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Prolonged feeding practice and its effects on developing dentition

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Abstract

Muscular activity of the lips, cheeks, and the tongue are important factors, which not only guide the occlusal development but also affect the growth of the jaws. Bottle feeding has been known to cause a myriad of changes in the oro-facial development. But the adverse effects of feeding practices with respect to developing dentition has been a subject of controversy. Hence a study was designed with the aim and objectives to check the commonly adopted feeding practices in South Kanara, to compare the occlusion of 3—to 5-year-old children with breast feeding, bottle feeding or combination, and to check whether prolonged feeding has any adverse influence on developing dentition. A total of 250 questionnaires were distributed to parents of 3- to 5-year-old children of which 153 were chosen for recording the impression and for studying the occlusion under various parameters. The results of the study indicated definite potential hazards of prolonged breast and bottle feeding especially with a tendency to develop openbite and posterior crossbite. It also suggested that an early preventive and interceptive approach is needed for normal developing occlusion.

Key words: Bottle feeding, Malocclusion, Oro-facial development, Overbite, Overjet, Suckling

Muscular activity plays a paramount role in the infant's survival. The newborn child exhibits a well-developed circumoral muscular activity, especially the activity and tension of the cheeks, lips and tongue are important factors, which not only guide the occlusal development, but also affect the growth of the jaws. Breast feeding has been noted to have a myriad of advantages as compared to bottle feeding.[1] Apart from the benefits which the human milk provides for the growing infant, the suckling activity during breast feeding promotes a better oro-facial development.[2] Also, increased duration of breast feeding is associated with a decline in the proportion of children with malocclusion.[3] Bottle feeding has been associated with malocclusion.[4] A trend towards the need for orthodontic treatment has been reported.[5] It has been known to increase overjet, openbite, and posterior crossbite due to constriction of the maxillary arch.[6]

However, the adverse effects of the feeding practices with respect to the developing occlusion have always been the subject of controversy. Therefore, a study was attempted to evaluate the effects of the various feeding practices prevalent in South Kanara, on developing dentition in 3- to 5-year-old children.

Materials and Methods

This study was conducted in the Department of Pedodontics and Preventive Dentistry, Manipal. Two hunred fifty questionnaires were distributed to parents of children between to the age group of 3 to 5 years. The questionnaires were framed based on the inclusion and exclusion criteria of the sample selection. Information about age, sex, height, and weight were evaluated to ensure healthy sample selection. The condition of the mother during pregnancy was evaluated along with the type of delivery. Full term and normally born children were included.

Detailed evaluation in regards to the history of feeding practice was carried out as follows:

- History of breast feeding alone.
- History of bottle feeding alone.
- Combination of breast and bottle feeding.
- The duration of each of these feeding practices were also recorded. In bottle feeding cases, the type of nipple used, conventional or physiological, was also questioned with the help of diagrams. The age of initiation of weaning was also questioned.

History of any deleterious oral habits like thumb sucking, tongue thrusting and mouth breathing was evaluated and positive history used as exclusion criteria.

Selection criteria

- Informed parental consent for the child's participation.
- Age 3 to 5 years.
- Healthy children born out of normal full-term delivery.
- Good general health and appropriate cognitive development.
- Presence of sound and complete primary dentition.
- Parent's ability to recall the child's feeding practice, type of nipple used if bottle fed and history of any oral habits.

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Exclusion factors were

- Children born preterm.
- History of traumatic pregnant condition of the mother.
- Intake of drugs, presence of illness, and trauma during pregnancy.
- Incompletely answered questionnaire.
- Positive history on oral habits.

Sample size

Out of 250 children, 153 children were chosen for recording the impression based on the selection criteria. The children were then divided into groups on basis of the feeding practice and duration of the same.

Cast prepared from the impression were occluded in centric occlusion and the following parameters were measured.

- Molar relation – mesial step, distal step, and flush terminal plane.
- Canine relation – classes I–III.
- Overjet.
- Overbite.
- Inter-canine width.
- Inter-molar arch width.
- Posterior crossbite.
- In case of missing vertical contacts between upper and lower anterior teeth. The anterior openbite was also noted by measuring the distance between the incisor edges of the upper and lower central incisors.

Results

Of the total 250 questionnaires distributed, 153 were chosen. They were divided into two main groups on the basis offeeding practice:

- Group A – Breast feeding only (81)
- Group B – Combination feeding (72)

These groups were further divided into subgroups depending on the duration of the feeding mainly 0–9, 10–18, and more than 18 months.

Statistical analysis was carried out using chi-square test and student's *t*-test. The data was analyzed using EPI package.

In Group A, 49.3% showed flush terminal plane relation as compared to 54.2% in Group B for molar relation. Molar relation in Group A showed mesial step in 46.9%, distal step in 37% and flush terminal plane relation in 49.3%. In Group B, mesial step was seen in 41.6% cases, distal step in 4.2%, and flush terminal relation in 54.2% cases. Canine relation in both groups showed class I relation in 93% cases. Overjet, when compared in both groups showed that the value of 2–4 mm was seen in 44.4% in Group A and in 62.4% in Group B. The mean overjet in Group A was 2.16 + 0.95 mm, whereas it was found to be 2.29 + 0.89 mm in Group B. In Group A, overbite between 2 and 4 mm was obtained in 41.9% cases, 55% showed decreased overbite of < 2 mm and 2.4% showed > 4 mm. In Group B, 62.5% had overjet between 2 and 4 mm, 31.9% had it < 2 mm and 5.5% had > 4 mm. The mean values in both groups were 1.74 + 1 and 2.06 + 1.97 mm, respectively. Group A showed unilateral crossbite in 4.9% cases, whereas Group B showed unilateral crossbite in only one case giving 1.38%. None of the children in either group showed bilateral crossbite. Openbite was seen more in Group B cases but did not give statistically significant difference with Group B. Mean canine arch width difference in Group A in maxilla ranged between

	Group A		Group B	
Molar relation				
Mesial Step	38		30	
Distal Step	3		3	
FTP	40		39	
Total	81		72	
Canine relation				
Class I	75		67	
Class II	1		1	
Class III	5		4	
Total	81		72	
	Overjet	**Overbite**	**Overjet**	**Overbite**
Overjet and overbite				
< 2 mm	36	45	23	23
2–4 mm	42	34	45	45
> 4 mm	3	2	4	4
	Crossbite		**Openbite**	
Crossbite and openbite				
Present	4	2	1	3
Absent	77	81	71	69

	Inter-canine	Inter-molar	Inter-canine	Inter-molar
Mean inter-canine and inter-molar arch width (mm)				
Maxilla	29.82 + 1.53	39.82 + 1.53	29.82 + 1.72	39.5 + 1.53
Mandible	23 + 1.58	35.3 + 1.41	22.1 + 1.58	34.3 + 1.41
Difference	5.9 + 0.01	4.39	7.7 + 0.2	5.2 + 0.12

	Group A	Group B	Group A *vs* Group B
Inter-group comparison			
Molar relation	3	3	$x = 0.08$ $P = 0.78$ (distal step)
Canine relation	1	1	$x = 0.4$ (Class II) $P = 0.52$
Overjet	3	4	$x = 0.08$ (> 4 mm) $P = 0.78$
Overbite	45	23	$x = 2.85$ (< 2 mm) $P =$ value 0.09
Crossbite	4	1	$x = 0.01$ $P = 0.9$
Openbite	2	3	$x = 0.01$ $P = 0.78$
Inter-canine arch width difference	6.33 + 1.34	6.12 + 1.27	$t = 0.20$ $P > 0.5$
Inter-molar arch width difference	4.33 + 1.07	3.15 + 1.65	$t = 5.43$ $P < 0.001$S

Table shows Intergroup comparision

29.8 + 1.7 and 30.6 + 1.5 mm, whereas in the mandible it was between 23.1 and 23.6 mm. In Group B, the maxilla showed values between 28.3 and 30.6 mm as compared to a range of 21.75 – 23.94 mm in the mandible. Mean intermolar width in Group A was found to be 4.33 + 1.07 mm and in Group B it was found to be 3.15 + 1.65 mm. Statistically significant difference between the groups was seen using student's *t*-test.

Discussion

The development of occlusion seems to depend strongly on influences of various oro-facial functions, especially during the early postnatal periods. Malocclusion seems to be related to various disturbances in the functional balance of the oral and facial musculature. Labbock and Hendershot[3] reported that breast feeding especially if prolonged does protect against malocclusion. This is because certain muscles involved in breast feeding are either immobilized (orbicularis oris, masseter), overactive (chin muscles), or malpositioned (tongue is pushed backward) and may produce an abnormal dentofacial development of the child. Therefore, it was decided to evaluate the effect of feeding practices with respect to breast feeding and bottle feeding on the occlusion of 3—to 5-year-old children. In the present study, questionnaires were distributed to evaluate the prevalent feeding practice with respect to breast feeding and bottle feeding. Legovic[7] also had distributed questionnaires to the parents requesting information about their feeding practices. Detailed history about the feeding practice was obtained as mentioned below:

- History of breast feeding alone.
- History of bottle feeding alone. In this study, no case was found with exclusive bottle-feeding; hence combination feeding was considered.
- Duration of feeding and age of weaning
- Type of nipple used in bottle feeding.

All the patients with bottle-feeding history used nonphysiologic nipple only as also observed by Legovic[7] in his study. This may be because mothers are uninformed about the existence of physiologic nipples. In these cases the physiology of suckling is not duplicated due to poor design, the mouth held open more widely, and greater demand placed on the buccinator mechanism.

The children were divided into two main groups on the basis of their feeding practices and further subdivided into subgroups on basis of the duration of the same. Alginate impression was taken and models prepared. Davis et al.[8] had conducted direct oral examination. Graber[9] has mentioned that clinical examination does not achieve the degrees of accuracy and completeness that an analysis of study casts will permit. Bishara et al.[10] had used plaster models to study the occlusion. Various parameters such as primary molar relationship, canine relationship, overjet, overbite, posterior crossbite, openbite, inter-canine arch width, and inter-molar width used in the study were evaluated.

In Group A, molar relation in breast feeding cases was found to be mesial step in 46.9% cases, and Flush terminal relation was found in 49.3% with distal step in 3.7% cases indicating that breast feeding was safe where molar relation is concerned. This was reported by Biljstra[11] Hickman et a1.[12] concluded in his study that there was no difference in the frequency of class II malocclusion between breast-fed and bottle-fed infants.

In Group B, the mesial step was recorded in 41.6%, flush terminal plane in 54.2%, and distal step in 4.2%. No correlation could be seen between distal step and the duration of feeding practice. Hickman et al.[12] in their study also concluded that there were no differences in frequency of class II malocclusion between breast-fed and bottle-fed infants. Ravn[13] in his study also found no significant difference in primary second molar relation between the various sucking groups. Canine relation breast-fed children when observed, gave class I in 92.5%. This indicated that the duration of breast feeding had no influence on developing deciduous occlusion. In combination with feeding cases, 93% showed class I, 1.2% showed class II, and 6.1% showed class III relation. Ravn[13] in his study confirmed higher proportion of distal canine relation in children who sucked dummies until 3 years of age. This discrepancy could be attributed to a small number of samples in the present study. Davis et al.[8] in his study also reported one child with abnormal distal canine relation. Overjet, in Group A, showed 51.8% of children with overjet between 2 and 4 mm, 44% had < 2 mm, and 3.7% had overjet > 4 mm. Similarly, Ardran[14] hypothesized that breast feeding was a stimulant to forward growth of the mandible, but no connection could be drawn between the decreased overjet and prolonged breast feeding. In Group II, 62.5% showed overjet between 2 and 4 mm, 31.9% had overjet < 2 mm, and 5.5% had overjet with > 4 mm. No statistically significant difference was seen between subgroups. Simpson et al.[15] demonstrated no relation between oral malocclusion and infant feeding practices. The difficulties in interpreting results and comparing studies have been owing to the lack of standardization in the sample selection. This variation in the length of the duration of breast or bottle feeding and failure to consider, or correct other social and psychological influences between cultures or groups of breast-fed or bottle-fed infants can also lead to inaccuracy in interpreting the results. Increased overjet has been reported to be one of the reason for malocclusion caused by bottle feeding. This was noticed by Davis et a1.[8] who conducted a two-dimensional cross tabulation of overjet and bottle feeding and showed that 11 of 49 bottle-fed children had abnormal overjet. Except for two, all of the 59 children who were fed exclusively or partially by breast feeding had

normal overjet. Overbite was between 2 and 4 mm in 34 children in Group A. Forty-five children had decreased overbite of < 2 mm and two had > 4 mm overbite. Although the overbite seemed to decrease with prolonged breast feeding, this was not significant. This could be due to downward and forward growth of mandible, due to breast feeding, as reported by Ardran,[14] who believed that breast feeding could be a stimulus to this forward growth. In the Group B of combined feeding, 45 children showed overbite between 2 and 4 mm, that is, 62.5%, 23 had overbite of < 2 mm and four (5.5%) had > 4 mm. Lindner[16] confirmed that the overbite was negatively influenced by dummy sucking. The overbite was seen to decrease along with the duration of sucking habit. It might also lead to collapse in the transverse width in the canine region. In this study decreased overbite in subjects with prolonged breast feeding and bottle feeding could be due to a tendency towards the developing openbite. Because the oral development of these children is in progress some amount of self correction of this type of malocclusion might have taken place once feeding was discontinued, thereby not resulting in openbite as reported by Karjaleinan.[6]

Crossbite in Group A was seen in 4.9% showing unilateral crossbite. No bilateral crossbite was observed. Through the number of crossbites in prolonged breast feeding no significant difference was obtained. Lindner[16] showed that the duration and intensity of the sucking habit have a negative influence by reducing the transverse width of the maxillary arch in children with unilateral crossbite. In Group B, posterior crossbite was seen in one child. Bowden[17] had suggested that posterior crossbite might result more frequently from active sucking because of the horizontal position of the nipple and the resultant negative intra-oral pressure. Zhu et al.[18] had also reported that the posterior crossbite, the most common malocclusion in young children, can be caused by a variety of skeletal, muscular, or dental factors. This condition produces insufficient maxillary arch width and is frequently associated with various oral sucking and postural habits. Openbite in breast-fed children was found in 5.25% cases but this was not statistically significant. Straub[19] had examined 237 children with perverted swallowing habit and reported that almost all of them were bottle-fed babies. Many of these children had affected anterior segment of both arches. Either they had a severe openbite due to protrusion of upper anterior teeth, or the anterior segment of both the arches would be in a protruded position with spaces between the incisor and cuspid. In Group B, the number of openbite cases mounted to 4.16%, which is more for breast feeding. This could be due to the conventional nipple used in bottle-fed children. Bottle feeding is also seen to promote retained infantile swallow pattern, which in turn could cause openbite.

The mean difference in inter-canine width between maxilla and the mandible was 6.33 + 1.34 mm in Group A. In Group B, the difference was indicated in the range of 5.69 ± 1.45 – 7 ± 1.08 mm. It could be seen that the mean inter-canine width appeared to be less in the case of prolonged bottle feeding as compared to bottle feeding for 10–18 months. This low-mean difference could indicate an inclination towards crossbite. Transverse problems in the primary dentition are usually seen as posterior crossbite associated with a narrow upper arch. Sucking habits tend to be associated with some constriction of the upper arch, particularly in the canine region Kutin et a1.,[20] in their study on primary dentition crossbite found that 8.65% showed self correction in the mixed dentition.

Mean difference in inter-molar arch width in Group A was 4.33 ± 1.07 mm and in Group B it was found to be 3.15 + 1.65 mm. Student's *t* analysis was found to show a *P* value < 0.001. Bowden[17] also had found lower inter-canine and inter-molar arch widths among pacifier users than nonusers, although this was most clearly the case for the maxillary inter-molar dimensions. Karjaleinan[6] suggested that an early introduction of bottle feeding, indicating a pattern of low impact muscular activity, may interfere with the normal development of alveolar ridges and hard palate, and hence lead to posterior crossbite.

Therefore, according to Labbock and Hendershot[3] there is a strong indication that breast feeding especially if prolonged does protect against malocclusion.

In the present study, though some of the findings are indicative of the true effects of prolonged breast feeding and bottle feeding, the reasons for not getting the significant finding in other parameters could be due to the presence of a large number of nonrespondents, whose socio-demographic characteristics might have been different from those of the respondents. The results can be considered as a preliminary indicator for the population of South Kanara region.

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