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Original Research Article

Early Orthodontic Treatment Need in Paediatrics Age: A Prospective Observational Study in the Eastern India

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Abstract:

Background: The early diagnosis of malocclusion is significant to assess the requirements of interceptive orthodontic treatment among children. The various clinical signs that can signify the requirement for orthodontic treatment include cross bite, increased over jet, limited eruption space and presence of certain oral habits.

Aim: To determine the frequency of interceptive orthodontic treatment needs in children aged between 4 to 10 years who visited the Department of Dentistry, Anugrah Narayan Magadh Medical College & Hospital (ANMMCH), Gaya ji, Bihar and to analyze the orthodontic features related to age and gender.

Methodology: The design of a prospective observational study was explained for six months, with 120 children in the age group of 4-10 years. The clinical variables considered were cross-bite, oral habits, overjet more than 3 mm, and insufficient eruption space for maxillary lateral incisors. The data analysis was done using IBM SPSS Statistics version 26.0 software. Frequencies and percentages along with chi-square test were used for statistical analysis.

Results: According to the artificial data set, 46 children (38.3%) showed evidence of treatment need. The prevalence of cross bite was 15.0%, oral habits 12.5%, and overjet 10.0%. There was no statistical significance in treatment need with respect to gender, even though female patients had higher treatment need percentage (42.9%) compared with male patients (34.4%), $p = 0.337$. The same was true for age groups, $p = 0.465$.

Conclusion: These are some examples of what research has found, which emphasizes the need for orthodontic evaluation among young children. However, real-life cases have to be examined to determine their prevalence and causes.

Keywords: Interceptive Orthodontics; Malocclusion; Paediatric Dentistry; Cross Bite; Oral Habits; Orthodontic Treatment Need.

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Introduction

Malocclusion is one of the major oral health problems that occur among children and is defined as an anomaly in the positioning of teeth and the interrelation between upper and lower arches [1]. This condition occurs due to genetic, skeletal, dental, and environmental factors (including oral habits and abnormal craniofacial growth) [2]. Early detection of malocclusion is crucial in terms of assessment of the necessity of the interception orthodontic treatment. The concept of interception orthodontic treatment means identification and management of developing malocclusions in childhood [3]. Its purpose is to deal with particular dental problems at an appropriate stage of growth [4]. Anterior or posterior cross bite, excessive overjet, lack of space for eruption of permanent teeth, and oral habits such as finger-sucking, mouth-breathing, and tongue-thrust can serve as some of the characteristics of developing need for treatment [5]. Clinical importance of the mentioned characteristics lies in the type of the problem, its seriousness, and possible consequences for the dentofacial development [6].

It is important to highlight that children aged 4-10 years belong to a group which requires orthodontic examination [7]. At this age, there are some changes in primary and mixed dentition. In addition, eruption of permanent teeth and continuing craniofacial growth may reveal occlusal discrepancies that require clinical assessment [8]. For example, excessive overjet increases the chances of incisor trauma, and cross bite and lack of arch space may affect dental occlusion [9]. Identification of all of the

mentioned characteristics along with oral habits allows defining the need for orthodontic examination [10]. Distribution of the orthodontic treatment need may differ depending on age and sex of children [11]. In case of different age groups, different levels of treatment need may occur because of dental development, eruption and presence of oral habits [12]. Likewise, in order to find out whether statistically significant difference exists in relation to treatment need between males and females, it is necessary to assess treatment need in each of them [13]. The extent of knowledge of preventive dental care and availability of orthodontic evaluation is expected to vary within Indian communities [14]. Hospital-based researches may provide some helpful information on the orthodontic features of children visiting dentistry clinics [15], but results achieved in them may not be representative of the whole region's population. Analysis of prevalence and distribution of such characteristics will enable identifying common problems in the clinical field and developing an appropriate plan for assessment of children's dental health needs [16]. Thus, the current study was conducted with the objective of analyzing the prevalence of the necessity of interceptive orthodontic treatment among children of 4–10 years old. The specific goals were to determine the distribution of orthodontic features indicating early treatment need, to explore the relationship between gender and treatment need, and the relationship between age groups and treatment-need status.

Methodology

This research was carried out in order to evaluate the frequency of interceptive orthodontic treatment need in children from Eastern India. The method of research employed a prospective observational approach in accordance with the ethically approved research protocol. Data was collected by conducting clinical examinations and referring medical history records from the Department of Dentistry, Anugrah Narayan Magadh Medical College & Hospital (ANMMCH), Gaya, Bihar, India.

Study Design: A study was carried out in a prospective manner to determine the prevalence of interceptive orthodontic treatment need (IOTN) in children of 4-10 years of age visiting the Department of Dentistry at ANMMCH, Gaya ji, Bihar. It consisted of clinical evaluation of certain orthodontic features along with data related to demographics and medicine. There was no form of treatment done for the purpose of research.

Study Area: This research was carried out in the Department of Dentistry, Anugrah Narayan Magadh Medical College and Hospital (ANMMCH), Gaya ji, Bihar, India. ANMMCH acted as the center for conducting the research on interceptive orthodontic treatment need among children of the Eastern Indian region.

Study Duration: This research was carried out for six months from March 2026 to August 2026, after receiving permission from the Institutional Ethics Committee of ANMMCH, Gaya, Bihar. The process of selecting participants, examination, and collecting information was done during the permitted study period.

Study Participants: Children ranging from 4 to 10 years of age who visited the Department of Dentistry, ANMMCH, Gaya, were included as the subjects of the study. The inclusion and exclusion criteria of the study have been defined below.

Inclusion Criteria

The following inclusion criteria were used for the selection of participants:

- Children in the age group of 4-10 years showing adequate cooperation during the examination.
- Children irrespective of gender.
- Children having their parents/legal guardian's consent in writing for participating in the study.
- Children visiting the department for the first time for the purpose of orthodontic assessment and have never been treated before.
- Children not suffering from any systemic disease.
- Participants able to understand English or Hindi language.
- Participants completing all the sections of the study questionnaire/assessment form.

Exclusion Criteria

The following groups of people were excluded from the study:

- Critically ill children or children having systemic disease.
- People who have received previous orthodontic treatment.
- Children not cooperating in clinical examination.
- Children whose parents or guardian did not give consent for the participation of the child in the study.

Sample Size: The total number of pediatric participants in the study was 120. The participants of the study were selected from those children aged between 4 to 10 years, who visited the Department of Dentistry of ANMMCH, Gaya, Bihar, India within the six months duration of the study and met the specified eligibility criteria for selection. The orthodontic traits of these participants were analyzed as per the set study protocol.

Procedure: After obtaining the necessary ethical approvals and consent from the participants'

parents/guardians, eligible children participated in the research study. Demographic and clinical data about age, gender and other relevant parameters were obtained through the patients' medical records and evaluation forms. A clinical assessment was done in order to detect the orthodontic traits that indicate the necessity for interceptive orthodontic treatment. The assessment involved an evaluation of anterior cross bite, cross bites unilateral/bilateral with/without midline deviation and oral habits such as sucking habits, mouth breathing, tongue thrusts. An overjet over 3 mm and insufficient space for the eruption of the maxillary lateral incisors (teeth 12 and 22) were also evaluated. In order to eliminate the variability between different operators, all the patients underwent the examination conducted by the same examiner with the help of standard clinical equipment, namely a dental mirror and probe. Presence of any one of the listed orthodontic traits was regarded as a positive interceptive orthodontic treatment need, based on the accepted study protocol. Next, the participants were divided into two groups depending on whether they had orthodontic characteristics that require interceptive orthodontic treatment or not. Based on the collected data, the prevalence and distribution of the orthodontic traits and their possible differences according to the gender were determined.

Statistical Analysis: The analysis of the data was done using IBM SPSS Statistics version 26.0. Descriptive statistics such as frequency and percentage were obtained for the purpose of presenting the demographic profile of the participants and the incidence of the individual orthodontic features. A comparison was made between the children that had the specific characteristics that would necessitate interceptive orthodontic intervention, and those that did not qualify according to the specific criteria for treatment. For categorical factors, such as the distribution of orthodontic traits among male and female children, we utilised a chi-square test to find any significant associations. Statistical significance was established when the p-value was less than 0.05.

Result

The number of 120 paediatric patients aged 4–10 years was included in the hypothetical study. The results were analyzed with respect to the prevalence of IOTN, frequency of specific orthodontic traits, and variation among different ages and gender.

Table 1 provides an overview of the demographic breakdown of the subjects. The majority of the subjects were those from the age range of 6-7 years (38.3%), with other children aged 8-10 years (35.0%). Male subjects represented 53.3% while female subjects comprised 46.7%.

Table 1: Demographic characteristics of the study participants

Characteristics	Category	n	%
Age group	4–5 years	32	26.7
	6–7 years	46	38.3
	8–10 years	42	35.0
Sex	Male	64	53.3
	Female	56	46.7
Total		120	100.0

According to Table 2 below, 46 individuals (38.3%) were categorized as having interceptive orthodontic need for treatment due to the presence of at least one orthodontic feature under evaluation. The rest 74 children (61.7%) did not have any of the mentioned features. Therefore, just over a third of our hypothetical study population had orthodontic features requiring early orthodontic assessment.

Table 2: Prevalence of interceptive orthodontic treatment need

Treatment-need status	n	%
Treatment need identified	46	38.3
Treatment need not identified	74	61.7
Total	120	100.0

From Table 3, it can be seen that cross bite was the most common orthodontic finding found in the study sample, occurring in 15.0%. The presence of oral habits occurred in 12.5%, while increased over jet more than 3 mm was 10.0%. Inadequate eruption space for maxillary lateral incisors was the least common finding, 5.8%.

Table 3: Distribution of individual orthodontic findings among the study participants		
Orthodontic finding	**n**	**%**
Unilateral or bilateral cross bite	18	15.0
Anterior cross bite	9	7.5
Oral habits	15	12.5
Increased overjet greater than 3 mm	12	10.0
Inadequate space for eruption of teeth 12 and 22	7	5.8

Sucking habits were observed to be the most common individual oral habit, followed by mouth breathing and tongue thrusting, as shown in Table 4. In total, 15 children (12.5%) were found to exhibit some oral habits under observation. The study results demonstrated the importance of assessing oral habits during regular dental checkups in pediatrics.

Table 4: Distribution of oral habits among the study participants		
Oral habit	**n**	**%**
Finger or other sucking habits	8	6.7
Mouth breathing	7	5.8
Tongue thrust	5	4.2
Children exhibiting at least one assessed oral habit	15	12.5

The Table 5 shows that the percentage of treatment need is higher in females (42.9%) compared to males (34.4%). Nevertheless, the result was statistically insignificant (($\chi 2$ = 0.92), (p=0.337)). Thus, the hypothetical test has not shown any statistically significant correlation between gender and treatment need for interceptive orthodontics.

Table 5: Association between sex and interceptive orthodontic treatment need			
Sex	**Treatment need identified, n (%)**	**Treatment need not identified, n (%)**	**Total**
Male	22 (34.4)	42 (65.6)	64
Female	24 (42.9)	32 (57.1)	56
Total	46 (38.3)	74 (61.7)	120

Statistical test	**Value**
Pearson chi-square (χ^2)	0.92
Degrees of freedom	1
p-value	0.337

According to Table 6, the largest percentage of children who required treatment was reported among those aged 4–5 years (46.9%), followed by 6–7 years (37.0%) and 8-10 years (33.3%). Despite the reduction of percentages from one age category to another, there is no significant relationship between age and treatment-need status (($\chi 2$=1.53), (p=0.465)).

Table 6: Association between age group and interceptive orthodontic treatment need			
Age group	**Treatment need identified, n (%)**	**Treatment need not identified, n (%)**	**Total**
4–5 years	15 (46.9)	17 (53.1)	32
6–7 years	17 (37.0)	29 (63.0)	46
8–10 years	14 (33.3)	28 (66.7)	42
Total	46 (38.3)	74 (61.7)	120

Statistical test	**Value**
Pearson chi-square (χ^2)	1.53
Degrees of freedom	2
p-value	0.465

Discussion

Current practice study is focused on the simulation of prevalence of interceptive orthodontic treatment need among 120 children in age of 4-10 years visiting ANMMCH, Gaya, Bihar. In this regard, the following aspects have been discussed: prevalence, specific orthodontic characteristics and association with age and sex. Since the findings were simulated for practice purposes, the comparison with other scientific publications should be considered as illustrative and not as evidence of actual clinical outcome.

In the present simulation study, 38.3% of children were found to have the interceptive orthodontic treatment need. Prabhakar et al. (2014) [17] researched prevalence of malocclusion and need for early orthodontic treatment among Indian children, emphasizing the necessity to detect developing occlusal problems at young age. Also, Mehta et al. (2022) [18] conducted a systematic review and meta-analysis of the prevalence of malocclusion in Indian children and adolescents, showing significant variability between results of different researches. Variations in diagnostic criteria, age ranges and sampling approaches prevent direct comparison of the findings with the current simulation study. However, those publications show the importance of clear definition of the orthodontic treatment need while describing the prevalence.

The importance of regional specific early orthodontic examination is shown in the study by Galui and Pal (2021) [19], in which the need for orthodontic treatment among children aged 6-9 years in West Bengal was researched. This publication and the current practice investigation are concerned with pediatric orthodontics in Eastern India. However, the school-based assessment made in this study is different from the hospital-based one, which was used in the current practice data. Thus, comparisons should be considered in the context of common problem, but not in the context of numerical prevalence.

With respect to individual orthodontic features, the results of simulation indicated a presence of unilateral or bilateral cross bite in 15.0%, oral habits in 12.5%, increased overjet in 10.0%, anterior cross bite in 7.5%, and deficiency in eruption space for maxillary lateral incisors in 5.8% of patients.

Singh et al. (2019) [20] conducted an investigation of malocclusion and orthodontic treatment need in schoolchildren aged 12-15 years in Patna, Bihar. Their study can be seen as additional information about the regional specifics of the issue under discussion; however, the difference in age group and the criterion of diagnosis used (Dental Aesthetic Index (DAI)) makes it impossible to compare their results with those of the current study.

The analysis of differences between sex showed that treatment need was detected in 42.9% of females and 34.4% of males. Still, the correlation is not statistically significant ($\chi2=0.92$), ($p=0.337$). Therefore, there were no statistically significant connections between sex and treatment need in the simulated results of the analysis. Treatment need was the highest in the age group of 4-5-year-old children (46.9%), 6-7 year-olds (37.0%) and 8-10 years-old (33.3%). Still, the age group correlation was also non-significant ($\chi2=1.53$), ($p=0.465$).

Thus, in general terms, the clinically reviewed literature proves the necessity to perform a systematic assessment of the cross bite, increased overjet, eruption-space deficiencies and oral habits in a pediatric dental clinic. Still, the current analysis had a number of limitations including the limited size of the hypothetical sample, hospital-based setting and simulated, rather than clinical data. Its results cannot be generalized to the broader population of Eastern India or be presented as clinical evidence.

In conclusion, the analysis of five selected studies proved the importance of the early orthodontic examination and the impact of the method of diagnosing and peculiarities of the population being examined on the rate of the orthodontic treatment need. This practice analysis demonstrated the methodology of evaluation of prevalence, clinical and demographic factors in the hospital-based observational study. The actual conclusions regarding the children visiting ANMMCH, Gaya, would require conducting the analysis of real clinical data.

Conclusion

In this current practice study, the need for interceptive orthodontic treatment in 120 children between 4-10 years was determined through a simulated exercise conducted within the Department of Dentistry, ANMMCH, Gaya, Bihar. The simulated findings revealed that 38.3% of the children needed treatment due to various clinical features including cross bite, oral habits, and increased overjet. Although female children (42.9%) were found to have more needs for treatment than male children (34.4%) and 4–5-year-old children (46.9%), no statistical relationship existed between sex or age of the child and treatment need. This is an example of how the need for interceptive treatment in children can be detected through proper paediatric dental assessment. It is important to note that since the results obtained are simulated and not from actual clinical practice, the validity of these results should be tested clinically.

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