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Original Research Article

Cross-Sectional Study on the Prevalence of Malocclusions and Orthodontic Treatment Needs in Pediatric Patients with Special Healthcare Needs

Kumari Menka[1], Kumar Anand[2], Monali Sah[3], Prakash Chandra Jha[4], Archana Kumari[5]

[1]Senior Resident, Department of Dentistry, Nalanda Medical College and Hospital Patna Bihar
[2]Senior Resident, Department of Dentistry, Bhagawan Mahavir Institute of Medical Sciences, Pawapuri Nalanda Bihar
[3]Assistant Professor, Department of ENT (Otolaryngology and Rhinology), Mata Gujri Memorial Medical College and Hospital, Kishanganj, Bihar
[4]Assistant Professor & Head of Department, Department of Dentistry, Nalanda Medical College & Hospital, Patna, Bihar
[5] Assistant Professor & Head of Department, Department of Dentistry, Bhagawan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar

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Corresponding Author: Dr. Kumar Anand
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Abstract:

Background: Malocclusions, or misaligned teeth, are frequent dental issues that can harm oral health and well-being, especially in children with special healthcare needs. These children may have more trouble diagnosing and treating oral disorders due to their circumstances. Understanding the prevalence and severity of malocclusions in this vulnerable population to create effective, personalised orthodontic interventions to improve oral health and quality of life.

Method: Cross-sectional research from October 2021 to March 2024 comprised 140 special-needs children. Clinical studies assessed malocclusion types and severity using the Dental Aesthetic Index (DAI). We recorded age, gender, and special healthcare needs. Logistic regression and chi-square testing were used to detect significant correlations.

Results: The study found that age groups affect malocclusion types ($p = 0.032$). Gender did not affect malocclusion types ($p = 0.085$). A substantial association between malocclusion types and specific healthcare demands was identified ($p = 0.021$), highlighting medical difficulties' different patterns. To emphasise the importance of malocclusion severity in treatment planning, the DAI strongly recommended orthodontic therapy depending on severity ($p < 0.001$).

Conclusion: The study underscores the importance of early orthodontic treatments since paediatric children with special healthcare needs have a high rate of malocclusions. Age, special healthcare needs, and malocclusion patterns were substantially linked, whereas gender was not. Malocclusion severity and treatment time are closely related, highlighting the necessity for personalised orthodontic treatments to help these children overcome their challenges. To understand how orthodontic treatment and malocclusions affect this population psychologically and socially and make these findings more universally applicable, multi-center, long-term studies are needed.

Keywords: Malocclusions, Orthodontic Treatment Needs, Pediatric Patients, Prevalence, Special Healthcare Needs.

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Introduction

Background on Malocclusions and Their Impact on Pediatric Patients with Special Healthcare Needs: Malocclusions, or jaw and tooth misalignment, are frequent dental conditions that can compromise oral health and self-esteem [1]. Children with unique healthcare requirements may have more malocclusions than the general population. Patients may have chronic illnesses or developmental issues. These people often struggle with oral hygiene, dental cavities, periodontal issues, speaking, chewing, and quality of life [2]. These demographic needs expert dental care and early malocclusion treatment.

Importance of Orthodontic Treatment: Orthodontics provides the foundation for malocclusion correction and oral health [3]. For

children with particular healthcare needs, early orthodontic treatments can improve quality of life.

Malocclusion-related chewing and addressing improve with orthodontics. It can also improve the child's smile, boosting confidence and social skills [4].

Orthodontic therapy can enhance oral hygiene by making it easier for patients to brush and floss their teeth, reducing the risk of dental caries and periodontal diseases. Given the particular dental and medical challenges of children with special healthcare needs, a comprehensive orthodontic treatment approach is essential.

Objectives of the Study

- To determine the prevalence of malocclusions in Patna's Nalanda Medical College and Hospital & Bhagawan Mahavir institute of medical sciences, Pawapuri, Bihar, we will collect data from children with special needs from October 2021 to March 2024.
- To determine which types and degree of paediatric malocclusions require orthodontic treatment.
- To illuminate the demographics and clinical aspects of children with special healthcare needs to better adapt orthodontic treatment and maintenance.

Prevalence of Malocclusions in Pediatric Patients: Dental malocclusions affect children worldwide. [5] Have revealed that children often develop malocclusions, with some showing demographic and geographic disparities. [6] Found that 74% of Swedish 7–9-year-olds had malocclusion. A comprehensive US study by [7] indicated that Class I malocclusions affect 70% of children, followed by Class II and Class III. Emerging countries also have significant malocclusion rates. [8] Showed 35.5% of 12–15-year-old Nigerians had malocclusions, mostly Angle's Class I. [9] revealed that 62% of Indian schoolchildren had crowding malocclusion, the most frequent kind.

Figure 1: Malocclusions in Pediatric Patients (Source: [10])

Orthodontic Treatment Needs in Special Healthcare Populations: Special Healthcare Needs (SHCN) children are increasingly getting orthodontic care. SHCN children have more malocclusions than usually developing children. This applies independently of the child's physical, developmental, behavioural, or emotional problem. 85% of impaired children had malocclusions, compared to 65% of non-disabled children. SHCN populations have more orthodontic issues. Additionally, [11] examined Down syndrome children's orthodontic treatment needs in Saudi Arabia. Since Class III malocclusion and anterior open bite were so widespread, 92% of kids needed orthodontic treatment. 81% of cerebral palsy children needed orthodontic treatment due to malocclusions. The severity of the developmental or medical issue also affects orthodontic treatment. Children with cleft lip and palate need significant surgical and orthodontic therapy for functional and aesthetic difficulties. [12] Have described the complex orthodontic treatment techniques needed to control malocclusions in children with cleft lip and palate, emphasising the necessity for a multidisciplinary approach.

SHCN children's orthodontic issues are often overlooked in lieu of cerebral palsy or Down syndrome research. Orthodontic therapy in SHCN populations has been studied little longitudinally. Long-term research is needed to determine what factors affect treatment success, patient satisfaction, and orthodontic procedure efficacy. While informative, most orthodontic therapy research for SHCN children is cross-sectional, thus it cannot disclose the treatment's long-term benefits and drawbacks. There's also little data on how orthodontic treatment and malocclusions affect

SHCN psychology and society. Malocclusions can negatively damage self-esteem and social skills in children with evident deficits. Understanding the psychosocial aspects of orthodontic treatments and malocclusions is crucial to designing comprehensive treatment plans for SHCN children's emotional and physical needs. Regional study is needed to account for differences in healthcare systems, cultural norms, and socioeconomic position, which may affect orthodontic treatment accessibility and malocclusion frequency.

Materials and Methods

Study Design: This cross-sectional study examines orthodontic treatment and malocclusions in special-needs children. Nalanda Medical College and Hospital, Patna, Bhagawan Mahavir institute of medical sciences, Pawapuri, Bihar & researchers collected data from October 2021 to March 2024.

Study Population and Sample Size: Child dental outpatients from Nalanda Medical College and Hospital, Patna & Bhagawan Mahavir institute of medical sciences, Pawapuri, Bihar with special healthcare needs are studied. The study included 140 children. These patients were selected using strict inclusion and exclusion criteria to ensure a representative and relevant sample.

Inclusion Criteria

- Pediatric patients aged between 5 to 18 years.
- Patients diagnosed with special healthcare needs, including but not limited to developmental disabilities, chronic medical conditions, and behavioral disorders.
- Patients with parental or guardian consent to participate in the study.
- Patients attending the dental outpatient department at Nalanda Medical College and Hospital, Patna & Bhagawan Mahavir institute of medical sciences, Pawapuri, Bihar during the study period.

Exclusion Criteria

- Patients without a confirmed diagnosis of special healthcare needs.
- Patients aged below 5 years or above 18 years.
- Patients who had previously received comprehensive orthodontic treatment.
- Patients or guardians who declined to provide consent for participation in the study.

Data Collection Methods: Data was collected using clinical exams and structured questionnaires. Patients had full dental exams by an orthodontist. We checked for crowding, spacing, over jet, overbite, crossbite, open bite, and tooth-jawbone interactions. Dental occlusion was categorised using Angle's method. Adults caring for children completed a standard questionnaire. The survey covered the child's demographics, health, dentistry, and special needs. A standard data collection form recorded all clinical examination and questionnaire results. The data were then entered into a secure computer database for analysis.

Ethical Considerations: The Institutional Ethics Committee approved the research design at Nalanda Medical College and Hospital, Patna & Bhagawan Mahavir institute of medical sciences, Pawapuri, Bihar. Each child whose parents or guardians allowed their education was a minor. The permission form detailed the study's goals, methodology, risks, and benefits. Everyone knew their involvement was voluntary and they might stop at any time without punishment. Privacy of participant data was always guaranteed. We anonymized and erased personal identifiers before analysis to safeguard privacy.

Statistical Analysis: Data analysis was done with SPSS 25.0. The participants' ages, sexes, special healthcare needs, and medical histories were summarised using descriptive statistics. The percentage of malocclusions in the study population was calculated. Inferential statistics showed that malocclusions were linked with several demographic and clinical factors. Chi-square testing examined categorical characteristics such malocclusion and specific healthcare needs.

Logistic regression analysis was used to determine what factors affect paediatric orthodontic therapy. Malocclusions were assessed using PAR and DAI. These indices quantified malocclusion and were compared to patient demographic and clinical data. All studies employed p-values below 0.05 to determine statistical significance.

Results

Demographic and Clinical Characteristics of the Study Population

Table 1: Demographic details

Characteristic	Number of Patients (n = 140)	Percentage (%)
Age Group (years)		
5-8	35	25.0
9-12	45	32.1
13-16	40	28.6
17-18	20	14.3

Gender		
Male	80	57.1
Female	60	42.9
Type of Special Healthcare Needs		
Developmental Disabilities	50	35.7
Behavioral Disorders	30	21.4
Chronic Medical Conditions	40	28.6
Multiple Disabilities	20	14.3

Our study's 140 paediatric patients at Nalanda Medical College and Hospital, Patna & Bhagawan Mahavir institute of medical sciences, Pawapuri, Bihar show demographic tendencies. By age category, 32.1% are 9–12, 25.0% are 5-8, and 28.6% are 13–16. This age distribution emphasises dental intervention's critical development. Women make up 42.9% of the population, while men make up 57.1%. Developmental disabilities (35.7%) and chronic medical conditions (28.6%) were the most common special healthcare needs in the paediatric population studied.

Prevalence of Different Types of Malocclusions

Table 2: Prevalence of Different Types of Malocclusions

Type of Malocclusion	Number of Patients (n = 140)	Percentage (%)
Angle's Class I	50	35.7
Angle's Class II Division 1	25	17.9
Angle's Class II Division 2	20	14.3
Angle's Class III	30	21.4
Crowding	70	50.0
Spacing	20	14.3
Overjet	40	28.6
Overbite	35	25.0
Crossbite	25	17.9
Open Bite	15	10.7

The distribution of malocclusions in children with special healthcare requirements shows several tendencies. Angle's Class I malocclusion (35.7%), crowding (50.0%), and overjet (28.6%) affected the study population most. Over 20% of patients have overbite and Angle's Class III malocclusion. Open bite has the lowest occurrence of any malocclusion type at 10.7%. This distribution shows the multiple orthodontic challenges these children face, emphasising the need for tailored treatment programmes that address the types and severity of malocclusions.

Orthodontic Treatment Needs

Table 3: Orthodontic Treatment Needs

Treatment Need	Number of Patients (n = 140)	Percentage (%)
Required	110	78.6
Not Required	30	21.4
Severity of Treatment Need (DAI)		
Mild	30	21.4
Moderate	50	35.7
Severe	30	21.4
Very Severe	20	14.3

The results demonstrate that many paediatric children with special healthcare requirements at Nalanda Medical College and Hospital, Patna & Bhagawan Mahavir institute of medical sciences, Pawapuri, Bihar need orthodontic treatment, underlining the great demand for dental care in this vulnerable group.

The Dental Aesthetic Index (DAI) states that 35.7% of malocclusions are moderate, 21.4% are mild, 21.4% are severe, and 14.3% are very serious. These results show that young children with different amounts of malocclusion need individualised orthodontic treatments to improve their health and ability to function.

Statistical Analysis Results

A statistical study of kids with special health care needs and problems with their teeth showed strong links between important factors. Age was strongly connected with malocclusion categories ($p = 0.032$), showing trends that are unique to older

people. Both men and women had the same types of malocclusions ($p = 0.085$), which shows that this is not affected by gender. The types of malocclusions were significantly linked with special healthcare needs ($p = 0.021$), which shows that health is concerned exist. The DAI strongly predicts the need for orthodontic treatment, highlighting the clinical relevance of malocclusion severity in treatment decisions ($p < 0.001$).

These results emphasise the importance of age-specific orthodontic treatments for susceptible children based on healthcare needs and malocclusion severity.

Discussion

The high associations between age groups and malocclusion types show that dental growth changes during childhood and adolescence. Children and adolescents have different malocclusion patterns than older teens, therefore orthodontic treatment must start early. However, gender did not significantly alter malocclusion types. Since the sample shows that malocclusions affect both sexes equally, gender-neutral orthodontic treatment planning is needed. The study also found a considerable correlation between malocclusion patterns and specific healthcare needs. Malocclusion patterns were found in people with developmental difficulties, chronic medical conditions, and behavioural disorders, indicating that these health issues affect dental development and oral health. The DAI also indicated that severe malocclusions required orthodontic treatment. Patients with more severe malocclusions need greater intervention, demonstrating the therapeutic value of severity evaluations in treatment decision-making. Early identification and orthodontic management are essential for paediatric patients with special healthcare needs to improve oral health and reduce issues.

Comparison Table

Table 4: Comparing study with existing Studies

Study	Study Type	Sample Size	Findings	Limitations
Current Study	Cross-sectional	140	Significant association between age groups and malocclusion types; no significant gender differences; strong correlation between severity of malocclusion and treatment needs.	Single-center study; cross-sectional design; potential recall bias.
Study 1 [13]	Cross-sectional	200	Found a high prevalence of malocclusions among children with special healthcare needs, particularly in those with developmental disabilities.	Limited to a single geographic region; potential selection bias.
Study 2 [14]	Longitudinal	150	Identified that early orthodontic intervention in children with special healthcare needs resulted in improved dental outcomes over time.	Long follow-up period required; loss to follow-up was significant.
Study 3 [15]	Cross-sectional	180	Reported a significant relationship between specific types of special healthcare needs and malocclusion patterns, with behavioral disorders showing unique malocclusion profiles.	Did not account for socioeconomic status; self-reported data limitations.

This cross-sectional study of 140 participants found a statistically significant association between age groups and malocclusion kinds, but not genders. A strong correlation was discovered between malocclusion severity and treatment need. Study 1, which also used a cross-sectional approach, indicated that malocclusions were prevalent, especially in children with developmental disabilities. Single-center designs and selection biases limited the research. The second trial, which followed 150 children, showed that early orthodontic therapy benefited children with special healthcare needs. This longitudinal perspective supports the current study's recommendation for early identification and accelerated therapy. Long-term studies have challenges such long follow-up and high loss to follow-up. The third cross-sectional study of 180 participants indicated that specific healthcare requirements were substantially associated with malocclusion patterns. The study's lack of socioeconomic consideration casts doubt on its conclusions, but it supports the premise that different healthcare demands have different malocclusion patterns. These studies demonstrate the necessity of longitudinal research involving many centres to promote generalizability and give comprehensive orthodontic treatment regimens for children with special medical needs.

Limitations of the Study

The study only used data from two/three area, thus the results may not apply to other populations.

Regional differences in healthcare, social position and cultural norms may affect malocclusions and orthodontic treatment. The study's cross-sectional design examines malocclusion treatment needs and prevalence at one time. Longitudinal research is needed to understand orthodontic treatments' long-term consequences and malocclusion development. Recall bias and subjectivity in clinical assessments might result from patient-reported data and clinical examinations. Future studies could increase diagnostic reliability and accuracy by using objective measurements and better imaging. This study did not examine the psychological and social impacts of orthodontic treatment and malocclusions on special-needs children.

Recommendations for Future Research

Multi-center study on diverse geographic and socioeconomic conditions could improve understanding of malocclusion therapy and prevalence in paediatric groups with unique healthcare requirements. This would boost findings' external validity. A longitudinal study of malocclusions and orthodontic treatment outcomes could help explain their natural history and the long-term efficacy of different treatments. Objective measurements like digital dental models and 3D imaging may improve malocclusion diagnosis and treatment outcomes. Studying the psychosocial consequences of orthodontic treatment and malocclusions on children with special healthcare requirements might help address their physical and mental health demands. Intervention trials show that preventative strategies and early orthodontic therapies can reduce malocclusion severity and progression in children with special healthcare needs.

Conclusion

This study examined paediatric children with special healthcare requirements' orthodontic treatment needs and malocclusion prevalence at Nalanda Medical College and Hospital in Patna & Bhagawan Mahavir institute of medical sciences, Pawapuri, Bihar. While there was no statistically significant difference between sexes, age groups and malocclusion types were strongly correlated. Orthodontic therapy closely correlated with DAI malocclusion severity. Pre-existing disorders affect dental maturation and oral health treatment, as seen by different malocclusion patterns across special healthcare needs. The therapeutic value of these discoveries cannot be overstated. It is important to study the prevalence and types of malocclusions in paediatric children with special healthcare needs since early detection and treatment can improve dental results and quality of life.

This study emphasises the need for personalised orthodontic treatment programmes for all patients, especially those with developmental difficulties, behavioural disorders, or long-term health issues.

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