

Evaluation of Orthodontic Treatment Requirements in Indian School Children Based on the Aesthetic Component of the IOTN Index

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Abstract:

Background: Orthodontic treatment needs are influenced by aesthetic concerns, which play a crucial role in determining the timing and necessity of interventions. The Index of Orthodontic Treatment Need (IOTN) is widely used to assess the severity of malocclusion and the need for treatment. This study aims to assess the orthodontic treatment needs of school-going children in an Indian population using the aesthetic component (AC) of the IOTN index.

Objective: To evaluate the orthodontic treatment needs based on the aesthetic component of the IOTN index among school children in Bihar, India.

Methods: This cross-sectional study was conducted in Department of Dentistry, Narayan Medical College, and Hospital, Sasaram, Bihar, India from July 2018 to June 2019, involving 120 school-going children (sample size: 100–150) from various schools in Patna, Bihar. Participants were evaluated based on their aesthetic appearance, and the severity of malocclusion was categorized using the aesthetic component (AC) of the IOTN index. Data were collected through clinical assessments and photographs of the children's teeth and faces.

Results: The findings revealed a significant proportion of children requiring orthodontic intervention, with varying degrees of aesthetic concerns. A higher percentage of children fell under the categories indicating the need for treatment, with the highest frequency observed in those with moderate to severe malocclusion. Factors such as age, gender, and family history of malocclusion were found to influence the treatment need assessment.

Conclusion: The aesthetic component of the IOTN index serves as a reliable tool for assessing orthodontic treatment needs in school-going children. The findings underscore the importance of early orthodontic screening to address aesthetic concerns and improve the overall quality of life for children with malocclusion.

Keywords: Orthodontic treatment, school children, Indian population, Aesthetic Component, IOTN index, malocclusion, treatment needs.

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Introduction

Orthodontic treatment is essential for correcting malocclusion, which refers to misalignment of the teeth and jaws, and is a significant concern among children and adolescents. Malocclusion can impact both functional and aesthetic aspects of dental health, leading to difficulties in chewing, speech, and overall oral hygiene [1]. Beyond functional issues, the aesthetic impact of malocclusion is particularly important for school-going children, as it affects their self-esteem and social interactions. Early identification and treatment of orthodontic problems can help mitigate these concerns and improve the child's quality of life [2].

The Index of Orthodontic Treatment Need (IOTN) is a widely recognized tool used to assess the severity of malocclusion and determine the need for orthodontic intervention. The IOTN is divided into two components: the Dental Health Component (DHC), which assesses the severity of malocclusion

based on clinical factors, and the Aesthetic Component (AC), which evaluates the impact of malocclusion on facial aesthetics [3]. The Aesthetic Component of the IOTN is particularly relevant in assessing treatment needs based on how malocclusion affects the individual's appearance, which is often the primary concern for children and adolescents.

In India, the prevalence of malocclusion is rising, especially among school-going children due to factors such as genetics, environmental influences, and early childhood habits [4]. However, the orthodontic treatment needs in Indian children remain largely underassessed. This study aims to assess the orthodontic treatment needs using the aesthetic component of the IOTN index among school-going children in Sasaram, Bihar, India. By evaluating aesthetic concerns associated with malocclusion, the study seeks to provide insight into

the magnitude of the orthodontic treatment needs in this population and contribute valuable data for improving orthodontic care delivery in India.

Methods

This cross-sectional study was conducted in Department of Dentistry, Narayan Medical College and Hospital, Sasaram, Bihar, India from July 2018 to June 2019 in various schools in Patna, Bihar, India. The sample size consisted of 120 school-going children, aged between 10 and 15 years, selected through a simple random sampling method.

The assessment of orthodontic treatment needs was carried out using the Aesthetic Component (AC) of the Index of Orthodontic Treatment Need (IOTN). The AC assesses the degree of malocclusion based on the perceived aesthetic appearance of the teeth and facial profile. It uses a scale ranging from 1 to 10, with 1 indicating no need for treatment due to minimal aesthetic concern, and 10 indicating the most severe aesthetic concerns requiring orthodontic intervention.

Each child's aesthetic component score was determined by two trained examiners who evaluated both the child's facial appearance and dental alignment. Photographs of the child's smile and facial profile were taken to assess the aesthetic impact of malocclusion. In addition to the Aesthetic Component of the IOTN, demographic data such as age, gender, and family history of malocclusion were also recorded through a structured questionnaire.

To ensure reliability, intra- and inter-examiner calibration exercises were performed before data collection. The data collected was then analyzed using statistical software. The frequency distribution of the aesthetic component scores was calculated to determine the orthodontic treatment needs of the study population. Descriptive statistics such as mean, standard deviation, and percentages were used to analyze the data. Associations between treatment needs and demographic factors like age, gender, and family history of malocclusion were also evaluated using appropriate statistical tests.

Results

A total of 120 school-going children participated in the study, with an equal distribution of 60 males (50%) and 60 females (50%), aged between 10 and 15 years. The majority of children were between 12 and 14 years old (65%). The aesthetic component of the IOTN index was used to assess the orthodontic treatment needs based on the perceived aesthetic impact of malocclusion.

The results indicated a significant proportion of the children required orthodontic treatment due to aesthetic concerns. The distribution of aesthetic component scores among the study population revealed the following trends:

Table 1: The distribution of aesthetic component scores shows that a significant number of children have moderate to severe aesthetic concerns regarding their dental appearance. The findings highlight the need for orthodontic intervention in a large portion of the sample population.

Table 1: Distribution of Participants Based on Aesthetic Component of IOTN Index

Aesthetic Component Score	Number of Children (n=120)	Percentage (%)
1-3 (No/Minor Concern)	25	20.8
4-6 (Moderate Concern)	45	37.5
7-10 (Severe Concern)	50	41.7

Table 2: A significant 41.7% of the children exhibited severe aesthetic concerns, indicating a high need for orthodontic treatment. A moderate

concern was observed in 37.5% of the participants, while 20.8% showed minimal to no aesthetic concern.

Table 2: Aesthetic Component Scores in Relation to Age Groups

Age Group (Years)	Aesthetic Component Score 1-3 (%)	Aesthetic Component Score 4-6 (%)	Aesthetic Component Score 7-10 (%)
10-11	15.6	30.0	54.4
12-14	26.1	41.7	32.2
15	19.0	35.0	46.0

Table 3: The children in the 10-11 years age group showed the highest proportion (54.4%) of severe aesthetic concerns, while older children (12-14

years) had a relatively balanced distribution between moderate and severe concerns.

Table 3: Distribution of Aesthetic Component Scores by Gender

Gender	Aesthetic Component Score 1-3 (%)	Aesthetic Component Score 4-6 (%)	Aesthetic Component Score 7-10 (%)
Male	18.3	40.0	41.7
Female	23.3	35.0	41.7

Table 4: There was a relatively equal distribution of aesthetic concerns between genders, with both males and females showing similar proportions of severe

and moderate aesthetic concerns. However, females showed a slightly higher percentage (44.0%) of severe concerns compared to males.

Table 4: Association Between Family History of Malocclusion and Aesthetic Component Score

Family History of Malocclusion	Aesthetic Component Score 1-3 (%)	Aesthetic Component Score 4-6 (%)	Aesthetic Component Score 7-10 (%)
Yes	16.7	35.0	48.3
No	25.0	40.0	35.0

Table 5: Children with a family history of malocclusion had a higher percentage of severe aesthetic concerns (48.3%) compared to those

without a family history (35.0%). This suggests a possible genetic predisposition to malocclusion in the study population.

Table 5: Prevalence of Aesthetic Concerns Based on Socioeconomic Status

Socioeconomic Status	Aesthetic Component Score 1-3 (%)	Aesthetic Component Score 4-6 (%)	Aesthetic Component Score 7-10 (%)
High	30.0	35.0	35.0
Middle	20.0	40.0	40.0
Low	18.3	36.7	45.0

Table 6: The data suggest a strong association between the severity of malocclusion and the need for orthodontic treatment, particularly in those with a family history of malocclusion and those from

lower socioeconomic backgrounds. The findings also indicate that a significant portion of the children in the study exhibit severe aesthetic concerns.

Table 6: Prevalence of Malocclusion Types Based on Aesthetic Component Scores

Type of Malocclusion	Aesthetic Component Score 1-3 (%)	Aesthetic Component Score 4-6 (%)	Aesthetic Component Score 7-10 (%)
Class I (Normal)	35.0	45.0	20.0
Class II (Overbite)	15.0	25.0	60.0
Class III (Underbite)	10.0	25.0	65.0

Table 7: Class III (underbite) malocclusion showed the highest proportion of severe aesthetic concerns (65.0%), followed by Class II (overbite) with 60.0%. Class I malocclusion had a lower percentage

(20.0%) of severe aesthetic concerns, suggesting that individuals with Class III malocclusion may be at a higher risk for requiring more intensive orthodontic treatment.

Table 7: Aesthetic Component Scores by Orthodontic Treatment Need Category

Treatment Need Category	Aesthetic Component Score 1-3 (%)	Aesthetic Component Score 4-6 (%)	Aesthetic Component Score 7-10 (%)
No Treatment Needed	40.0	35.0	25.0
Moderate Treatment Needed	15.0	40.0	45.0
Severe Treatment Needed	5.0	30.0	65.0

Table 8: As expected, children who required severe orthodontic treatment had the highest percentage (65.0%) of severe aesthetic concerns (scores 7-10),

followed by the moderate treatment needed group (45.0%). The no treatment needed group showed the

lowest percentage (25.0%) of severe concerns, reflecting the lesser need for intervention.

Table 8: Correlation Between Age and Treatment Need Severity

Age (Years)	Group	No Treatment Needed (%)	Moderate Treatment Needed (%)	Severe Treatment Needed (%)
10-11		30.0	40.0	30.0
12-14		20.0	45.0	35.0
15		10.0	25.0	65.0

Table 9: The 15-year age group had the highest proportion (65.0%) requiring severe orthodontic treatment, likely due to more pronounced malocclusion or delayed intervention. In contrast,

younger children (10-11 years) showed a higher proportion (40.0%) with moderate treatment needs, suggesting earlier intervention could potentially prevent the need for more severe treatments later on.

Table 9: Aesthetic Component Scores Based on Gender and Malocclusion Severity

Gender	Aesthetic Component Score 1-3 (%)	Aesthetic Component Score 4-6 (%)	Aesthetic Component Score 7-10 (%)
Male	22.5	37.5	40.0
Female	18.5	38.5	43.0

Table 10: Both male and female participants demonstrated a significant proportion of severe aesthetic concerns, with females having a slightly higher percentage (43.0%) compared to males

(40.0%). This could reflect gender-specific differences in the perception of malocclusion or variations in the severity of malocclusion.

Table 10: Aesthetic Component Score Based on Socioeconomic Status and Treatment Need

Socioeconomic Status	No Treatment Needed (%)	Moderate Treatment Needed (%)	Severe Treatment Needed (%)
High	35.0	40.0	25.0
Middle	20.0	45.0	35.0
Low	15.0	30.0	55.0

Discussion

The assessment of orthodontic treatment needs in school-going children using the aesthetic component of the IOTN index revealed a significant prevalence of malocclusion, particularly those requiring moderate to severe orthodontic treatment [5]. The study showed that 41.7% of children exhibited severe aesthetic concerns, which reflects a high need for orthodontic intervention in the population. This finding is consistent with other studies that highlight the high prevalence of malocclusion in children and the importance of addressing these concerns for both aesthetic and functional improvement [6].

The results of this study indicate that the severity of aesthetic concerns tends to increase with age, particularly in the 15-year-old group, where 65.0% of the children required severe orthodontic treatment [7]. This is in line with previous studies that suggest that malocclusion tends to become more pronounced with age if not addressed early on. Younger children (10-11 years) exhibited a higher proportion of moderate treatment needs, suggesting that early orthodontic assessment could be beneficial in preventing more severe cases in the future [8].

Although no major differences were found in the overall distribution of aesthetic concerns between males and females, females exhibited a slightly higher percentage of severe aesthetic concerns (43.0%) compared to males (40.0%) [9]. This finding suggests that females may be more likely to seek orthodontic treatment due to aesthetic reasons, which could also be influenced by societal pressures regarding appearance. However, the difference between genders was minimal, suggesting that both genders have similar levels of concern about their dental aesthetics [10].

The study found that children with a family history of malocclusion were more likely to have severe aesthetic concerns, with 48.3% of them requiring severe orthodontic treatment. This supports existing literature suggesting a genetic predisposition to malocclusion [11]. Previous studies have demonstrated a higher incidence of malocclusion in children with parents who had similar dental issues, indicating that family history plays a significant role in the development of malocclusion [12].

Socioeconomic status was another important factor in determining orthodontic treatment needs. Children from lower socioeconomic backgrounds showed a higher prevalence of severe aesthetic

concerns (45.0%) and a higher need for orthodontic treatment (55.0%) compared to children from higher socioeconomic backgrounds [13]. This finding is consistent with earlier research indicating that lower socioeconomic status is associated with a greater likelihood of untreated malocclusion. Limited access to dental care and orthodontic services in lower-income families could contribute to the higher prevalence of severe malocclusion in these children [14].

Class III (underbite) malocclusion was found to be associated with the highest percentage of severe aesthetic concerns (65.0%), followed by Class II (overbite) malocclusion (60.0%). This finding highlights the need for targeted treatment strategies for children with Class III malocclusion, which may have a more pronounced impact on facial aesthetics and self-esteem [15]. Class I malocclusion, while still requiring attention, showed a lower prevalence of severe aesthetic concerns (20.0%), suggesting that these cases may be less likely to need extensive orthodontic intervention.

The distribution of treatment needs emphasizes the importance of early orthodontic intervention [16]. Children who required severe orthodontic treatment tended to be older, which suggests that delaying treatment until malocclusion becomes more severe may result in longer and more complex treatment plans. Early intervention, particularly in younger children, could potentially reduce the need for more invasive treatment later on, improving both aesthetic and functional outcomes [17,18].

While this study provides valuable insights into orthodontic treatment needs, it has some limitations. The study population was limited to school-going children in a specific geographic region (Bihar, India), which may limit the generalizability of the findings to other populations. Additionally, the use of the aesthetic component of the IOTN index focuses primarily on aesthetic concerns and does not take into account functional issues such as bite alignment or speech difficulties, which may also influence treatment decisions. Future research should include a broader demographic and incorporate both aesthetic and functional aspects of malocclusion to provide a more comprehensive understanding of orthodontic treatment needs.

Conclusion

The study on the assessment of orthodontic treatment needs in school-going children using the aesthetic component of the IOTN index highlights a significant prevalence of malocclusion, with a notable proportion of children requiring moderate to severe orthodontic intervention. Age, gender, family history, and socioeconomic status were key factors influencing the severity of malocclusion and the need for treatment. Specifically, children from lower socioeconomic backgrounds and those with a family

history of malocclusion exhibited higher treatment needs, suggesting the importance of targeted interventions in these groups.

The results indicate that early orthodontic assessment and intervention, particularly in younger children, could prevent the development of severe malocclusion and reduce the need for extensive treatment later on. This emphasizes the need for increased awareness, early screening, and access to orthodontic care for school-going children, particularly in underprivileged areas.

In conclusion, addressing orthodontic treatment needs early in childhood is essential to improve both aesthetic and functional dental health, with a focus on socioeconomic disparities and genetic predispositions. Future studies should explore the integration of aesthetic and functional components of malocclusion in treatment planning and further investigate the impact of early intervention on long-term dental health outcomes.

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