Original Article

Gender influence on occlusal characteristics in the primary dentition

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Abstract

Objectives: The objective of this study was to assess and discuss the influence of gender on occlusal characteristics of primary dentition. **Materials and Methods:** In this study, cluster randomized sampling was done to select 4-6-year-old children from Government primary schools of Farukh Nagar block, Gurgaon, Haryana, India. Children were evaluated clinically for occlusal characteristics of primary dentition such as molar relation, Canine relation, overjet, overbite, openbite, scissors bite, and crossbite. Chi-square test was used to compare the occlusal characteristics of both genders. **Results:** Flush terminal plane, Class I Canine relation and both primate as well as developmental spaces were found to be prevalent in the study population, in percentages of 62.4%, 67.2%, and 37.6%, respectively. It was observed that females had more spacing, distal step molar relation and increased overjet as compared to males. Males had more Class II Canine relation, crowding, openbite, overbite, and incompetent lips as compared to females. Significant differences were found between males and females w.r.t various occlusal characteristics. **Conclusion:** Most of the children had gender influence on malocclusion, which indicates the need for early interception or correction of malocclusion traits based on the gender of the child.

Key words: Gender, occlusion, primary dentition

INTRODUCTION

Childhood is the mirror in which the propensities of adulthood are reflected. It has been seen that very little importance has been given to the primary dentition when compared to permanent dentition, as deciduous teeth get exfoliated eventually.

However, the characteristic set of features of primary dentition to a large extent lays the foundation for proper eruption and alignment of succeeding dentition. Based on the observation of these key features of occlusion in the child's dentoalveolar system during the formative years, the characteristics of the permanent dentition occlusion can be predicted.[1]

It is very important for an individual to have well-aligned teeth for proper occlusion, which in turn contributes to better chewing and facial appearance.

Occlusion constitutes one of the important objectives of pedodontic treatment whether it is preventive, interceptive or corrective. The understanding of the anteroposterior changes that occur in the occlusion between the deciduous and permanent dentition is crucial for the clinician involved in early orthodontic treatment.[2]

Occlusion is influenced by changes in timing of tooth eruption and loss, and dental caries.[3]

Certain characteristics of primary dentition and occlusion, which are required for a smooth transition from primary to permanent dentition are:[4]

- Developmental spaces – spaces between primary teeth.
- Primate or anthropoid spaces – spaces mesial to

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Quick Response Code:

Website: www.apospublications.com

DOI: 10.4103/2321-1407.135789

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Canine in the maxillary arch and distal to Canine in the mandibular arch.
- Vertical position of incisor teeth, with lower incisors touching cingulum of upper incisors.
- Flush terminal plane – distal surfaces of maxillary and mandibular second molars in same vertical plane.

Various longitudinal studies indicate that in most patients, diagnosis of malocclusion and fairly consistent predictions of development of mixed and permanent dentitions can be based on several occlusal features of primary dentition.[5]

Malocclusion can lead to various psychological and social problems in an individual. It is a problem affecting a large number of Indian children and literature has revealed significant differences between males and females with respect to occlusal characteristics.[4,6,7] Hence, the present study was conducted to assess the gender influence on occlusal characteristics of primary dentition in 4-6-year-old primary school children of Farukh Nagar block, Gurgaon.

MATERIALS AND METHODS

The present study was conducted in Government primary school of district Gurgaon, Haryana. Gurgaon district is divided into four blocks, that is, Sohna block, Pataudi block, Gurgaon block and Farukh Nagar block, Gurgaon, Haryana, India. Out of these blocks, Farukh Nagar block was selected for the study. As there are only a few private schools in Farukh Nagar block; the study was carried out in the Government schools of this block. There are a total of 71 Government primary schools in Farukh Nagar block as registered in the block educational office. Out of these 71 schools, 10 were randomly selected for the study. A total of 357 children with primary dentition, between the age of 4 and 6 years were examined. A total of 250 children were selected for this cross-sectional study as they fulfilled the selection criteria.

The following inclusion criteria were used to select the study participants:
- Those with complete set of primary teeth, no premature loss of primary teeth.
- No erupted permanent teeth.
- No proximal caries.
- No abnormal oral habits.

The following exclusion criteria were used to select the study participants:
- Children with fractured teeth, any anomaly in size, shape, and number.
- Children with uncooperative behavior.

The parents and children were informed regarding the purpose of the study and a signed informed consent was obtained from the parent of each participant before conducting the study. Ethical clearance was obtained from the ethical committee of SGT Dental College. Clinical examination was performed by a single examiner under natural daylight and occlusal parameters were recorded. Instruments used were mouth mirror, community periodontal index probe, and dental floss.

Parameters checked were:
- Molar relationship — flush terminal plane, mesial step, and distal step.
- Canine relationship — Class I, Class II, and Class III.
- Spaces — primate space, developmental/generalized/physiological spaces.
- Crowding — maxillary, mandibular arch.
- Mid line discrepancy — present/absent.
- Crossbite — anterior crossbite and posterior crossbite.
- Scissors bite — present/absent.
- Openbite — anterior/posterior.
- Overbite — no overbite, 1-2 mm, 2-4 mm, >4 mm.
- Overjet — 1-2 mm, 2-4 mm, >4 mm.
- Lateral profile — convex/concave/straight.
- Lip incompetency — competent/incompetent.

An intra-examiner reliability test was performed by examining a group of 20 children, at two different time periods 1 week apart. These results were then subjected to Cohen's kappa statistical analysis. The findings revealed that the kappa coefficient for various occlusal characteristics ranged from 0.80 to 0.92.

Statistical analysis

Data were processed and analyzed using Statistical Package for Social Sciences version 20. Chi-square test was used to compare the proportion of occlusal characteristics among different genders. $P < 0.05$ was considered as significant.

RESULTS

The present study included 110 males (44%) and 140 females (56%) [Table 1]. Flush terminal plane, Class I Canine relation and both primate as well as development spaces were prevalent in the study population, in percentages of 62.4%, 67.2%, and 37.6%, respectively [Table 2].

Incompetent lips were seen in 19.2% of participants and other characteristics such as midline discrepancy, cross bite, scissor bite, and open bite were less prevalent [Table 2].

Table 1: Distribution of study sample

Males %	Females %
44	56

Table 2: Total prevalence of occlusal parameters in the primary dentition of children between the ages of 4-6 (*N* = 250)

Occlusal parameters	Particulars	No. of children	Prevalence in the sample (%)
Molar relationship	Flush terminal plane	156	62.4
	Mesial step	63	25.2
	Distal step	31	12.4
Canine relationship	Class I	168	67.2
	Class II	79	31.6
	Class III	3	1.2
Spaces	Developmental spaces	48	19.2
	Primate spaces	62	24.8
	Both	94	37.69
	No spaces	46	18.4
Crowding	Maxillary	15	6
	Mandibular	78	31.2
Midline discrepancy	Present	2	0.8
	No discrepancy	248	99.2
Crossbite	Anterior	0	0
	Posterior unilateral	1	0.4
	Posterior bilateral	1	0.4
Scissor bite	Present	1	0.4
Openbite	Anterior unilateral	2	0.8
	Anterior bilateral	16	6.4
	Posterior bilateral	18	7.2
Overjet	1-2 mm	231	92.4
	2-4 mm	16	6.4
	>4 mm	3	1.2
Overbite	No overbite	48	19.20
	1-2 mm	171	68.4
	2-4 mm	31	12.4
	>4 mm	0	0
Lateral profile	Straight	187	74.8
	Convex	61	24.4
	Concave	2	0.8
Lip competency	Competent	202	80.8
	Incompetent	48	19.2

Significant differences were observed between male and female participants for occlusal characteristics like molar relation, Canine relation, spacing, crowding, overjet, overbite, openbite, and lip incompetency [Table 3].

It was found that none of the male participants had distal step molar relation. Statistically, significant difference was found for Canine relationship among genders. Crowding was seen more in males than females ($P \leq 0.001$) and spacing was seen more in females ($P \leq 0.001$) [Table 3]. Openbite, increased overbite and lip incompetency was seen more among males and overjet of 2-4 mm was found more in the female gender.

However, no significant differences were found between males and females when checked for midline discrepancy, scissor bite and lateral profile. Posterior crossbite was more prevalent in males ($P \leq 0.001$), but no statistically significant difference between gender was found for anterior crossbite ($P = 0.59$) [Table 3].

DISCUSSION

The present study was done on 4-6-year-old primary school children to find whether there is an influence of gender on occlusal characteristics of primary dentition.

The results of this study showed that flush terminal plane was prevalent in 62.4% of the study population, with mesial step and distal step molar relationships in 25.2% and 12.4% of the study population respectively. The prevalence of flush terminal plane decreases with age, whereas the mesial step demonstrates a corresponding increase in frequency. Therefore, at around 6 years of age, the mesial step predominates providing for good direct intercuspation of the erupting permanent molars. A distal step in the primary dentition probably reflects a skeletal imbalance and typically results in Class II malocclusion in the permanent dentition.

Similar results were reported in the study done by Zakirulla in 2012,[2] in which flush terminal plane (55.6%) was seen more frequently than distal step (3.2%) and in the study done by Reddy in 2010, the prevalence was 68.8%, 31.2%, and 0% for flush terminal plane, mesial step, and distal step, respectively.[8]

In the study done by Abu Alhaija and Qudeimat, mesial step (47.7%) was more prevalent followed by flush terminal (37%) and distal step (3.7%).[9]

Canine Class I (67.2%) was more prevalent in the present study, followed by Class II (31.6) and Class III (1.2%). Similar findings were observed in the study done by Abu Alhaija and Qudeimat where Class I Canine relationship was found in 57% of children, followed by Class II Canines in 29% and Class III Canines in 3·7%.[9] In the study done by Keski-Nisula *et al.* also, it was seen that the frequency of Canine Class I, II, and III Canine relationship were 46%, 52%, and 2%, respectively.[11]

In the present study, 31 females showed a distal step molar relationship while none of males showed a distal step. In the study done by Sriram *et al.* in 2011, it was observed

Table 3: Distribution of occlusal characteristics in primary dental arches by gender

Occlusal parameters	Particulars	Males	Females	Significance
Molar relationship	Flush terminal plane	80	76	56.256 (*P*<0.001)***
	Mesial step	30	33	
	Distal step	0	31	
Canine relationship	Class I	63	106	20.045 (*P*<0.001)***
	Class II	46	33	
	Class III	1	2	
Spaces	Developmental spaces	8	40	183.17 (*P*<0.001)***
	Primate spaces	15	47	
	Both	30	64	
	Absent	36	10	
Crowding	Maxillary	15	0	42.062 (*P*<0.001)***
	Mandibular	60	18	99.74 (*P*<0.001)***
Midline discrepancy	Present	1	1	0.59 (*P*=0.808)
Crossbite	Anterior	0	0	0.59 (*P*=0.808)
	Posterior unilateral	1	0	30.163 (*P*<0.001)***
	Posterior bilateral	1	0	24.596 (*P*<0.001)***
Scissor bite	Present	0	1	1.578 (*P*=0.209)
Openbite	Anterior unilateral	1	1	0.033 (*P*=0.856)
	Anterior bilateral	14	2	42.062 (*P*<0.001)***
	Posterior bilateral	15	3	171.81 (*P*<0.001)***
Overjet	1-2 mm	107	124	28.213 (*P*<0.001)***
	2-4 mm	1	15	
	>4 mm	2	1	
Overbite	No overbite	3	45	139.25 (*P*<0.001)***
	1-2 mm	121	50	
	2-4 mm	16	15	
	>4 mm	0	0	
Lateral profile	Convex	79	108	4.576 (0.101)
	Straight	31	30	
	Concave	0	2	
Lip competency	Competent	80	122	14.723 (*P*<0.001)***
	Incompetent	30	18	

****P* value is very highly significant

that there was no statistical difference between males and females for molar relationship.[10] However, Sriram *et al*.'s study was done in a South Indian sample, and therefore, racial factors could've attributed to this difference.

In the study done by Suma and Das in 2010 and Thilander *et al*. in 2001, it was found that spacing was more frequent in males and the crowding was more in females.[6,12] In the present study spacing was more prevalent in females and crowding was more in males indicating that the frequency of developing malocclusion was more in males. In the study done by Abu Alhaija and Qudeimat mesiodistal crown diameters revealed that males exhibit larger tooth size than females for all primary tooth types.[9] Such an increase in tooth dimensions might lead to increased prevalence of crowding in male subjects.

No developmental and primate spaces were seen in 18.4% of the study population. Absence of primate or secondary spaces in the primary dentition is an expression of disproportion between jaws/tooth sizes.

Open bite was seen in 14.4% of the study population in the present study. In the studies done by Keski-Nisula *et al*. and Tschill *et al*., it was 39% and 37.4%, respectively.[11,13]

In the present study, over jet of more than 2 mm was seen in 7.6% of the population and overbite of more than 2 mm in 12.4%. Similar results were seen in the study done by Reddy with increased overjet seen in 9.8% of children.[8] However, in the study done by Keski-Nisula *et al*. overjet and overbite were in 27% and 34% of study subjects, respectively.[11] This may be due to inclusion of mixed dentition children in the study done by Keski-Nisula *et al*.

It was observed that incompetent lips were seen in the majority of the male population (i.e., 30 subjects) as

compared with female (i.e., 18 subjects). It has been proved by Motta *et al*. in 2012, that gender is a risk factor for mouth breathing and other harmful oral habits in preschoolers and these deleterious habits are seen more in male gender.[14]

The present study showed that only one child had scissor bite. Similarly, in the study done by Keski-Nisula *et al*. scissor bite was seen in only 1% of children.[12]

Greater incidence of malocclusion (94.1%) is found to be more in children with malocclusion in the primary dentition as compared to those who had no malocclusion during primary dentition period.[5] Furthermore, anterior openbite, posterior cross bite and overjet >3 mm in the primary dentition are risk factors for malocclusion in early mixed dentition.

Present study showed that most of the study subjects had malocclusuion traits and it was also observed that there was statistically significant differences between genders for many occlusal parameters. But, in the study done by Frazão *et al*., it was observed that there was no statistically significant relation between gender and prevalence of occlusal problems.[15] In the study done by Cavalcanti *et al*. on 342 children in the 3-5 year age group with complete primary dentition, there was statistical significant ($P = 0.008$) difference among genders for malocclusion.[16] Accentuated overjet, anterior openbite and posterior crossbite showed a positive association with deleterious habits in that study.

It was a limitation of the present study that deleterious habits such as pacifier sucking, thumb sucking, nail biting, and tongue thrusting or mouth breathing were not taken into consideration. Hence, further studies are required to observe the prevalence of these deleterious habits among genders and the association of these habits with malocclusion characteristics of different genders.

CONCLUSION

The present study provided an insight into the state of dentition and the occlusal characteristics of primary dentition in government primary school children. The overall prevalence of occlusal characteristics showed the existence of qualities that may lead to the development of malocclusion.

A gender influence was observed on the occurrence of occlusal characteristics. Flush terminal plane was seen in the majority of the subjects. Crowding was seen more frequently in males predicting a higher risk of developing malocclusion in males. Hence, the study indicates the need for early correction of malocclusion characteristics and planning treatment on the basis of gender in children.

This, together with the data from other studies conducted on other Indian populations, can contribute as a data bank that can be compiled and used for comparison between other local Indian populations; to arrive at a method of predicting any future malocclusion in the permanent dentition.

Further studies are however required to clarify the factors contributing to occlusal discrepancies among genders.

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How to cite this article: Yadav NR, Prasad S, Rajashekharappa CB, Tandon S. Gender influence on occlusal characteristics in the primary dentition. APOS Trends Orthod 2014;4:87-92.

Source of Support: Nil. **Conflict of Interest:** None declared.