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Original Research Article

Comparative Study of IOTN and DAI in Evaluating Orthodontic Treatment Needs among Patients in Eastern India

Shagufta Anjum[1], Ritu Priya[2], Swapnil Singh[3]

[1]Senior Resident, Department of Orthodontics and Dentofacial Orthopaedics, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India
[2]Head of Department, Departments of Conservative and Endodontics, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India
[3]Senior Resident, Department of Periodontist and Implantologist, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India

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Corresponding Author: Ritu Priya
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Abstract:

Background: Malocclusion is a common dental health issue that can negatively impact psychological well-being, facial appearance, and oral function. Accurate assessment of orthodontic treatment need is essential for effective treatment planning and prioritization, particularly in resource-limited settings. Standardized indices such as the Index of Orthodontic Treatment Need and the Dental Aesthetic Index are commonly used to evaluate malocclusion severity; however, variations in their assessment criteria may lead to differences in treatment need estimation, especially when patient perception is considered.

Objective: To assess how well patients at Anugrag Narayan Magadh Medical Hospital facility in Eastern India agree with the Dental Aesthetic Index and the Index of Orthodontic Treatment Need in order to compare orthodontic treatment needs from the perspective of the patient.

Methods: The Dental Department carried out a retrospective cross-sectional investigation at Anugrah Narayan Magadh Medical College and Hospital between June 2025 and December 2025. Pre-treatment orthodontic records of 250–300 patients aged 12–25 years were analyzed. The Dental Aesthetic Index and the IOTN's requirement for orthodontic treatment were assessed using the Dental Health and Aesthetic Components. Data were subjected to descriptive statistical analysis, and comparisons between indices were performed using the chi-square testA. The agreement between IOTN and DAI was evaluated using kappa statistics at a significance threshold of $p < 0.05$.

Results: Assessment using IOTN and DAI revealed varying levels of orthodontic treatment need among the study population. A higher proportion of patients demonstrated moderate to definite treatment need when evaluated using IOTN compared to DAI. The agreement between the two indices ranged from fair to moderate, indicating that the indices did not consistently identify the same individuals as requiring orthodontic treatment. Patient-perceived aesthetic concern showed a closer association with the Aesthetic Component of IOTN than with DAI scores.

Conclusion: The findings of this study suggest that IOTN and DAI differ in their assessment of orthodontic treatment need when patient perception is considered. While both indices are useful for evaluating malocclusion severity, IOTN appears to better reflect patient aesthetic concerns. Comparative use of these indices may aid in improved treatment prioritization and more patient-centered orthodontic care in clinical practice.

Keywords: Malocclusion, the requirement for orthodontic treatment, the Index of Orthodontic Treatment requirement, the Dental Aesthetic Index, and patient opinion.

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Introduction

Malocclusion constitutes a common dental condition that can influence oral function, facial harmony, and an individual's psychological well-being. Irregularities in tooth alignment and jaw relationships may interfere with chewing efficiency, speech, and maintenance of oral hygiene, thereby predisposing individuals to periodontal problems and dental trauma. Beyond functional limitations, altered dental appearance often affects self-confidence and social interaction, especially during adolescence and early adulthood, when concern for physical appearance is heightened. As a result, orthodontic care is increasingly sought not only for functional correction but also for aesthetic improvement.

The need for orthodontic treatment can be interpreted differently by clinicians and patients. Professional assessment typically focuses on the severity of occlusal discrepancies and their potential health implications, whereas patients tend to judge the need for treatment based on personal satisfaction with dental appearance. This difference in perception may influence treatment-seeking behavior, acceptance of orthodontic intervention, and compliance with long-term therapy. Therefore, reliable and standardized methods that incorporate both clinical findings and aesthetic considerations are essential for an accurate and meaningful evaluation of orthodontic treatment need.

The Index of Orthodontic Treatment Need and the Dental Aesthetic Index are the two most widely used indices that have been designed to objectively evaluate malocclusion and prioritize orthodontic therapy. The IOTN evaluates malocclusion through its Dental Health Component, which reflects functional and health-related aspects, and its Aesthetic Component, which considers dental appearance using a graded photographic scale. In contrast, the DAI integrates specific occlusal traits into a single numerical score that categorizes malocclusion severity and indicates treatment necessity. Owing to differences in design and scoring criteria, these indices may vary in identifying individuals who require orthodontic treatment, emphasizing the importance of comparative evaluation.

In the Indian context, the prevalence and characteristics of malocclusion demonstrate regional variation influenced by genetic, environmental, and socio-cultural factors. Data from Eastern India regarding orthodontic treatment needs assessed through standardized indices remain limited. Retrospective analysis of orthodontic records offers valuable insight into real clinical presentations and patient concerns without imposing additional clinical procedures. Hence, the present study was undertaken to compare the Dental Aesthetic Index and the Index of Orthodontic Treatment Need in evaluating orthodontic treatment requirements from the viewpoint of patients visiting a tertiary care dental facility in Eastern India, with the objective of evaluating the agreement between these two indices and their applicability in routine clinical practice.

Materials and Methods

Study Design and Setting: A retrospective cross-sectional comparison analysis was carried out Dental Department at Anugrah Narayan Magadh Medical College and Hospital, Bihar. The study evaluated pre-treatment orthodontic records collected over a six-month period from June 2025 to December 2025.

Study Sample: Orthodontic case records of patients who reported to the Dental department during the study period were reviewed. A total of 250–300 patient records were included based on the availability of complete and legible pre-treatment documentation. Convenience sampling was employed since the study was retrospective in nature.

Eligibility Criteria

Inclusion Criteria

- Patients aged 12–25 years
- Presence of permanent dentition
- Complete pre-treatment orthodontic records, including intraoral photos and dental casts, are available.
- Individuals who had never had orthodontic treatment before

Exclusion criteria

- Records of patients with craniofacial anomalies or syndromic conditions
- History of orthodontic treatment
- Incomplete, damaged, or unclear records unsuitable for index assessment

Data Collection Procedure: Pre-treatment orthodontic records were retrieved from departmental archives. Each record was assessed for orthodontic treatment need using two standardized indices: the IOTN and the DAI. Assessment was performed under standardized conditions to ensure uniformity.

The IOTN was evaluated using both components:

- **Dental Health Component**, which categorizes malocclusion based on its potential impact on oral health and function
- **Aesthetic Component**, which assesses dental attractiveness using a standardized ten-point photographic scale representing patient-perceived aesthetic concern

The Dental Aesthetic Index was calculated by measuring specific occlusal characteristics, including crowding, spacing, overjet, anterior open bite, and molar relationship, according to established criteria. The final DAI score was used to classify malocclusion severity and the requirement for orthodontic therapy.

Examiner Calibration and Reliability: All assessments were carried out by a single examiner who underwent calibration prior to data collection. To assess intra-examiner reliability, a subset of records was re-evaluated after a two-week interval. Kappa statistics were used to assess reliability, and the results showed adequate agreement.

Statistical Analysis: After the data was entered into a Microsoft Excel spreadsheet, it was evaluated

using the Statistical Package for the Social Sciences application. The distribution of orthodontic treatment needs according to both indices was summarized using descriptive statistics, such as percentages and frequencies. Comparative analysis between IOTN and DAI categories was performed using the Chi-square test. The degree of agreement between the two indices was assessed using kappa statistics. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: The project received ethical approval from the Institutional Ethics Committee of Anugrah Narayan Magadh Medical College and Hospital. As the study involved retrospective analysis of existing records, a waiver of informed consent was granted. Confidentiality of patient information was strictly maintained throughout the study.

Results

A total of patient records that fulfilled the inclusion criteria were analyzed. The distribution of orthodontic treatment need according to IOTN and DAI is presented below.

Distribution of Orthodontic Treatment Need: Assessment using the IOTN Dental Health Component revealed that 32% of patients exhibited little or no treatment need, while 38% demonstrated moderate need. Definite orthodontic treatment need was observed in 30% of the study population. In contrast, evaluation using the Dental Aesthetic Index showed that 45% of patients fell into the no or minor treatment need category, 34% were categorized as having moderate need, and 21% were identified as requiring definite orthodontic treatment.

Overall, IOTN identified a higher proportion of patients with definite treatment need compared to DAI, suggesting differences in sensitivity between the two indices.

Table 1: Distribution of Orthodontic Treatment Need According to IOTN and DAI

Treatment Need Category	IOTN (%)	DAI (%)
No / Little Need	32	45
Moderate Need	38	34
Definite Need	30	21

Comparative Analysis Between IOTN and DAI: Comparison between the two indices demonstrated variation in classification of treatment need categories. The Chi-square test revealed a statistically significant difference in treatment need distribution between IOTN and DAI ($p < 0.05$). This indicates that the two indices do not uniformly identify the same individuals as requiring orthodontic treatment.

Agreement Between Indices: The level of agreement between IOTN and DAI, assessed using kappa statistics, showed fair to moderate agreement, indicating partial concordance between the indices. Discrepancies were more pronounced in borderline and moderate malocclusion categories.

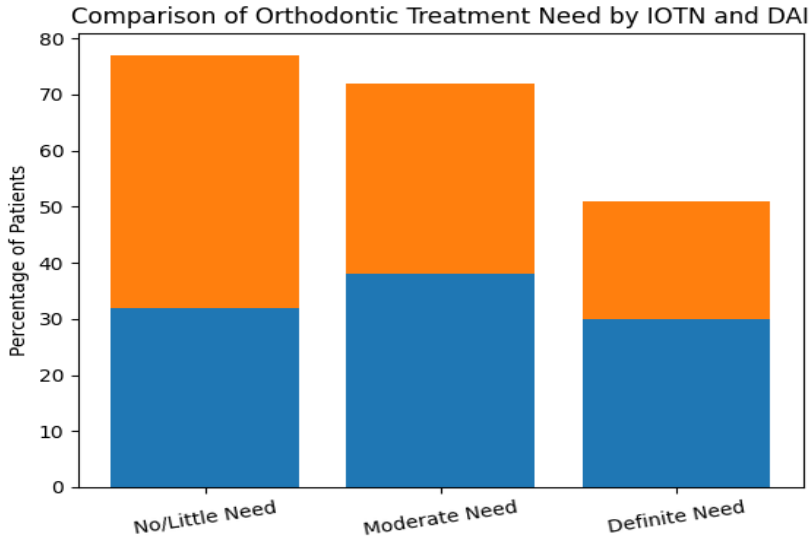

Figure 1. Comparison of Orthodontic Treatment Need Assessed by IOTN and DAI

Patient-Perceived Aesthetic Concern: Analysis of the Aesthetic Component of IOTN revealed that patient-perceived aesthetic dissatisfaction was more closely aligned with higher AC scores. Patients categorized under definite treatment need by IOTN-AC showed greater concern regarding dental appearance compared to those classified using DAI, suggesting that IOTN-AC better reflects patient perception.

Discussion

The findings of the present study highlight meaningful differences in orthodontic treatment need assessment when two widely used indices were applied to the same patient population. Variation in classification across indices reflects differences in scoring methodology rather than inconsistencies in the study sample. These differences assume particular importance in institutional settings where objective assessment tools are used to guide clinical decision-making and prioritize care.

A higher proportion of patients were categorized as having definite treatment need when assessed using IOTN compared to DAI. This difference can be explained by the emphasis placed on the most severe occlusal trait within the IOTN framework, which may elevate overall treatment need classification even when other occlusal parameters are less pronounced. In contrast, the composite scoring system used in DAI tends to distribute weight across several traits, which may lead to a more conservative estimation of treatment requirement in certain clinical situations.

Evaluation of aesthetic concern revealed that patients classified into higher categories by the The IOTN's aesthetic component showed higher dissatisfaction with dental appearance. This observation suggests that visual grading systems may more closely align with patient expectations than purely measurement-based indices. The ability of an index to reflect patient concern is particularly relevant in orthodontics, where treatment acceptance and compliance are strongly influenced by perceived improvement in appearance.

The level of agreement between IOTN and DAI was found to be limited, indicating that the indices identify overlapping yet distinct subsets of patients as requiring treatment. This partial concordance supports the view that each index captures different dimensions of malocclusion severity. Rather than viewing this discrepancy as a limitation, it may be interpreted as evidence of the complementary nature of these assessment tools when used in conjunction.

Clinical decision-making in orthodontics often involves nuanced judgment, particularly in cases that fall within moderate or borderline categories. The present findings suggest that reliance on a single index may oversimplify this process. Incorporation of patient-related factors, along with objective scoring, may allow clinicians to arrive at more balanced treatment recommendations and avoid unnecessary intervention or delayed care.

In public healthcare institutions, the choice of an assessment index can influence service delivery patterns and workload distribution. The tendency of IOTN to identify a greater number of patients with higher treatment need may assist in prioritizing cases requiring timely intervention. Conversely, DAI may be advantageous in large-scale assessments due to its structured scoring system and reproducibility. Selection of an index should therefore be aligned with the specific clinical or administrative objectives of the healthcare setting.

Certain limitations of the present study warrant consideration. As a record-based analysis, the study depended on the accuracy and completeness of existing documentation. Additionally, direct patient-reported measures of psychosocial impact were not available. Despite these constraints, the study provides practical insights into the application of orthodontic indices in routine clinical settings. Future research incorporating prospective designs and patient-reported outcome measures may further refine assessment strategies and support more patient-centered orthodontic care.

Conclusion

Patients attending a tertiary care facility in Eastern India had significant difference in classification when orthodontic treatment needs were evaluated using the Index of Orthodontic Treatment Need and the Dental Aesthetic Index in this retrospective study. The findings indicate that the two indices do not uniformly identify the same individuals as requiring orthodontic treatment, reflecting differences in their assessment frameworks. The Index of Orthodontic Treatment Need demonstrated greater sensitivity in identifying patients with higher treatment priority and showed closer alignment with patient-perceived aesthetic concern. In contrast, the Dental Aesthetic Index provided a more conservative estimation of treatment need. These results suggest that reliance on a single index may not adequately capture the complexity of orthodontic treatment demand. A combined approach incorporating objective clinical assessment and patient perception may enhance treatment prioritization and decision-making. The study underscores the importance of selecting appropriate assessment tools based on clinical objectives and resource availability in institutional orthodontic practice.

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