

To Study the Characteristic of Occlusion of Primary Dentition in Pre School Children-An Epidemiological Study

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ABSTRACT

Background: Childhood is the mirror that reflects our future and habits that form part of our childhood are inculcated in our adulthood. Similarly the primary dentition lays down foundation stone for our permanent dentition and determines all the basic characteristics of permanent dentition. The objective of the study is to assess the occlusal characteristics of primary dentition in the age group of 3-5 years in school of Sriganganagar. All the basic parameters, terminal molar relationship, primary canine relationship, the degree of overbite and overjet (in millimeters) were considered in this study. **Methods:** The study was based on examination of the primary dentition of 600 preschool children aged 3-5 years old from Sriganganagar, India. The sample was selected from nursery school and the age of each child were obtained from school records. Healthy preschool children irrespective of socioeconomic status whose age was between 3-5 years were included in the study. **Results:** A total of 600 children who met the selection criteria were examined. In this sample size, 136 were of 3 year of age, 152 children were 4 year of age and 321 children were of 5 year of age respectively. Age wise distribution of primary molar relationship for Right side was 83.8% for flush terminal plan, 12.5 % was mesial step, 3.7 % distal step and on left side it was 84.6% for flush terminal plan, 11.8% was mesial step, 3.7% distal step and it was found to be significant however the age wise distribution of canine relationship, overbite and overjet was found to be insignificant. **Conclusion:** There is an increase in mesial step molar relationship with age, which is statistically highly significant. Distal step molar relationship was less prevalent and was not significant with age. However, the Class I canine relationship was the most prevalent type of deciduous canine relationship than the Class II canine relationship, though the changes in canine relationship with age were not statistically significant. In addition, the changes in overjet and overbite with age were not statistically significant. Also No case of anterior open bite (negative overlap) was observed. Probably larger scale of sample size may be required to assess the incidence of cases of negative overlap.

Keywords: Childhood, dentition, occlusion.

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INTRODUCTION

Occlusion in the primary dentition plays a significant role in determining the space for the occlusion in the succeeding permanent dentition. Occlusion is defined a manner in which the upper and lower teeth inter-cuspsate between each other in all mandibular positions and movements. It is a result of neuromuscular control of the components of the mastication systems namely: teeth, periodontal structures, maxilla and mandible, temporomandibular joints and their associated muscles and ligaments.^[1]

The primary dentition is completed with the eruption

of 2nd primary molar, so at this time location for the eruption of permanent teeth in future has been determined.^[2] Angle had provided the first clear definition of normal occlusion. The normal occlusion is when the upper and lower molars were in a relationship whereby the mesiobuccal cusp of the upper molar occluded in the buccal groove of the lower molar and the teeth were arranged in a smoothly curving line of occlusion.^[3]

Andrews reported of six significant characteristics consistently observed in 120 casts of non-orthodontics patients with normal occlusion. As the reference point, he used the centre of the clinical crowns and measured the thickness, tip and torque of each tooth.^[4] These constants were referred to as the "six keys to normal occlusion".

Analysis of the occlusion in the primary dentition should consider the arrangement of deciduous teeth and the occlusal relationship of the anterior and posterior segments of both arches. The recognition

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of normal occlusion patterns in primary dentition as well as the identification of morphologic changes during permanent teeth eruption is essential for treatment planning in pediatric dentistry.^[2]

It is agreed that in the deciduous dentition it is common to have spacing between the teeth and for the second molars to have a flush terminal plane relationship.^[3,4] At the time of eruption of the first permanent molar, their initial occlusion is dependent on the terminal plane relationship of the deciduous second molars.^[2]

There are limited numbers of studies pertaining to occlusion in preschool children and the contradictory findings concerning age changes in deciduous molar relation, a further investigation seemed appropriate.

Therefore, the present study made an attempt to obtain the baseline information regarding the occlusal characteristics in preschool children (3-5 years) and to assess the age changes in molar relations.

The objective of the study is to assess the occlusal characteristics of primary dentition in the age group of 3-5 years in school of Sriganganagar, Rajasthan with following parameters: terminal molar relationship, primary canine relationship, degree of overbite and degree of overjet (in millimeters).

MATERIALS & METHODS

The present study was conducted by the Department of Pedodontics and Preventive dentistry, Maharaja Ganga Singh Dental College, Sriganganagar, Rajasthan. The study was based on examination of the primary dentition of 600 preschool children aged 3-5 years old from Sriganganagar, India. The sample was selected from nursery school and the age of each child were obtained from school records. Healthy preschool children irrespective of socioeconomic status whose age was between 3-5 years were included in the study.

Inclusion Criteria

- Children with complete set of primary dentition.
- Age of children should be between 3 to 5 yrs.

Exclusion Criteria

- Children with missing teeth due to any reason.
- Children with dental deformities like cleft lip and palate, ankylosis of mandible, gemination, fusion, hypodontia and hypoplasia.

The study protocol was reviewed by the Ethical Committee of Maharaja Ganga Singh Dental College and Research Centre and was granted ethical clearance. Proper permission was obtained from the concerned educational authorities, Head of the schools and parents/guardians to examine the school children after explaining the purpose of the study clearly.

Study Setting and Study Design

Children who fulfilled the inclusion criteria were examined. Maxillary and mandibular impressions were made by main examiner with alginate in the hall/room provided by the school authorities. These impressions were washed with water, models were poured with the dental stone immediately and study cast were prepared. An examination form was developed to record the findings. Occlusal assessment was carried out with the teeth in centric occlusion and in children who had a complete primary dentition without any erupted permanent teeth. The following arch characteristics were recorded;

- The terminal molar relationship of deciduous molars.
- The primary canine relationship.
- The degree of overbite.
- Degree of overjet (in millimeters).

Statistical Analysis

The obtained data was subjected to the standard statistical analysis, in which arithmetic mean, standard deviation and chi square test was performed.

RESULTS

A total of 600 children who met the selection criteria were examined. In this sample size, 136 were of 3 year of age, 152 children were 4 year of age and 321 children were of 5 year of age respectively.

[Table 1, Figure 1] shows the agewise percentage distribution of primary molar relation for the right side. In group of three year old children, number of children with flush terminal plane were 114 (83.8%), children with mesial step were 17 (12.5%) and 5 (3.7%) children were with distal step molar relationship. In the group of four year old children 112 (73.7%) had flush terminal plane, 33 (21.7%) mesial step and 7 (4.6%) had distal step molar relationship. In five year old group children 200 (64.1%) had flush terminal plane, 90 (28.8%) had mesial step and 22 (7.1%) had distal step molar relationship. The agewise changes in primary molar relationship on the right side were highly significant ($p = 0.001$).

Similarly [Table 2, Figure 2] depicts the agewise percentage distribution of primary molar relation on left side. In three year old group children, 115 (84.6%) were present with flush terminal plane, 16 (11.8%) children with mesial step and 5 (3.7%) children with distal step molar relationship. In the age group of four year old, 116 (76.3%) children had flush terminal plane, 28 (18.4%) children had mesial step and 8 (5.3%) children had distal step molar relationship. In five years group, the flush terminal plane was present in 215 (68.9%) children, mesial step in 83 (26.6%), and distal step molar relationship in 14 (4.5%) children. The agewise changes in primary molar relation on the left side were statistically highly significant. ($p=0.007$).

In addition, [Table 3, Figure 3] represent the agewise percentage distribution of canine relationship on right side. In three year age group Class I canine relationship was present in 131 (96.3%) and Class II in 5 (3.7%) of participants. In four year age group, 145 (95.4%) were present with Class I and 7 (4.6%)

with Class II. In age group of five years Class I canine relationship was present in 290 (92.9%) and Class II in 22 (7.1%) on right side. On statistical analysis the changes in agewise distribution of canine relation on right side was not significant (p=.294).

Table 1: Age wise distribution of primary molar relationship - right side

Age (years)		Primary molar relationship			Total
		Flush terminal	Mesial step	Distal step	
3	Count	114	17	5	136
	% within age	83.8%	12.5%	3.7%	100.0%
4	Count	112	33	7	152
	% within age	73.7%	21.7%	4.6%	100.0%
5	Count	200	90	22	312
	% within age	64.1%	28.8%	7.1%	100.0%

Table 2: Age wise distribution of primary molar relationship on left side.

Age (years)		Primary molar relationship			Total
		Flush terminal plane	Mesial step	Distal step	
3	Count	115	16	5	136
	% within age	84.6%	11.8%	3.7%	100.0%
4	Count	116	28	8	152
	% within age	76.3%	18.4%	5.3%	100.0%
5	Count	215	83	14	312
	% within age	68.9%	26.6%	4.5%	100.0%

Table 3: Age wise distribution of primary canine relationship on right side

Age		Primary canine relationship		Total
		Class 1	Class 2	
3	Count	131	5	136
	% within age	96.3%	3.7%	100.0%
4	Count	145	7	152
	% within age	95.4%	4.6%	100.0%
5	Count	290	22	312
	% within age	92.9%	7.1%	100.0%

Table 4: Age wise distribution of primary canine relationship on left side

Age		Primary canine relationship		Total
		Class 1	Class 2	
3	Count	131	5	136
	% within age	96.3%	3.7%	100.0%
4	Count	145	7	152
	% within age	95.4%	4.6%	100.0%
5	Count	297	15	312
	% within age	95.2%	4.8%	100.0%

Table 5: Age wise degree of overbite

Age		Overbite				Total
		Normal	increased	Edge to edge	Anterior overbite	
3	Count	70	66	0	0	136
	% within age	51.5%	48.5%	.0%	0%	100.0%
4	Count	77	75	0	0	152
	% within age	50.7%	49.3%	.0%	0%	100.0%
5	Count	167	142	3	0	312
	% within age	53.5%	45.5%	1.0%	0%	100.0%

Table 6: Age wise distribution of degree of overjet

Age		Overjet			Total
		Decreased	Normal	Increased	
3	Count	14	108	14	136
	% within age	10.3%	79.4%	10.3%	100.0%
4	Count	19	122	11	152
	% within age	12.5%	80.3%	7.2%	100.0%
5	Count	40	239	33	312
	% within age	12.8%	76.6%	10.6%	100.0%

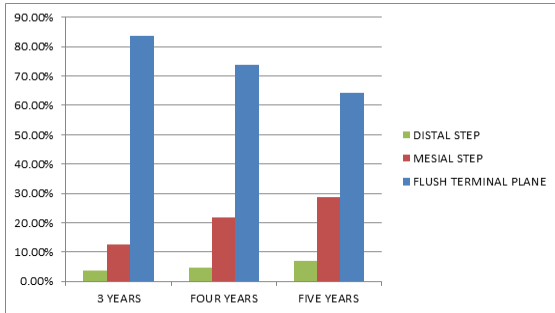


Figure 1: Primary molar relation- right

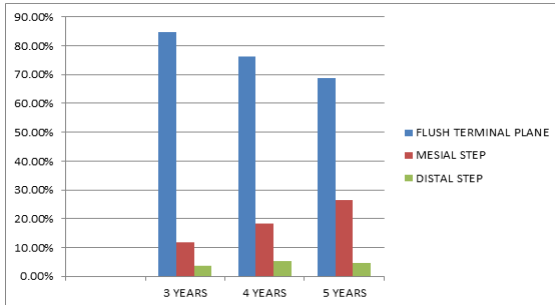


Figure 2: primary molar relation-left

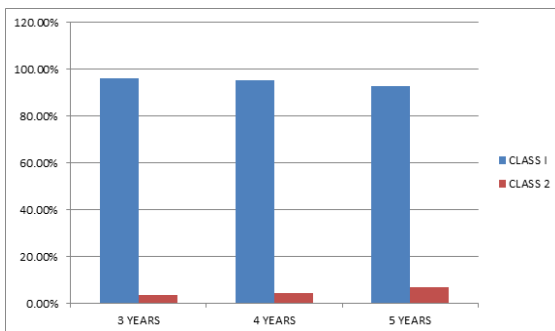


Figure 3: primary canine relation-right

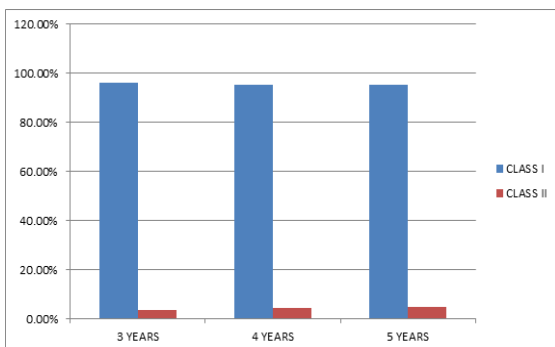


Figure 4: primary canine relation-left

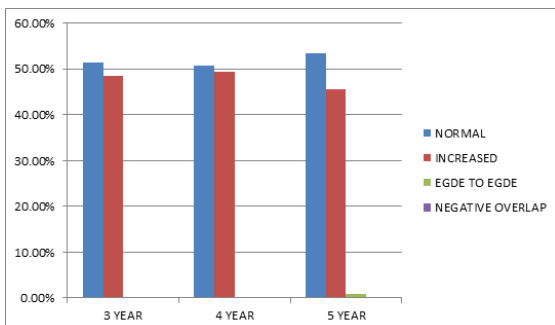


Figure 5: age wise distribution of overbite

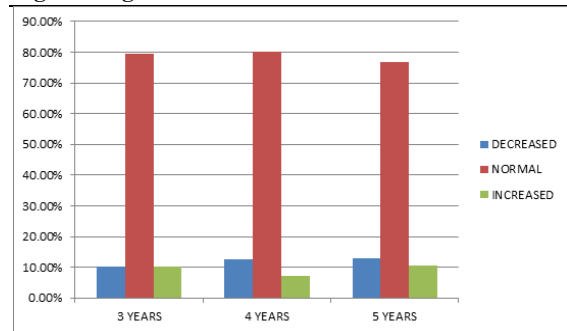


Figure 6: age wise distribution of overjet

Also [Table 4, Figure 4] depicts the agewise percentage distribution of Canine relation on left side of the selected sample size. In 3 year old children Class I canine relationship was present in 131 (96.3%) children and Class II canine relation was present only in 5 (3.7%) of the total sample size. In four-year old children Class I canine relation was present in 145 (95.4%) and Class II in 7 (4.6%) of the total sample. In five year age group 297 (95.2%) children were present with Class I canine relation and only 15 (4.8%) children were having Class II relationship. The changes in canine relationship with age was not significant. (p= .866).

Also [Table 5, Figure 5] depicts the agewise percentage distribution of overbite. In three year age group 70 (51.5%) had normal overbite, 66 (48.5%) had increased overbite and no case of edge to edge and anterior open bite was observed. In 4 year old children 77 (50.7%) had normal overbite, 75 (49.3%) had increased overbite and no cases of edge to edge bite and anterior open bite was observed. In 5 year old children normal overbite was present in 167 (53.5%), 142 (45.5%) had increased overbite, only 3 (1.0%) had edge to edge relation and no children was having anterior openbite. The age wise changes in degree of overbite were not statistically significant. (p= .502).

And [Table 6, Figure 6] shows the agewise distribution of overjet. In group of three year old children 14 (10.3%) were having decreased overjet, 108 (79.4%) were normal overjet and 14 (10.3%) were present with increased overjet. In group of four year old children 19 (12.5%) were having decreased overjet, 122 (80.3%) were normal and 11(7.2%) were having increased overjet. In five year old age group, 40 (12.8%) were having decreased overjet, 239 (76.6%) were normal and 33 (10.6%) children were present with increased overjet. The values of agewise changes in overjet was not statistically significant (p=.740).

Also No case of anterior open bite (negative overlap) was observed. Probably larger scale of sample size may be required to assess the incidence of cases of negative overlap.

DISCUSSION

Childhood is the mirror that reflects the propensity of adulthood. An ideal primary dentition likewise is an indicator of potentially perfect permanent dentition, function of the primary dentition includes maintenance of the occlusion and space for the permanent dentition in addition to mastication.^[5]

Early recognition of conditions predisposing young children to malocclusions is in the hands of primary care providers who for practical purposes are general practitioners and the pediatric dentist. It is important that conditions that predispose one to develop a malocclusion of the permanent dentition, be detected early in the primary dentition.^[6]

Many studies have been done in different parts of the world in order to determine variations in occlusion. The understanding of anterior and posterior changes that occur in occlusion between primary and permanent dentition is crucial for the clinician involved in planning early interceptive treatment.^[7-10] The lack of such statistical data of the Indian population in Sri Ganganagar prompted us to undertake this study.

Terminal molar relationship

One aspect of the development of dental occlusion which has given rise to different opinions is the early changes in relationship between the upper and lower second deciduous molars. Variations in this changes has been attributed either to differences of the tooth size or to varying amounts of mesial migration of upper and lower teeth.^[11,12]

In our study, 426 (71.0%) had shown flush terminal plane on right side and 446 (74.3%) on left side while as mesial step was observed in 140 (23.3%) on right side and 127 (21.2%) on left side and similarly Distal step was present in 34 (5.7%) on right side and 27 (4.5%) on left side.

This is comparable to studies done by Alexander et al,^[7] Otuyemi et al,^[13] Sapna Hegde et al,^[14] and Sriram et al.^[15] While former study was done on Indian population, the latter was done on Nigerian population with same age group. Findings observed in our study, though based on cross sectional investigations, showed an increase in the mesial step molar relationship with advancing age. It was observed that agewise percentage distribution of terminal molar relation on the right side were 83.8% flush terminal plane, 12.5% mesial step and 3.7% distal step in three year age group. In four year age group 73.7% had flush terminal plane, 21.7% mesial step and 4.6% had distal step while in five year age group 64.1% had flush terminal plane, 28.8% had mesial step and 7.1% had distal step [Table 1, Figure 1]. The agewise changes in terminal molar relationship on the right side are statistically very highly significant ($p = 0.001$).

This is supported by the findings of other studies like Nanda et al,^[16] in their findings they indicated that there was a significant decrease in the Class I relationships and Ravn et al,^[17] which indicates an

increase in the number of normal relationships and a reduction in the number with straight terminal occlusion. These changes may be attributed to the forward growth of the mandible.

The agewise percentage distribution of terminal molar relation of three years on the left side were 84.6% flush terminal plane, 11.8% mesial step and 3.7% distal step. In the age group of four years 76.3% had flush terminal plane, 18.4% mesial step and 5.3% had distal step. In the age of five years group the flush terminal plane is 68.9%, mesial step in 26.6%, and distal step in 4.5% (Table 2, figure 2). The agewise changes in terminal molar relation on the left side are statistically very highly significant. ($p=0.007$).

Primary canine Relationship

In our study, the percentage distribution of canine relation in Class I canine relation is 94.3% and in Class II is 5.7% in right side [Table 3] while on the left side the percentage distribution of canine relation in Class I is 95.5% and in Class II is 4.5% [Table 4]. The reports coincide with those reported by other studies as done by Laila baidas in which they concluded that canine relationship was Class I in 90.1% of the sample,^[18] followed by Class II canine relationship (2.5%) as well as Sham Bhat et al,^[19] in which percentage distribution of canine relation was class I in 88.9%, class II in 7.2%. However the prevalence of canine class II relationship in this sample is much lower than 45% in English children and 31.6% reported by Ravn JJ,^[17] in Danish children. The difference could be due to the small sample size in the former study and the inclusion of children with extracted teeth in latter study. In addition both the studies included only children from young age group (3 years).

The agewise percentage distribution of canine relation on right side was Class I canine relation in 96.3% and Class II 3.7% in three years age group. In four years age group the percentage distribution of canine relation was Class I 95.4% and Class II 4.6% while in age group of five years Class I canine relation 92.9% and Class II 7.1% in right side. [Table 3, Figure 3] The change in agewise distribution of canine relation on right side was not significant statistically. ($p= .294$)

Similarly, the agewise percentage distribution of Canine relation on left side were Class I canine relation 96.3% and Class II canine relation 3.7% of sample. In four-year age group Class I canine relation in 95.4% and Class II in 4.6% of sample. In five year age group the percentage distribution of Class I canine relationship is 95.2% and Class II in 4.8% [Table 4, Figure 4] the change in canine relationship agewise was not significant. ($p= .866$).

The prevalence of class II canine relationship is generally low in the present study. However the class II canine relationship seems to increase in incidence with age though statistically not

significant. It has been suggested that the prevalence of class II canine relationship seem to decrease with advancing age due to termination of some environmental factors such as sucking habits in the older age group,^[4] though not observed in the present study.

Overbite and Overjet Many investigators have measured overjet and overbite but different methods and criteria were used like a depth gauge calibrated in millimetres was used to measure the overjet and a new overbite gauge was designed and used directly (intra-orally) in the English survey and A thicker plate forming its vertical portion is calibrated in millimetres for recording the overbite (Kinaan, 1977).^[20]

In our study the degree of overbite was statistically analysed and it was observed that 52.3% had normal overbite that is maxillary incisors were covering mandibular incisors less than 50%, 47.2% had increased overbite that is maxillary incisors covering mandibular incisors more than 50%, 0.5% had edge to edge bite and no one had open bite [Table 5].

The prevalence of normal overbite was found in about 52.3% of population comparable with several studies as done by O. D. Otuyemi et al,^[13] in which most of the children (68.6%) had 'ideal' overbite as well as study done by Farsi et al.^[21] The age wise percentage distribution of overbite in three years of age group was 51.5% normal, 48.5% increased and no case of edge to edge and anterior openbite was seen. However In the age group of 4 years 50.7% normal, 49.3% had increased no cases of edge to edge bite and anterior openbite was seen. While, in age group of 5 years normal overbite was seen in 53.5%, 49.3% had increased 1.0% had edge to edge bite and no case had openbite. [Table 5, Figure 5]

Thus, the age wise changes in degree of overbite were not statistically significant. (p= .502). This is not in conformity with the study done by Otuyemi et al.^[13] The overjet was measured in millimeters using a millimeter scale. It was observed that 12.2% was having decreased overjet which is less than 1mm, 78.2% was having normal overjet that is between 1 to 2mm and 9.7 % was seen to have increased overjet that is more than 2mm [Table 6, Figure 6]. The prevalence of overjet above 2mm was 9.7%, which was comparable to Nanda et al,^[16] however it was much lower than the studies done by Foster TD and Infante PF.^[22,23] Nanda et al,^[16] has shown that there was a significant reduction in overbite and overjet as children become older. The age wise changes observed in this study however were not significant.

CONCLUSION

Since the aim of this study was to examine occlusion characteristics and to assess the differences in occlusion pattern with age. 600 children from the age group of 3 to 5 year old were selected in schools

of Sriganganagar, Rajasthan. This study confirms the finding reported earlier that flush terminal molar relationship is the most prevalent terminal molar relationship in deciduous dentition. There is an increase in mesial step molar relationship with age, which is statistically highly significant. Distal step molar relationship was less prevalent and was not significant with age. However, the Class I canine relationship was the most prevalent type of deciduous canine relationship than the Class II canine relationship, though the changes in canine relationship with age were not statistically significant. In addition, the changes in overjet and overbite with age were not statistically significant. Also No case of anterior open bite (negative overlap) was observed. Probably larger scale of sample size may be required to assess the incidence of cases of negative overlap.

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