Prevalence of Malocclusion in Primary Dentition in Southeast Part of Haryana, India: A Cross-sectional Study

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ABSTRACT

Objective: The purpose of this study was to assess the prevalence of malocclusion in primary dentition of children in southeast part of Haryana state in India.

Materials and methods: About 1,540 children of age 3–5 years from 10 nursery and 10 primary schools were selected across Rohtak city. The children were selected by stratified random technique and examined at their respective schools. Oral examination was done to record the parameters such as molar relation, canine relation, crowding, spacing, midline shift, overjet, overbite, rotations, supernumerary teeth, tooth wear, anterior crossbite, and open bite. Chi-square test was used for calculating *p*-value.

Results: Class I canine relations was seen in 66.2%, flush terminal plane, mesial step, and distal step were observed in 60%, 30.8%, 9.2%, respectively. Midline shift was observed in 1.8% in maxilla and 4% cases in mandible. Rotations were more prevalent in mandibular dentition (26%). Supernumerary teeth were found to be 0.4% in maxillary arch. Spacing was reported in 81.9% in maxillary dentition and 69% in mandibular dentition. Increased overjet and overbite was present in 10.3% and 30.9%, respectively. Anterior crossbite and anterior open bite were seen in only 1% and 1.9% children, respectively with statistically significant higher prevalence in males. Prevalence of attritional facets were reported 13% in enamel and 8% in dentin.

Conclusion: There is a high prevalence of class I canine relation, flush terminal plane molar, and spaced dentitions, suggestive of low prevalence of malocclusion in primary dentition in Rohtak district of Haryana state. The results may provide a baseline data for further research on a larger scale.

Keywords: Flush terminal plane, Occlusal characteristics, Primary dentition.

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INTRODUCTION

Malocclusion is a developmental anomaly of dental arches that may occur in both primary and permanent dentition. It is a well-known fact that if discrepancies were found in occlusal characteristics of deciduous dentition, then there are high chances of getting the similar occlusal problems in the succeeding permanent teeth.¹ Generally, etiology of malocclusion involves interaction of hereditary, congenital, and acquired factors. Depending upon the severity of malocclusion, it may cause esthetic discomfort, functional damage and disability.² The dictum “the early age is the golden age” always holds good to treat malocclusion. If a malocclusion is identified early, the developing malocclusion can be treated with the help of preventive and interceptive measures. Flush terminal plane molar relationship, spaced dentition, less overjet, and overbite are characteristic features of primary dentition.

To determine the oral health status of population and to see the changes in occlusion during growing stages of children, the role of epidemiological studies is important. Very few literatures are available on the occlusal characteristics of primary dentition in India, as most of the studies have done on children above 6 years of age. Thus, the present study was undertaken to obtain baseline information about occlusion and its characteristics in 3–5 years old children in Rohtak district of Haryana, India.

MATERIALS AND METHODOLOGY

The present study was conducted in the Department of Pedodontics and Preventive dentistry of Post Graduate Institute of Dental Sciences, Rohtak. The study was based on the examination of 1,540 Children aged between 3 and 5 years, out of which 770 were

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males and 770 were females. Selection of children were done from nursery and primary schools spreading over four geographic zones of Rohtak city (north, south, east, and west) of Haryana. Five schools were selected randomly from each zone. Thus a total of 20 schools, 10 from nursery and 10 from primary sections were selected for the study. The children were selected by stratified random technique and examined at their respective schools. The age, address, and socioeconomic status was obtained from their school records. The examination was performed under daylight in the classroom. Clinical evaluation was performed on all children in upright position and biting in maximal intercuspation in compliance with the international standards of infection control protocol in a classroom setting. The Foster and Hamillton⁴ criteria was applied in

the assessment of the prevalence of malocclusion in the deciduous dentition in an examination chart.

After the due ethical clearance by the institutional ethical committee, consent was obtained from concerned school authorities as well as from concerned district education officer.

Inclusion Criteria

- Children in between the age of 3 and 5 years.
- Health and age-appropriate physical development (within normal limit).
- Presence of only deciduous teeth with no erupted permanent teeth.

Exclusion Criteria

- Children having mixed and permanent dentition.
- Children having proximal caries.
- Uncooperative children and abnormal physical development.

Canine relation, molar relation, spacing, crowding, rotations, midline shift, overjet, overbite, anterior crossbite, and open bite were evaluated among 1,540 children.

Canine relation: When the cusp tip of the maxillary primary canine and distal surface of mandibular primary canine are in the same vertical plane then it is Class I canine relation. In Class II, the cusp tip of the maxillary primary canine tooth is mesial and in Class III it is distal to the distal surface of the mandibular primary canine.⁴ **Molar relation** was classified as flush terminal plane, mesial step, and distal step depending upon the relationship of distal surfaces of upper and lower second primary molar.⁵ **Spacing** was graded according to Kising and Krebs⁶ criteria.

Overjet: Overjet is measured with the help of millimeter gauge, it is the distance between the incisal edges of the upper and lower primary incisors. It is registered as ideal overjet- when equal to 2mm, increased-more than 2mm, and decreased or reverse overjet in case of less than 2mm.⁴ Measurement of vertical overlapping of upper and lower central incisors is **overbite**. It was recorded as ideal, when incisal edges of lower incisors touches the palatal surfaces of the upper central incisors in centric occlusion, increased, if the lower incisors touches the palate, and when they are not in contact either with the upper incisors or the palate, recorded as reduced overbite.⁴

Statistical Analysis

The Microsoft Excel spreadsheet was made with the help of collected information, then coded correctly and later cleaned for any possible errors in SPSS (Statistical Package for Social Sciences) for Windows version 23. For categorical variables Pearson's Chi-square test was used to evaluate differences between independent groups. In case, expected cell count was less than 5 in > 20% cells, Fisher's exact test was used. All tests were performed at 5% level of significance, thus a difference was considered statistically significant if the *p*-value was less than 0.05.

RESULTS

Result showed that most prevalent canine relation was Class I that were present in 66.2% followed by Class II (33%), and Class III (0.8%) canine relation. No significant association was found between male and female (Table 1). Midline shifting was more common in mandible (4%) as compared to maxilla (1.8%). Flush terminal plane (60%) was the commonest molar relation followed by mesial terminal plane (30.8%) and distal terminal plane (9.2%) in the examined population. (Table 2).

Prevalence of rotated teeth was more in mandibular arch (26%) as compared to maxillary arch (9%) (Table 3). Supernumerary teeth was found 0.3 % in maxillary arch only of the examined children. Crowding was reported 18% in maxillary dentition and 31% in mandibular dentition (Fig. 1). Spacing was present in 81.9% in maxillary dentition and 69% in mandibular dentition (Fig. 2). Nearly 10.3% cases were of increased overjet and overbite was present in 30.9%, whereas reduced overjet and overbite was noticed in 1.2% and 9.7%, respectively in the examined children (Figs. 3 and 4).

Anterior crossbite was seen in 15 (1%) children, out of which 11 were males and 4 were females (Table 4). Statistically significant prevalence was present in males. Anterior open bite was reported in 1.9% children with statistically significant higher prevalence in males than females (Table 5). Prevalence of attritional facets were reported 13% in enamel and 8% in dentin.

DISCUSSION

At the age of 3 years, the deciduous teeth are completely erupted and establishing their occlusal relationship which last at the age of 6 years until the first permanent tooth begins to erupt in the oral cavity.⁷ For early interceptive treatment, it is important to understand the relationship between primary and early permanent dentition.⁸ In this study, Class I (87%) **canine relation** was most common followed by Class II (8%) and Class III (5%) in age group of 3–5 years. Similar results were found by Shavil RG et al.⁹ in primary dentition of children of Davangere city in which Class I canine relation was found to be more prevalent (90%) followed by Class II (6.4%) and Class III (6%) and Vegesna M et al.¹⁰ in 3–6 years old Dravidian children found that Class I canine relation to be more prevalent (81.3%) than Class II (5.9%) and Class III (5.8%). On the contrary, study conducted in Gurugram by Yadav NR et al.¹¹ noted the prevalence of Class I canine relation (67.2%) was much less than the prevalence recorded in our study and they also noted increased prevalence of Class II canine relation that is, 31.6%, whereas study conducted in Nigerian children by Otuyemi OD et al.¹² found increased prevalence of Class III canine relation (20.2%).

In our study, flush terminal plane (60%) and mesial step relationships (30.8%) were observed with high prevalence. Similar results were seen by Bhayya DP et al.¹³ study in Bagalkot city of India, that 52.5% had a flush terminal molar relationship. A study conducted by Yadav NR et al.¹¹ found that flush terminal plane

Table 1: Distribution of canine relation by gender of subjects (*n* = 1,540)

Gender	Canine relation			Significance*
	Class I	Class II	Class III	
Male (<i>n</i> = 770)	512 (66.4%)	251 (31.4%)	7 (0.9%)	<i>p</i> = 0.917 not significant
Female (<i>n</i> = 770)	507 (65.8%)	257 (34.7%)	6 (0.8%)	
Total (<i>n</i> = 1,540)	1,019 (66.2%)	508 (33.0%)	13 (0.8%)	

Table 2: Distribution of molar relation according to gender of subjects

Gender	Molar relation			Significance*
	FTP	MS	DS	
Male (n = 770)	477 (61.9%)	231 (30.0%)	62 (8.2%)	p = 0.169 (not significant)
Female (n = 770)	447 (58.1%)	243 (31.6%)	80 (10.4%)	
Total (n = 1,540)	924 (60.0%)	474 (30.8%)	142 (9.2%)	

Table 3: Distribution of rotation according to gender of subjects

Gender	Rotation		Significance*
	Maxillary arch	Mandibular arch	
Male (n = 770)	71 (9.2%)	97 (12.6%)	p = 0.59 (not significant)
Female (n = 770)	67 (8.7%)	103 (13.4%)	
Total (n = 1,540)	138 (9.0%)	200 (26.0%)

Fig. 1: Distribution of crowding of teeth according to gender of subjects **Fig. 2:** Distribution of spacing of teeth according to gender of subjects **Fig. 3:** Distribution of overjet of teeth according to gender subjects **Fig. 4:** Distribution of overbite according to gender of subjects

(62.4%) was prevalent in Gurugram population followed by mesial step (25.2%) and distal step molar relationships (12.4%). A study done by Adersona AA¹⁴ found mesial step molar relationship was more prevalent in both the African American and European children, which was opposite to our results. According to Clinch LM¹⁵ normally molar relationship in primary dentition was straight

(flush) until eruption of permanent first molar. However many studies had claimed straight or mesial terminal planes is normality and our findings also support the same.

Midline shift were present in 5.84% children in our study with a higher prevalence in boys and in mandible, similar finding was seen by Bhayya DP et al.¹¹ in Bagalkot city of India (6%), the study done

Table 4: Distribution of anterior crossbite according to gender of subjects

Gender	Anterior crossbite		Significance*
	Number	Percentage	
Male (n = 770)	11	1.4%	p = 0.001 (significant)
Female (n = 770)	4	0.5%	
Total (n = 1,540)	15	1.0%	

Table 5: Distribution of anterior open bite according to gender of subjects

Gender	Anterior open bite		Significance*
	Number	Percentage	
Male (n = 770)	21	2.7%	p < 0.001 (significant)
Female (n = 770)	9	1.2%	
Total (n = 1,540)	30	1.9%	

by Alamoudi N¹⁶ in Saudi Arabian children reported a prevalence of 10.5% which was higher than our results. The most common cause of dental midline shift is early shedding of the deciduous teeth that may lead to lack of space and midline discrepancy in the permanent dentition.

Crowding is one of the most common features in contemporary dentition. In our study, crowding was seen in 31% in mandibular anterior teeth and 18% in maxillary dentition. These results were similar to a study done by Yadav et al.¹¹ in Gurugram city of Haryana showed 31.2% crowding in mandibular arch and 6% in maxillary arch. The study done by Abu Alhaija and Qudeimet¹⁷ who reported crowding in 38.2% and 21.6% in upper and lower arches, respectively in Jordan preschool children which was higher than our study. In contrast, Bhayya DP et al.¹³ in Bhagalkot city of India found only 4.6% crowding in mandibular arch and 1.7% in maxillary arch. If there is crowding or tight contact is present in deciduous dentition then chances of crowding are increased in the permanent dentition. Generally, **spacing** should be present in all upper and lower primary teeth. In our study, we observed 81.9% of spacing in maxillary teeth and 69% in mandibular teeth with more common in males than females. Mostly spacing was present in the anterior region. The study conducted by Suma G and Das VM² and Thilander B et al.¹⁸ also noted that spacing was more frequent in males and crowding was more in females but on contrary, study done by Yadav NR et al.¹¹ in Farukhnagar, Gurugram reported spacing was more prevalent in females and crowding was more common in males that indicates there are high chances of malocclusion in permanent dentition in males rather than females.

In present study, 88.4% of examined population showed an **ideal overjet**, 10.3% have increased overjet and only 1.2% of study population showed decreased overjet (which includes anterior crossbite cases that are 1% of total sample). The results were in association with the study of Vegesna M et al.¹⁰ in Dravidian children and Yadav NR et al.¹¹ in Haryana children found an increased overjet in 8.9% and 7.6%, respectively. On the converse, Ravn¹⁹ found 27% of Copenhagen children have increased overjet whereas Foster and Hamilton⁴ reported a very higher percentage (72%) of children with increased overjet.

About 59.41% of studied population had **ideal overbite**, while 30.9% had increased overbite and 9.7% were reported with decreased overbite which also included anterior open bite (1.9%). Vegesna M et al.¹⁰ found that ideal overbite, increased overbite and decreased bite was seen in 72.7%, 19.4%, and 2.5% of children, respectively which also includes 1.5% anterior open bite. Yadav NR et al.¹¹ found an increased overbite in 12.4% of study population.

In the present study, attrition was noted in 20.9% of children, out of which enamel and dentin involvement were 13% and 8%, respectively. Mild tooth wear can be considered as physiological process.

Anterior crossbite was found in 0.97% of children. In the study population of Deepak P Bhayya¹³ anterior crossbite was seen in 1.9% and 0.5% in a study population of Hegde S.²⁰

In 1.9% of study population, **Anterior open bite** was seen. Contrary to our results, a prevalence of 37.4% in Caucasian children found by Tschill et al.¹⁵ and Thilander B et al.¹⁸ found prevalence of 10.7%, which was very much higher than our study. In present study, no case of scissor bite and proclination was reported in deciduous dentition.

CONCLUSION

It can be concluded from our study that Class I canine relation, flush terminal plane molar relation, spaced dentition, ideal overjet, and overbite were amongst the most common occlusal characteristics found in our study population without any gender variation. Anterior crossbite and open bite were more prevalent in males than females. So our results, indicates that there are low prevalence of developing malocclusion in the primary dentition of Rohtak children in Haryana, India. For prevention and early management of dental malocclusion it is necessary to conduct a study including other and nearby area of Rohtak district with larger sample sizes.

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