusion and orthodontic treatment need worldwide. In particular, role of the genetic factors as an etiology has been reduced, considering that many malocclusions develop postnatally as a result of nonnutritive or nutritive sucking habits at early stages of life and traumas.^[3] Orthodontic treatment is necessary to improve dental health – reduce the risk of tooth decay and gum disease, function, and appearance.

In recent years, orthodontic treatment is gaining popularity, as a consequence of patients' expectations as regard to oral impact on the quality of life and treatment opportunities. Especially, children and adolescents are more sensitive to a variety of impacts, such as appearance, that may affect their current quality of life and psychological development and ultimately result in influencing their social skills and education.

Many occlusal indices have been widely used to achieve a more uniform evaluation of orthodontic treatment

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need. Two recently developed orthodontic indices that are being used to determine orthodontic treatment need, priority, and evaluation of treatment success are index of orthodontic treatment need (IOTN) and peer assessment rating. The development of the IOTN by Brook and Shaw (1989), Shaw *et al.* (1991) has gained wide acceptance in Europe and the rest of the world as a method of objectively assessing treatment need. It is a useful, standardized tool for those interested in research into Dental Public Health and the epidemiology of malocclusion. As orthodontic treatment needs to be justified on either dental health or esthetic needs, the index has two components:

- The dental health component (DHC)
- The aesthetic component (AC).

This index ranks malocclusion in terms of significance of various occlusal traits for the person's dental health and perceived esthetic impairment. It will help in recognizing those pupils who would be most likely to benefit from orthodontic treatment. To achieve a high standard for orthodontic treatment and reduce the waiting times, it is important to determine the patient who is in great need of treatment and give a high priority to these patients.^[4]

IOTN was used in our study to determine the need of orthodontic treatment in 11–14-year-old schoolchildren in Chamrajpet, Bengaluru, Karnataka, India, as it provides reliable and practical results.

MATERIALS AND METHODS

The study sample includes 500 children (313 males and 187 females) in the age group of 11–14 years randomly selected from five different schools in Chamrajpet, Bengaluru. The individuals had no history of orthodontic treatment. A minimum sample size consisting of 499 individuals was calculated with a margin of error of 5% and a 99% confidence level. A round study sample was set at 500 individuals. An ethical clearance (A1/Y/2017/07) was obtained from the head of the schools for conducting the present study. Oral examination was conducted by single examiner after obtaining the consent from the parents. The survey was carried out over 4 weeks.

An average of approximately 15 min per participant was taken to examine both the DHC and AC components of the IOTN, following the World Health Organization (1997)^[5] guidelines. Within each category, the different malocclusions are included (overjet, overbite, crossbite, open bite, displacement, etc.) according to their severity.

The DHC [Table 1] of the IOTN has five categories ranging from 1 (no need for treatment) to 5 (great need). The most severe occlusal trait is identified for

any particular patient and the patient is then categorized according to this most severe trait. Patients in Grade 1 would include those with minor tooth displacements where there is little need for treatment. Those in Grade 5 would include patients with crossbite, hypodontia, cleft lip, and palate where there is severe need for definitive treatment.

The DHC uses a simple ruler and an acronym – MOCDO (missing teeth, overjets, crossbites, displacement of contact points, overbites) – to guide the observer to the single worst feature of the malocclusion which may be applied clinically.^[2]

The AC [Figure 1]^[6] of the IOTN includes a 10-point scale illustrated by a series of photographs representing various range of esthetics, Grade 1 representing most aesthetic and Grade 10 least aesthetic arrangement of the dentition.^[6] A rating is allocated for overall dental aesthetics rather than specific similarities to the photographs.

- Grade 1–4 little or no treatment required
- Grade 5–7 moderate or borderline treatment required
- Grade 8–10 treatment required.

The evaluation of a plain plaster model or black and white photographs has the advantage that the estimate is not influenced by the oral hygiene, the condition or color of the gingiva.^[6] When the AC was being recorded, the dental attractiveness of the anterior teeth was graded by an examiner after the individuals had closed their teeth in central occlusion and retracted their lips.



Figure 1: Index of orthodontic treatment need: Aesthetic component

Table 1: The Dental Health Component of the index of orthodontic treatment needs

| Code | Occlusal traits | 1 | 2 | 3 | 4 | 5 |
|------|--|---|-------------------------------------|--|---|---------------|
| a | Overjet | Includes minor contacts Point displacements <1 mm | 3.5-6 mm Competent lips | 3.5-6 mm Incompetent lips | 6-9 mm | 9mm and above |
| b | Reverse overjet | | 0-1 mm No | 1-3.5 mm | 3.5 mm + Masticatory or speech difficulties | |
| c | Crossbite anterior/posterior | | <1 mm Discrepancy RCP ↔ ICP | 1-2 mm Discrepancy RCP ↔ ICP | 2 mm + Discrepancy RCP ↔ ICP | |
| d | Displaced contact points | | 1-2 mm | 2-4 mm | 4+ mm=severe | |
| e | Open bite anterior/posterior | | 1-2 mm | 2-4 mm | 4+ mm=severe | |
| f | Overbite | | Up to 3.5 mm No gingival contact | Complete on gingiva or palate No trauma | Complete with trauma | |
| g | Pre- or post-normal occlusion | Grade 2 only (if no other anomalies present and include up to 1/2 unit discrepancy) | | | | |
| h | Hypodontia | Grade 5 Extensive hypodontia with restorative implications (>1 tooth missing in any quadrant) Requiring prerestorative orthodontics | | Grade 4 Less extensive hypodontia Requiring prerestorative orthodontics or orthodontic space closure to obviate necessity for prosthesis | | |
| i | Impeded eruption of teeth except third molars | Grade 5 due to crowding, displacement, the presence of supernumerary teeth, retained deciduous teeth, and any pathological cause | | | | |
| j | Posterior lingual crossbite | Grade 4 with no functional occlusal contacts in one or both buccal segments | | | | |
| k | Reverse overjet (see b) | Grade 4 1-3 mm Recorded masticatory or speech difficulties | | Grade 5 3.5 mm+Recorded masticatory or speech difficulties | | |
| p | Cleft lip/palate craniofacial anomalies | Grade 5 only | | | | |
| s | Submerged deciduous teeth | Grade 5 only | | | | |
| t | Partially erupted, tipped, and impacted against adjacent teeth | Grade 4 only | | | | |
| x | Presence of supernumerary teeth | Grade 4 only | | | | |

RCP=Retruded contact position, ICP=Intercuspal position

The data were analyzed statistically using software SPSS 20 (IBM, Armonk, NY, USA). The significance of the dependency on sex of DHC and AC grades and percentage of population for each grade of DHC and AC was calculated using Chi-square test. The Spearman correlation test used to correlate the DHC and AC grades in the study sample. A significance level of 5% was considered relevant.

RESULTS

Most prominent point in the study population was that none of the students had undergone orthodontic treatment. The study population consisted of 313 (62.6%) boys and 187 (37.4%) girls.

The DHC results in the schoolchildren were found to be distributed as follows: 60 (12%) students in no need, 263 (52.5%) students in little need, 102 (20.5%) students in moderate or borderline, 58 (11.5%) students in severe need, and 17 (3.5%) students were in the category of very severe need for treatment.

After evaluating AC components, the results showed that 458 (91.6%) students were placed in the category of no need or little need, 10 (2%) students in moderate need, and 81 (6.4%) in great need category.

Correlation of DHC and AC in the study population was evaluated using Chi-square test and Spearman correlation test. Both DHC and EC of IOTN in all grades were found to be in mild positive correlation ($r = 0.153$)

Table 2: Correlation of Dental Health Component grade and aesthetic component grade in the study sample (using Chi-square and Spearman correlation test)

| DHC grade | AC grade (%) | | | Total | Chi-square test, <i>P</i> | Spearman correlation value, <i>P</i> |
|-----------|--------------|----------|----------|-----------|---------------------------|--|
| | 1 | 2 | 3 | | | |
| 1 | 58 (96.7) | 2 (3.3) | 0 | 60 (100) | 53.964, <0.001 | <i>r</i> =0.153, mild positive correlation, <i>P</i> =0.001, significant |
| 2 | 244 (92.8) | 3 (1.1) | 16 (6.1) | 263 (100) | | |
| 3 | 95 (93.1) | 0 | 7 (6.9) | 102 (100) | | |
| 4 | 51 (87.9) | 1 (1.7) | 6 (10.3) | 58 (100) | | |
| 5 | 10 (58.8) | 4 (23.5) | 3 (17.6) | 17 (100) | | |

DHC=Dental Health Component, AC=Aesthetic component

and statistically significant ($P = 0.001$) in the study population [Table 2].

When the sex distribution of the DHC and AC components of the IOTN among schoolchildren was considered, the difference between the IOTN values of boys and girls was not statistically significant [Tables 3 and 4].

DISCUSSION

The physical appearance of an individual may be the single variable feature that has the greatest impact on self-esteem, behavioral patterns, and personal interactions.^[7] Malocclusion is undoubtedly a public health concern in any country. It is the second most common dental disorder in children and young adults next to dental caries.^[8] Many occlusal indices have been proposed to categorize the malocclusion according to severity and need of treatment.

A large number of adolescents and young adults should receive orthodontic treatment because of the associated health risks, esthetics, functional, and psychosocial problems with malocclusion, but unfortunately, not many of them have access to such services.^[9,10] This is probably because of certain reasons, for example, lack of specialist- orthodontists and lack of resources – high cost and lack of materials and equipment. Furthermore, the orthodontic concern is given a low priority in oral health-care system.

IOTN is an orthodontic index is a numerical scale that is derived by scoring specific features of a malocclusion to objectively assess some parameters such as how far a malocclusion varies from an ideal occlusion.^[11] Taking the prevalence of malocclusion as 71% among primary schoolchildren of Bengaluru,^[12] assessment of orthodontic treatment need using IOTN, in schoolchildren of Central Bengaluru was carried out.

Other hypothesis of this study was to find the correlation between DHC and AC components of IOTN among higher primary schoolchildren of Central Bengaluru. There exists mild positive correlation because DHC limits in midline discrepancy, soft-tissue abnormalities, and

Table 3: Distribution of Dental Health Component grades according to gender

| DHC | Gender | | Total | χ^2 | <i>P</i> |
|---------|--------|--------|-------|----------|----------|
| | Male | Female | | | |
| Grade 1 | 41 | 19 | 60 | 2.37 | 0.668 |
| Grade 2 | 165 | 98 | 263 | | |
| Grade 3 | 65 | 37 | 102 | | |
| Grade 4 | 32 | 26 | 58 | | |
| Grade 5 | 10 | 7 | 17 | | |

DHC=Dental Health Component

AC does not include Class III and Class II malocclusion photographs.

In our study, the DHC scores were found as 12% individuals in no need, 52.5% individuals in little need, 20.5% individuals in moderate or borderline, 11.5% individuals in severe need, and 3.5% individuals were in the category of very severe need for treatment. Our study reported that more than 50% of individuals in the little need category, whereas Hedayati *et al.*^[13] (48.1%) and Nakas *et al.*^[14] (43%) reported that approximately half of the individuals were in the category of little need to treatment. Grade 3 was in accordance with Nguyen *et al.*^[15] study (21%) and Gudipaneni *et al.*^[16] (29.6%). Uçüncü and Ertugay^[4] found that 24% moderate need (Grade 3) and 2.8% very severe need (Grade 5) which is similar to our study.

With regard to the distribution of AC -IOTN, 91.6% of the individuals showed no or little need (Grade 1–4). About 2% and 6.4% of the individuals showed moderate need (Grades 5–7) and definitive need (Grades 8–10), respectively. The values for Grade 1–4 were satisfactorily in line with those values of Uçüncü and Ertugay study^[4] (90.4%), Nakas *et al.*^[14] (92%), and Nguyen *et al.*^[15] (78%). Among this no or little need category [Table 4], 21% Grade 1, 24.5% Grade 2, 41% Grade 3, and 5% Grade 4 were included. Grade 1 and 2 values were in accordance with Uçüncü and Ertugay^[4] and Hedayati *et al.*,^[13] whereas Grade 3 values are in accordance with Hedayati *et al.*^[13] and Grade 4 value is not relating with any of the studies. About 6.4% of study population showed great need for treatment. This

Table 4: Distribution of aesthetic component according to gender

| AC | Gender | | Total | Treatment need category | χ^2 | P |
|----|--------|--------|-------|-------------------------|----------|-------|
| | Male | Female | | | | |
| 1 | 64 | 41 | 105 | No/little need | 5.685 | 0.771 |
| 2 | 77 | 46 | 123 | 458 (91.6%) | | |
| 3 | 134 | 71 | 205 | Moderate need | | |
| 4 | 16 | 9 | 25 | 10 (2%) | | |
| 5 | 3 | 2 | 5 | Great need | | |
| 6 | 1 | 1 | 2 | 32 (6.4%) | | |
| 7 | 2 | 1 | 3 | | | |
| 8 | 14 | 13 | 27 | | | |
| 9 | 2 | 1 | 3 | | | |
| 10 | 0 | 2 | 2 | | | |

AC= Aesthetic component

finding was more close to finding of Nguyen *et al.*^[15] and Uçüncü and Ertugay^[4] studies.

When the AC grades were evaluated, Grade 3 (41%) and Grade 8 (5.5%) were considered to be highest values among no/little need and great need category, respectively. In both the grades, canines were unesthetic on AC scale. It could be concluded that the ectopic canines which is unesthetic point were the driving factors for the patients to apply for the treatment. This study reported that there is no significant association between DHC and AC of IOTN and gender.

On comparing distribution of rating for IOTN in school population to several studies like Brook and Shaw^[17] and Kumar *et al.*^[11] studies showed higher prevalence and high percentage of samples required need for orthodontic treatment than this study.

Previous studies showed that there is variation in the occlusion during mixed dentition period and treatment need diminishes with the age.^[18] Further, research directions based on this study can be done at specific ages and individual perceptions of AC components can be compared with the examiner's AC examinations.

CONCLUSIONS

More than half of the study population was in the category of little need which is undiagnosed most of the times. Both the pedodontists and orthodontists should focus on this category to intercept malocclusion. Although the AC is assessed independently of the DHC, results showed that most of the children with poor dental esthetics were also considered to be in little need of treatment on dental health grounds. In comparison of the need to treatment according to DHC, it was concluded that both boys and girls equally need orthodontic treatment.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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