



RESEARCH ARTICLE

ASSESSMENT OF PROLONGED BREAST FEEDING AND BOTTLE FEEDING ON ANTERO-POSTERIOR RELATIONSHIP OF DENTAL ARCHES IN CHILDREN

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ABSTRACT

The purpose of this study was to assess the effect of breast feeding and bottle feeding on primary molar relation in 3-6 year old children attending different schools of south Bangalore city. The association between infant feeding duration and primary molar relation were evaluated in 400 children at the stage of complete primary dentition. The information regarding their feeding practices was recorded based on the questionnaires filled out by parents/guardians. The clinical examination was done to record the primary molar relation. The positive association between the age of cessation of breast feeding and presence of distal step was observed. The shorter the child was breast fed, higher chances of child to be bottle fed which showed a greater prevalence of distal step. Breast feeding duration is one of the important factors that have great influence in the development of distal step, which in turn will influence the permanent molar relation.

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INTRODUCTION

Malocclusion cannot be considered as a single disease, but a group of developmental disorders arising from multiple causes. It occurs in the craniofacial structure, composed of jaw, tongue and facial muscles and may cause deformity or lack of functionality. Malocclusion can interfere with quality of life based on its extent, also treatment is expensive. Growth and development of craniofacial structure are affected by functional stimuli such as sucking, chewing, swallowing, breathing and nutritive sucking, which includes breast-feeding and bottle-feeding (Xiaoxian chen *et al.*, 2015; Karen glazer peres *et al.*, 2015). Breastfeeding is very important since mother's milk has the best nutrition which strengthen the immune system of child to fight against diseases, the act of breast sucking helps in adequate development of the structures of mastication, providing internal and external balance of muscular forces (Ana Carla Raphaelli Nahas Scocate *et al.*, 2011). Right from the time of birth, infants have a natural sucking instinct or urge which is said to be the first feeding. This is essential for an infant's survival, as it allows infants to nurse and bond to their mothers. If this sucking urge is not completely satisfied by breast or bottle feeding, the infant will have a tendency which may lead to frustration. To satisfy this sucking tendency the child will engage in a non-nutritive sucking habit. So sucking not only has nutritive significance, but it is also a important

source of pleasure, self-gratification, comfort, and soothing relaxation. The sucking habits are considered very evident from the literature in the past many years. The prevalence of these habits varies significantly from one population to another. The factors such as sex, birth rank, feeding method, and socioeconomic status influence the prevalence of these habits. There is strong evidence that the educational level of parents has a greater influence on digit and dummy sucking (Baume, 1950). Various studies to compare the prevalence of sucking habits in breast-fed and bottle fed children predicted a lesser chance of these habits among breast-fed children. Sucking habits are associated with anterior open bite and increased over jet in the primary dentition. Therefore, the aim of this study was to assess the effect of prolonged Breast feeding and bottle feeding on Antero-posterior relationship of the dental arches in school going children of south Bangalore.

MATERIALS AND METHODS

The sample consisting of 400 children of both genders aged 3 to 6 years from public schools in south Bangalore. Signed written informed consent was taken from the school authorities and parents of the children. Information on infant feeding duration and the data about their general health were investigated by means of questionnaires filled out by the parents/guardians. Information regarding the oral habits was not included in the study. Children with complete primary dentition, without erupted permanent teeth or teeth in the process of eruption, absence of early primary tooth loss,

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absence of any type of trauma, absence of visual/hearing deficiencies, absence of extensive caries lesions or loss of coronal structure, which would compromise occlusion were included in the study. The selected children did not show any characteristics of cleft lip and palate fissures or other anomalies that would alter the establishment of occlusion. The clinical examinations were performed by a calibrated dentist who was blind to the questionnaire in the school environment, using sterile mouth mirrors and under natural lighting. The terminal plane were able to check under natural lighting. The child was asked to open the mouth to maximum extent and then to bite in maximum intercuspation (MI) to collect the data. The prevalence of the relationships of the distal surfaces of the primary second molars were recorded according to criteria given by baume (Davis and Bell, 1991): a) Mesial step (MS)-the distal surface of primary second molars is located in a more mesial direction in relation to distal surface of maxillary primary second molar: b) Vertical plane (VP)- the distal surface of primary second molars is in line with the vertical plane: c) Distal step (DS)-distal surface of mandibular second molar is placed more distal in relation to distal surface of maxillary primary second molar. The frequency of the data with reference to breast and bottle feeding, age and gender were calculated. According to the age of interruption of breast feeding, they were divided into five groups; breast feeding interrupted for less than 3 months; breast feeding interrupted between 3 and 6 months; breast feeding interrupted between 6 and 9 months; breast feeding interrupted between 9-12 months; breast feeding interrupted after 1 year. According to age of interruption of bottle feeding, they were divided into five groups: no bottle feeding, bottle feeding in less than 6 months; bottle feeding interrupted between 6-12 months; bottle feeding interrupted between 1-2 years and bottle feeding interrupted after 2 years.

In the study, the frequency of the data with reference to breast and bottle feeding, age and gender were calculated and then the prevalence of the relationships of the distal surfaces of the primary second molars were evaluated. To identify the factors related to breastfeeding and bottle feeding durations that influence the development of the relationships of the distal surfaces of the primary second molars, multiple logistic regression analysis were done. The level of significance was set at 5%. Using the group that presented VP (vertical plane type) as a reference, two regression models were considered simultaneously, one for the presence of DS and the other for the presence of MS. The Co-variables were the age of breast feeding interruption and the age of bottle feeding interruption. In the age of breast feeding interruption, the reference group was the one those interrupted the habit after 1 year and in the age of bottle feeding interruption, the reference group did not have the habit. Logistic regression model of the relationship of distal surfaces of the primary second molars and the age when bottle feeding and breast feeding interrupted were calculated. The Odds ratio (OR) was estimated which showed a strong association with the types of relation of distal surface of primary second molars.

## RESULTS

Results of the study with respect to terminal plane type showed 73% children with mesial step, 17% with vertical plane type and 10% showed Distal step. The children were divided into different groups based on the age (Table 1 & 2). Observing the children who were breastfed, 5.7% children interrupted the habit below the age of 3 months, 8.5% interrupted

breastfeeding between 3-6 months of age, 29.5% between the ages of 6-9 months, 37.7% interrupted between 9-12 months and 18.5% interrupted after 1 year of age. It was seen that 5.7% children who interrupted the habit less than 3 months showed the presence of distal step (Table 3). Observing the children who were bottle fed, 5.7% children were without the habit; 27.5% for children who interrupted the habit between 6 to 12 months; 51.5% interrupted it between the ages of 1-2 years, and 15.3% interrupted after 2 years. The mesial step was statistically significant at the age of 1-2 years. Even though the number of distal step reported at the age group of more than 2 years is less, the difference is not statistically significant, that we can state that distal step is decreased (Table 4). The data obtained from calibration were subjected to Kappa statistics (k) for reproducibility analysis. A k index higher than 0.875 was obtained, indicating good intra examiner agreement (SE of kappa = 0.054, 95% confidence interval: From 0.769 to 0.981).

**Table 1. Distribution of children based on age on duration of breast feeding**

Age	Duration of breast feeding	Terminal plane type		
		Mesial step	Vertical plane type	Distal step
3	Less than 3 months	0	0	3
	3-6 months	1	7	3
	6-9 months	68	3	0
	9-12 months	38	8	1
	More than 1 year	17	6	0
4	Less than 3 months	0	0	8
	3-6 months	3	6	3
	6-9 months	15	0	0
	9-12 months	32	6	1
	More than 1 year	10	1	1
5	Less than 3 months	0	0	8
	3-6 months	0	4	2
	6-9 months	21	0	0
	9-12 months	17	4	0
	More than 1 year	18	8	1
6	Less than 3 months	0	0	4
	3-6 months	0	3	2
	6-9 months	11	0	0
	9-12 months	35	9	0
	More than 1 year	6	6	0

**Table 2. Distribution of children based on age on duration of bottle feeding**

Age	Duration of bottle feeding	Terminal plane type		
		Mesial step	Vertical Plane type	Distal step
3	No bottle feeding	38	0	0
	Less than 6 months	35	6	2
	6-12 months	11	1	2
	1-2 years	0	2	6
	More than 2 years	13	4	0
4	No bottle feeding	49	3	0
	Less than 6 months	28	4	2
	6-12 months	23	7	5
	1-2 years	2	3	4
	More than 2 years	5	2	0
5	No bottle feeding	12	4	0
	Less than 6 months	19	6	0
	6-12 months	9	4	3
	1-2 years	3	2	7
	More than 2 years	6	2	1
6	No bottle feeding	8	2	0
	Less than 6 months	15	7	0
	6-12 months	8	5	2
	1-2 years	0	2	2
	More than 2 years	8	5	1

**Table 3. Distribution of children based on breastfeeding interruption**

Duration of breast feeding	Terminal plane type			Total	Percentage
	Mesial Step	Flush Terminal	Distal Step		
Less Than 3 months	0	0	23	23	5.7
3-6 months	4	20	10	34	8.5
6-9 months	115	3	0	118	29.5
9-12 months	122	27	2	151	37.7
More than 1 year	51	21	2	74	18.5
Total	292	71	37	400	100.0

**Table 4. Distribution of children based on bottle feeding interruption**

Duration of bottle feeding	Terminal plane type			Total	Percentage
	Mesial Step	Vertical Plane type	Distal Step		
No bottle feeding	107	9	0	116	29
Less than 6 months	97	23	4	124	31
6 to 12 months	51	17	12	80	20
1 to 2 years	5	9	19	33	8.25
More than 2 years	32	13	2	47	11.7
Total	292	71	37	400	100.

**Table 5. Multiple Logistic regression model**

Comparisons		Odds ratio	p-Value	Odds ratio	p-Value
Age when breastfeeding was interrupted	Mesial Step			Distal Step	
Less than 3 months	.108	.047	.331	.001*	
3-6 months	.163	.267	.338	.001*	
6-9 months	2.202	.081	1.904	.651	
9-12 months	.919	.651	.933	.915	
More than 1 year	1.080	.800	1.065	.952	
Age when bottle feeding was interrupted					
No bottle feeding	.889	.897	.908	.969	
Less than 6 months	.403	.051	.392	.268	
6-12 months	.757	.781	.818	.930	
1-2 years	.205	.001*	.274	.405	
More than 2 years	.411	.060	.484	.620	

The reference category is: Vertical plane type.\* p value less than 0.05

The Multiple logistic regression model analysis for the relationships of the distal surfaces of the primary second molars were carried out. In the sample of age when breastfeeding was interrupted, less than 3 months subgroup had 0.10 and 0.33 times of having mesial step and distal step respectively and both the results were statistically significant. In 3-6 months sub group 0.16 and 0.33 times of having mesial step and distal step respectively. In 6-9 months 2.2 and 1.9 times of having mesial step and distal step occlusion respectively. In 9-12 months 0.91 and 0.93 times of having mesial and distal step respectively, In more than 1 year group 1.08 and 1.06 times of having mesial and distal step respectively. In the sample of age when bottle feeding was interrupted, no bottle feeding subgroup had 0.86 and 0.90 times of having the mesial and distal step occlusion. Less than 6 months group had 0.40 and 0.39 times of having mesial and distal step respectively, 6-12 months group had 0.75 and 0.81 times of having mesial and distal step occlusion. 1-2 years

group had 0.19 and 0.39 times of having mesial and distal step occlusion and the result is statistically significant for the mesial step. More than 2 years group had 0.40 and 0.60 times of having mesial and distal step occlusion (Table 5).

## DISCUSSION

The Terminal plane type of primary second molars seems to be the first factor that could determine the future relationship between the permanent molars and the stages in development of occlusion. It is one of the important factor in guiding occlusion of the permanent first molars (Ana Carla Raphaelli Nahas Scocate *et al.*, 2011). The action of certain muscles involved which are either immobilized (orbicularis oris, masseter), overactive (chin muscles), or malpositioned (tongue is pushed backward) prolonged breast feeding does protect against malocclusion and might produce an abnormal dentofacial development of the child (Davis and Bell, 1991). Oral myofunctional structures also showed alterations in the shape of hard palate and tonicity of lips and tongue (Cristina Giovannetti del Conte Zardetto *et al.*, 2002). According to Proffit, habits that are maintained for at least 6 hours per day influence posture and alter resting tongue and lip pressures, which, in turn, are capable of affecting the pattern of development and causing malocclusion (Humphreys *et al.*, 1950). The isolated effect of bottle feeding on craniofacial development is not well defined, which encourages the accomplishment of both experimental and population-based studies. Therefore, the present study was conducted to assess the effect of prolonged Bottle feeding and Breast feeding on Antero-posterior relationship of the dental arches in school going children of south Bangalore.

The relationship between the types of terminal plane and the early occlusion of first permanent molar are as follows; The vertical plane type will lead to Angle's class I occlusion or cusp-to-cusp occlusion, The mesial step will lead directly to Angle's Class I occlusion and the distal step will lead to Angle's class II occlusion (Minoru nakata). Angle's class I occlusion is considered as the ideal occlusion. In this study, 400 children were included in the age range of 3-6 years. Prevalence of terminal plane type of primary second molars were evaluated. Among them 73% children showed mesial step, 17% showed vertical plane type and 10% showed distal step. Evaluating the age of children who interrupted breast feeding, a significant statistical result was found at the age groups of less than 3 months and 3-6 months in which more prevalence of distal step was observed. These findings are comparable to the results obtained in a study reported by Viggiano *et al* 2004 in which they stated that breastfeeding can be considered as a protective factor to avoid the development of malocclusion in deciduous dentition. Similar results were also reported by Peres *et al.* 2007 in which they stated that breastfeeding less than 9 months of age can be a risk factor for the development of malocclusion. Another study done by Warren and Bishara 2002 also showed that breastfeeding would favor palatal formation thus avoiding the formation of deep high arched palate which influence in the healthy growth of maxillary bones. In the present study, all children who interrupted the breast feeding habit before the age of 3 months showed Distal step. It was observed that longer the breast feeding duration there is lesser chance of developing distal step. These findings are similar to the findings reported by Anna Carla *et al.* 2011 in which they stated that children who

interrupted breastfeeding before the age of 3 months showed higher prevalence of distal step.

Breast feeding act as a stimulus for the downward and forward growth of mandible (Ganesh *et al.*, 2005). Longer breastfeeding duration has been found to reduce the palatal depths thus providing a harmony in establishment of craniofacial development (Edson *et al.*, 2012). Also children who are breast fed presents a greater facial muscle activity than those who are bottle fed, thus promoting an adequate development of jaws (Karen *et al.*). Children with short breast feeding duration seems to develop malocclusion and also have less maxillary space in primary dentition (Xiaoxian chen *et al.*, 2015). So early weaning may interfere with the normal development of alveolar ridges and the hard palate and hence result in malocclusion. Therefore the general benefits of breast feeding for child's health and the protective effects of breast feeding for malocclusions support the current recommendation for breast feeding for a longer duration. Evaluating the age of children who interrupted bottle feeding, a statistically significant result was found at the age of 1-2 years in which less prevalence of mesial step was observed. These findings are comparable to the results reported by Adamiak 1981 in which he found a positive association between bottle feeding and occlusal anomalies. Another studies reported by Labbok and hendershpt 1987 and Davies and bell 1991 also showed similar results in which they found a positive association between bottle feeding and malocclusion. The result of the present study are also comparable to the study reported by Churchut *et al.* 2003. Contrary to above studies, Humphrey and Leighton 1950 and Legovic and Ostrich 1991 found no significance between bottle feeding and malocclusion. Bishara *et al* 1987 also found no positive association between bottle feeding and occlusal relationship. Bottle feeding requires less forceful muscle action and thus does not facilitate mandibular development to the same degree as breast feeding (Xiaoxian chen *et al.*, 2015). Bottle feeding infants have shown to have reduced malar growth (Pottenger and Krohn, 1950). Also children who are bottle fed showed shorter maxillary inter molar width when compare to children who were not given a bottle (Aznar *et al.*, 2006). The nipple of infant feeding bottle is usually made from less flexible material which may cause misalignment of the teeth. During bottle feeding, the movement for obtaining milk is passive, which has a greater influence on developing malocclusion (Karen *et al.*).

According to the multiple logistic regression models, it was clearly seen that the longer the child was bottle fed, greater the chances of presenting distal step, which will lead to Angle's class II permanent molar relation. So, in many cases, there will be a need for early orthodontic intervention. When the data was analyzed, only the age at which breastfeeding was interrupted presented more significance than the age whose bottle feeding was interrupted. This study enhances scientific evidence that shows a lower prevalence of distal step in primary dentition in association with longer period of breast feeding. It can be inferred that when there is short duration of breast feeding, it results in less oral exercises, which in turn leads to the under development of muscles, deep high arched palate and also incorrect posture of lips and tongue. The child may also acquire other oral habits and all of these may contribute to the development of malocclusion. Therefore when the child is breastfed for longer duration, there will be lesser chance for the child to have the bottle feeding habit, thus lesser chances of presenting distal Step and leading to Angles class II molar

relation. It can be emphasized that the duration of breastfeeding has greater influence on the occurrence of distal step. Bottle feeding also contributes to the development of malocclusion, as it requires less muscle activity which results in decreased development oral structures thus resulting in inadequate growth of mandible. Also during bottle feeding tongue acts only to control the milk flow thus developing an abnormal swallowing pattern or tongue thrusting habits. A study reported by Takuro *et al.* 2005 also suggested that there will be a spontaneous change in the occlusion of children in primary dentition following discontinuation of feeding. These results are comparable to the established fact that there is higher prevalence of malocclusions in children who received only artificial or mixed feeding.

Even though the relationship between the types of feeding and occlusion are dependent on information about the width and length of dental arch, size of tooth and space of dentition, Based on the present observations it can be stated that Terminal plane type can be one of the factor which could determine the relation between duration of breast and bottle feeding and occlusion. Various nutritive feeding methods showed trends of increasing or decreasing steadily with age, the duration and extent of habits were less predictable and it can be suggested that the etiology of malocclusions are environmental. Therefore, the prevention of malocclusion in an organized manner can be performed by public health services, so that they become economically and socially accessible, differing from the current situation of offering orthodontic treatment.

## Conclusion

The relationship of malocclusion with breast feeding and bottle feeding were studied and it was found that the children with short duration of breast feeding seem to develop a distal step. This relation will always lead to Angle's class II permanent molar relation. The cessation time of breast feeding and bottle feeding are strongly associated in the occlusal development. The development of distal step, mesial step or vertical plane type will be influenced by the duration of breast feeding and bottle feeding, Hence we can conclude that breast feeding duration has got more influence on the relationship of primary molars. Longer the child is breastfed there will be less chance of child being bottle fed, which in turn may influence in the development of malocclusion.

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**Ethical Approval:** All procedures performed in the study involving human participants were in accordance with ethical standards of the institution and/or national research committee with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed consent:** Informed consent was obtained from all individual participants in the study.

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