

Occlusal traits of deciduous dentition of preschool children of Indian children

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Abstract

Objectives: To assess the occlusal relationship, canine relationship, crowding, primate spaces, and anterior spacing in both maxillary and mandibular arches of primary dentition of Indian children of Wardha District and also to study the age-wise differences in occlusal characteristics. **Materials and Methods:** A total of 1053 (609 males and 444 females) children of 3-5 year age group with complete primary dentition were examined for occlusal relationship, canine relationship, crowding, primate spaces, and anterior spacing in both maxillary and mandibular arches. **Results:** The data after evaluation showed significant values for all parameters except mandibular anterior spacing, which was 47.6%. Mild crowding was prevalent at 5 year age group and moderate crowding was common at 3 year-age group. **Conclusion:** Evaluated parameters such as terminal molar relationship and canine relationship were predominantly progressing toward to normal but contacts and crowding status were contributing almost equal to physiologic anterior spacing. Five-year-age group showed higher values with respect to all the parameters.

Keywords: Anterior spacing, canine relationship, crowding, occlusal relationship, primate spaces

Introduction

Children differ considerably from each other, even within the same family, with regard to growth factors, skeletofacial patterns, and spacing of teeth.^[1] Occlusion of growing child is regarded as dynamic rather than static relation between facial structures.

Characteristic occlusal features of primary dentition consist of mesial step, distal step and flush molar relationships, class I canine relationship, physiologic spaces, primate spaces.

Relationship of maxillary and mandibular deciduous canines is one of the most stable relationships in primary dentition, which influences the canine relationship in permanent dentition. As suggested by Davies *et al*,^[2] canine is an essential tooth to consider in the developing occlusion. In an ideal" adult occlusion this tooth provides the anterior guidance during an excursive movement of the mandible.

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Occlusion in the primary dentition plays a significant role in determining occlusion in permanent dentition. Crowding may cause malocclusion in primary dentition. Generalized spacing of the primary teeth is a requirement for proper alignment of the permanent incisors.^[3]

Such data seems to be deficient in the Indian population. So this study was carried out to assess the occlusal characteristic features in 3-5 year age group of Wardha region in Maharashtra State of India.

Aims and Objectives

Aim

The study aimed to study the occlusal characteristic features in preschool children of Indian population.

Objectives

To study the occlusal relationship, canine relationship, crowding, primate spaces, and anterior spacing in both maxillary and mandibular arches of primary dentition of Indian children of Wardha District.

To assess the age-wise comparison of occlusal characteristic features of children in primary dentition.

Materials and Methods

This survey is based on dental examinations of 1053 children, 3-5 years of age, from Wardha, India. Letters explaining the nature of the study and informed parental consent for the child's participation were sent to the parents through school principal. The age of each child was obtained from the preschool records and by questioning the parents. Dental examinations were completed at the primary schools. The criteria for selecting the children consisted of choosing those having all of their primary teeth with no eruptions of

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permanent teeth. All children with missing teeth were excluded from the study. The distribution of the sample according to age is given in Table 1. The dentition was examined under natural daylight and the data was recorded on a specially prepared proforma in which the molar and canine occlusions were recorded according to the methods described by Foster and Hamilton.^[4] Total 349 cases of crowding and those who were unable to occlude in centric relation were recorded by taking their impressions with alginate impression material and preparing casts with stone plaster. The instruments used for the study were impression trays and Vernier caliper. The molar relations were recorded as flush, mesial step and distal step with respect to the termination pattern of the dental arches in centric occlusion. Canine relationship was recorded as follows:

Class I: The tip of the upper primary canine in the same vertical plane as the distal surface of the lower primary canine in centric occlusion.

Class II: The tip of the upper primary canine in anterior relationship to the distal surface of the lower primary canine in centric occlusion.

Class III: The tip of the upper primary canine in posterior relationship to the distal surface of the lower primary canine in centric occlusion.

Molar and canine occlusions for each child were recorded separately for the left and right sides of the dentition. Proforma also consisted of the presence or absence of primate spaces and spacing among the anterior teeth in the upper and lower arches. Crowding (anterior and posterior) among both arches was recorded on the cast with the help of Vernier caliper and score given according to degree of crowding (mild = 1-3 mm, moderate = 4-6 mm, severe = more than 6 mm).

Statistical analysis

The data was analyzed using Statistical Package for Social Science (SPSS) version 11.5 (SPSS Inc., Chicago, IL, USA). The *P* value was taken as significant when less than 0.05. A Chi-square test was used to compare the proportions of different occlusal characteristics among different age groups.

Results

Distribution of dental parameters among the 3-5 years groups are summarized in Table 1.

Sex distribution

In this study, all three age groups were almost equally distributed among males 609 (57.8%) and females 444 (42.2%).

Terminal molar relationship

Out of 1053 (100.0%) study participants examined, 603 (57.3%) presented with mesial step, followed by 327 (31.1%) with flush terminal plane, and 123 (11.7%) with distal step. When the distribution of different sagittal relationships of molars assessed with age groups, 5 years of age showed the highly

significantly proportion value compared to age 3 and 4 years ($P < 0.00$).

Canine relationship

Out of 1053 children, class I molar relationship was found in 497 (47.20%) children, class II in 451 (42.83%), and class III in 105 (9.97%) children. A 5-year-old children showed higher values (259 [24.60%]) than 3 year (103 [9.78%]) and 4 year (135 [12.82%]) children.

Crowding

Crowding among the three age groups was recorded and score given according to degree of crowding (mild = 1-3 mm, moderate = 4-6 mm, severe = more than 6 mm). Among all the age groups maximum number of study participant did not show any crowding among both arches. However, 285 (27.1%) of children showed mild type of crowding, which was highly found among the 5 years of children compared to other age groups. Severe type of crowding is less commonly found among the study children 21 (2.0%), which was more among 5 years of children 12 (1.1%) compared to 3 and 4 years of age groups and the difference was statistically highly significant ($P < 0.00$).

Primate space maxilla and mandible

In this study, primates spaces on both side of maxilla and mandible was present (681 [64.7%]; 534 [50.7%]) among study participants and it was found statistically highest ($P < 0.00$) among the 5 years of children (360 [34.2%]; 297 [28.2%]), respectively. Whereas, in maxilla 42 (4.0%) and mandible 33 (3.1%) of participants showed the presence of primates spaces on one side of arch.

Presence of maxillary and mandibular anterior spacing

Statistically significant amount of anterior spacing was found among both the arches ($P < 0.002$). Anterior spacing maxilla 520 (49.4%) and mandible 493 (46.8%) was higher compared to presence of contact and crowding in an anterior region. When the presence of anterior spacing in maxillary and mandibular arches was assessed between different age groups, it was found highest among 5 years of age (277 [26.3%]; 271 [25.7%]), respectively.

Discussion

Four important features usually described while considering a normal occlusion are spacing of incisors, deep incisor overbite and relationship of the distal surface of the upper and lower second primary molars and the primate spaces.^[1] Primate spaces are normally present from the time teeth erupt. Developmental spaces between the incisors are also often present from the beginning, but become somewhat larger as the child grows and the alveolar processes expand.^[3]

Occlusal traits in primary dentition can act as a potential predictor for occlusal characteristics in permanent dentition.

Table 1: Comparative evaluation of occlusal trait in 3, 4 and 5 years of age group

Dental parameters	Age			Total (%)
	3 years (%)	4 years (%)	5 years (%)	
Sex**				
Male	111 (10.50)	144 (13.7)	354 (33.6)	609 (57.8)
Female	117 (11.1)	135 (12.8)	192 (18.2)	444 (42.2)
Terminal molar relationship**				
Flush	105 (10.0)	51 (4.8)	171 (16.2)	327 (31.1)
Mesial	111 (10.5)	210 (19.9)	282 (26.8)	603 (57.3)
Distal	12 (1.1)	18 (1.7)	93 (8.8)	123 (11.7)
Canine relationship*				
Class I	103 (9.78)	135 (12.82)	259 (24.60)	497 (47.20)
Class II	92 (8.74)	121 (11.49)	238 (22.60)	451 (42.83)
Class III	33 (3.13)	23 (2.18)	49 (4.65)	105 (9.97)
Crowding**				
No crowding	135 (12.8)	207 (19.7)	381 (36.2)	723 (68.7)
Mild	69 (6.6)	69 (6.6)	147 (14.0)	285 (27.1)
Moderate	18 (1.7)	0 (0.0)	6 (0.6)	24 (2.3)
Severe	6 (0.6)	3 (0.3)	12 (1.1)	21 (2.0)
Primate space maxilla*				
Present	132 (12.5)	189 (17.9)	360 (34.2)	681 (64.7)
Absent	81 (7.7)	78 (7.4)	171 (16.2)	330 (31.3)
Present on one side	15 (1.4)	12 (1.1)	15 (1.4)	42 (4.0)
Primate space mandible**				
Present	132 (12.5)	105 (10.0)	297 (28.2)	534 (50.7)
Absent	84 (8.0)	153 (14.5)	216 (20.5)	453 (43.0)
Present on one side	12 (1.1)	21 (2.0)	33 (3.1)	66 (6.3)
Presence of maxillary anterior spacing**				
Spacing present	108 (10.3)	138 (13.1)	288 (27.4)	534 (50.7)
Contact present	48 (4.6)	90 (8.5)	123 (11.7)	261 (24.8)
Crowding present	72 (6.8)	51 (4.8)	135 (12.8)	258 (24.5)
Presence of mandibular anterior spacing				
Spacing present	87 (8.3)	138 (13.1)	276 (26.2)	501 (47.6)
Contact present	75 (7.1)	93 (8.8)	135 (12.8)	303 (28.8)
Crowding present	66 (6.3)	48 (4.6)	135 (12.8)	249 (23.6)
Total	228 (21.7)	279 (26.5)	546 (51.9)	1053 (100.0)

* = Significant; ** = Highly significant

Several epidemiological studies have assessed the occlusion of primary dentition among preschool children in different population of the world. In this study, it was observed that at the age of 3 years, flush terminal plane (10%) and mesial step (10.5%), values were almost similar. At the age of 4 years and 5 years mesial step molar relationship (19.9% and 26.8%) was more followed by flush terminal molar relationship (4.8% and 16.2%) and distal molar relationship (1.7% and 8.8%). Overall it was observed that 57.3% children had mesial step molar relationship followed by 31.1% flush terminal plane relationship and 11.7% distal relationship,

which was the lowest. These findings are concurrent with the study of Ronald,^[1] Farsi and Salama,^[5] Abu Alhajaand Qudeimat, and Hegde *et al.*,^[7] in which mesial step was most commonly observed and distal step molar relationship was least common.

Studies of Humphreys and Leighton,^[8] Kaufman and Koyoumdjisky,^[9] Nanda *et al.*,^[10] Bujwidona *et al.*,^[11] and Ravn^[12] contradict the findings of our study who reported higher percentage of children with the straight terminal type molar relationship. Other contradictory studies related to our study are those of Baume^[13] who found 76% of flush

terminal relationship, 14% mesial step and only 10% distal step molar relationship in 3-year-old children. Clinch^[14] found 42% children with normal occlusion, whereas Otuyemi *et al.*,^[15] reported majority of the Nigerian children with flush terminal molar relationship (74.5%). Kerosuo^[16] reported flush terminal relationship in African/Asian groups (97%/94%) compared to the Finnish group (84%). Sriram *et al.*,^[17] also found bilateral flush terminal plane molar relationship in Indian children of Hyderabad (72.5%) and Chennai (74%).

This study showed that class I canine relationship was 47.20% followed by class II 42.83% and class III 9.97%. Values of our study were somewhat similar to that of the study of Abu Alhaja and Qudeimat^[6] who reported that in Jordanian children, class I canine relationship was found in 57% of children, followed by class II canines in 29% and class III canines in 37%. Studies showing higher values for class I canine relationship than our study were that of Farsi and Salama^[5] who reported that 86% of Saudi children had class I canine relationship, with no significant differences between the age groups. Study of Baidas^[18] also reported higher values for class I canine relationship in 90.1% of the sample, followed by class III (7.4%), and class II (2.5%) relationship. Otuyemi *et al.*,^[15] reported the class I canine relationship (73.3%) as the most prevalent feature in Nigerian children. In this study, class I canine relationship increased as per the increase of age, i.e., at the age of 5 year it was 24.60% than at the age of 3 year (9.78%) and 4 year (12.82%).

Results of this study showed that the anterior spacing in the maxilla was 50.7% and in the mandible was 47.5%. Both the arches showed an increase in anterior teeth spacing with an increase in age, i.e., it was higher in 5 year age group (27.4% and 26.2%) as compared to 3 year age (10.3% and 8.3%). Kaufman and Koyoumdjisky^[9] showed 84.2% spacing in Israel children, Byoko^[19] showed 42% and 98% and Abu Alhaja and Qudeimat^[6] reported 61.8% spacing in maxilla and 61.1% spacing in the mandible of primary dentition of preschool Jordanian children with predilection for maxilla, which was higher than those reported in this study. Sriram *et al.*,^[17] showed spacing in primary dentition of Indian children to be 73.6% in Chennai group and 74.1% in Hyderabad group. These values in Indian children are also found to be higher than those found in our study. Study of Otuyemi *et al.*,^[15] revealed 32% generalized anterior segment spacing in Nigerian child, which was lower than those reported in this study.

This study showed that contacts between teeth were found to be 24.8% in maxilla and 28.8% in mandible, respectively. These findings match with the study related to Indian population where non-spaced dentition was 26.4% in Chennai group and 25.9% in Hyderabad group. Higher values than our study were reported by Kisling and Krebs,^[20] i.e., 37% prevalence of non-spaced primary dentition. In this study, age wise comparison showed that contacts were

found to increase with an increase in age, i.e., at the age of 5 years it was 11.7% in maxilla and 12.8% in mandible, respectively, as compared to 3 years of age. This study showed that crowding in anterior region of maxilla was 24.5% and in mandible it was 23.6% which matches with the findings of Hegde *et al.*,^[7] who revealed 26.5% crowding in single segment and 19% crowding in two segments of Indian population. Otuyemi *et al.*,^[15] showed contacts or crowding in anterior region of Nigerian children to be 18% which was lower than the present study. In this study, contacts and crowding was almost equal to the spaced dentition since there was variability in the presence of crowding and contacts arch wise, i.e., if crowding was seen in upper arch of child, then contacts were prominent in the lower arch of the same child and vice versa.

Presence of primate spaces, absence of primate spaces and unilateral presence of primate spaces was also analyzed in 3-5 year age group. It was observed that primate spaces present in the maxilla were 64.7% and in the mandible were 50.7%. Hegde *et al.*,^[7] reported lower values of primate spaces in maxilla (56.5%) and mandible (38%) in Indian population in Udaipur region as compared to our study. Otuyemi *et al.*,^[15] reported 4% anthropoid spaces in 3-4 year old Nigerian children which was lower as compared to those reported in our study. Baume^[13] reported that presence of primate spaces (67%) is the common finding in primary dentition which is usually found mesial to maxillary canine and distal to mandibular canine. Higher values compared to our study were reported by Kaufman and Koyoumdjisky,^[9] i.e., 86.5% in preschool children in Israel. Primate spaces absent in maxilla were 31.3% and that found absent in mandible were 43%. Unilateral presence of primate spaces was more in mandible (6.3%) as compared to maxilla (4%). Presence of primate spaces was found to gradually increase with increase in age. However, unilateral presence of primate spaces showed fairly constant values throughout all ages.

In this study, mild crowding was observed in 27.1% children. Moderate and severe crowding was comparatively less, i.e., 2.3% and 2%, respectively. Age wise comparison showed that mild crowding was similar at the age 3 years and 4 years (6.6%), while it was higher at 5 year age group, i.e., 14%. Moderate type of crowding was higher at 3 year age group (1.7%) as compared to 5 year age group where it was 0.6%. Severe crowding was higher at 5 year age group (1.1%) followed by 3 year (0.6%) and 4 year age group (90.3%). Results of the study of Kerosuo *et al.*,^[16] showed were contrary to the finding of this study where mild crowding was prevalent in older age group and moderate to severe crowding was more prevalent in younger age group of Tanzanian children.

Howe *et al.*,^[21] found that crowding and other malocclusions were due to insufficient maxilla size, as opposed to large tooth size. Both reduced interproximal wear and lessened

jaw growth, engendered by a softened modern diet, were considered to be responsible for a majority of cases of malocclusion. For this study, reasons cited for crowding could be due to tooth jaw discrepancy. Other factors which can be considered for crowding in present case could be the modern “civilized” diet with high sugar content and ready to eat sweet snacks due to its ready availability associated with modern eating techniques. Refined and sticky nature of dietary carbohydrates does not efficiently contribute to effective masticatory action, which indirectly is responsible for deficient jaw growth. Due to deficient jaw growth, crowding can be observed. As per Proffit *et al.*,^[3] functional factors such as mouth breathing might conceivably contribute to crowding. Study of Tschill *et al.*,^[22] showed contacts or crowding in 24% individuals between upper anterior teeth of deciduous dentition of Caucasian children and considered that such crowding in primary dentition can be the potential candidates to have crowding in their permanent dentition though improved space conditions to accommodate permanent incisors result from surface remodeling accompanying eruption of permanent incisors and leeway space.

Transition from normal deciduous dentition to normal adult molar relationship brings changes in the processes of differential growth in maxilla and mandible, which influence local changes in the dental arch. Disturbances in these normal processes can result in malocclusion, including crowding. Therefore, proper evaluation of normal characteristic features in primary dentition is important to be assessed with proper follow-up until the eruption of permanent successors to prevent potential problems of crowding, malocclusion, space loss, etc.

Conclusion

Mesial step molar relationship was predominant followed by flush terminal plane relationship and distal relationship.

Mild crowding was observed in 5-year-age group. Moderate type of crowding was higher at 3-year-age group.

Anterior teeth spacing was higher in 5-year-age group as compared to 3-year-age.

Presence of primate spaces was found to gradually increase with increase in age.

Contacts and crowding status were almost equal to physiologic anterior spacing.

Contacts and crowding of deciduous teeth showed more values that is concern to the Pedodontist for further research and follow-up with needed preventive measures.

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