

The effect of feeding methods and non-nutritive sucking habits on early childhood caries and development of occlusion (A cross-sectional study)

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Background and objectives: Early Childhood Caries (ECC) is the most common chronic disease condition in childhood and involves the presence of one or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in children under 72 months of age. Time and frequency of breast-feeding, artificial feeding and of non-nutritive sucking habits can influence orofacial development, and when negative can provoke instability of orofacial function. Sucking habits involving digits or dummies are the most tangible environmental factors that play a role in the etiology of malocclusion.

Subjects and method: A cross-sectional study performed on a convenient sample of 500 preschool children aged between 4-6 years old in Erbil city. Parents (mothers) were asked for a permission to include their children in the study. A short interview with the mothers of the children preceded the dental examination. The clinical examination included child weight, height determination and dental examination.

Results: The results showed that prevalence of caries in breast fed children was (70.6%), in bottle was (62.4%) and both fed children was (65%) with no significant association between type of feeding and caries prevalence ($P=0.298$). Mean dmfs in males was (9.84 ± 12.99) which is higher than mean dmfs of females (7.39 ± 10.58) . Class II canine classification was higher in bottle and both feeding than in breast feeding and there was no prevalence of Class III canine relation was found in bottle feeding.

Conclusion: Type of feeding was not found to be related to development of early childhood caries in primary dentition of preschool children. Bottle feeding was considered as a risk factor for development of class II canine relation. Non-nutritive sucking (finger, pacifier sucking and both) were found to be risk factors for the development of anterior open bite and posterior cross bite. Finger sucking produces the development of unilateral posterior cross bite in primary dentition.

Key words: type of feeding, dental caries, malocclusion.

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Introduction

Feeding practices include breast and bottle feeding that provides the infant with nutrients essential for survival, so it is called nutritive sucking habits. Nonnutritive sucking include thumb, fingers and object sucking, pacifier use, which ensure a sense of security.¹ Prolonged breast-feeding apparently carries a risk of developing dental caries or early childhood caries.² Early childhood caries (ECC) is a major public health problem and the most common chronic infectious childhood disease that is

difficult to control. It is not life-threatening, but can result in pain, impairment of function, have deleterious influence on the child's growth rate and body weight, and ability to thrive, thus reducing quality of life, therefore its impact on individuals and communities is considerable.³ Normal occlusion development is the changes one would expect in the 'average' child for average eruption dates. While malocclusion is an acceptable deviation either and/or functionally from the ideal relationship of the upper and lower teeth.⁴ There are several

factors that could lead to malocclusion in primary dentition. In general, these factors may be genetic or environmental. Among environmental factors nonnutritive sucking habits (finger and pacifier-sucking) are risk factors for development of malocclusion.^{5,6} Time and frequency of breast-feeding, artificial feeding and non-nutritive sucking habits can influence orofacial development⁷, and, when negative they can provoke instability of orofacial function.⁸ The objectives of this study were to find out the effect of breast and bottle feeding practices of preschool children on development of dental caries and occlusion, and to find out the effect of non-nutritive sucking habits on occlusion development.

Subjects and Method: The present study was a cross sectional study carried out for a convenience samples of (500) children aged between (4 -6) of both gender (262 males and 238 females) receiving their medical care except dental care in primary health care centers and in Raparin Pediatric Hospital of Erbil city. The study performed during the period between June - November 2013. Parents (mothers) were asked for a permission to include their children in the study. A short interview with the mothers of the children preceded the dental examination. During interview, mothers were asked to answer the questionnaire designed by the researcher to collect information about child general health, feeding practices, sucking habits and oral health (appendix I). The clinical examination included child weight, height determination and dental examination.

Inclusion criteria. Apparently healthy children with normal weight and height, Born out of normal full term delivery, full primary dentition and no prematurely lost primary teeth.

Exclusion criteria: Medically compromised children, history of traumatic pregnant condition of mother, presence of erupting permanent teeth, cleft lip and palate or any anomalies that may preclude breast feeding, presence of extensive carious lesion or loss of coronal structure, which would compromise occlusion, presence of any type of trauma like accidental loss of anterior teeth, history of orthodontic

treatment or speech and language therapy.

Determination of child's weight and height. Each child was asked to get on ordinary scale in order to obtain the child weight, a scaled tape was used to determine the height.

Dental caries examination. While the child was sitting comfortably on ordinary chair, examiner stood front child and asked the child to open his/her mouth widely and under good illumination that obtained by using pen light, mouth mirrors were used to examine child's teeth.⁹ The child teeth were examined starting from upper right second primary molar to upper left second primary molar then lower left primary molar to lower right primary molar, disposable mirrors were used during examination. A full mouth examination is carried out by a thorough visual examination in dry field, gauze was used to clean and dry the teeth surfaces prior to the examination, When plaque deposit is present it was removed by wiping surface with gauze dental examinations was made by visual inspection with the aid of plane disposable mirror. The dmfs index was applied to primary dentition, child caries experience is expressed as total number of teeth or surfaces that are decayed "d", missed "m" or filled "f" and "s" mean surface. The examination included the five surfaces on posterior teeth starting from occlusal surface, followed by buccal, lingual, mesial and distal surface, and the four surfaces on anterior tooth were examined starting from facial, lingual, mesial and distal as described by Cappelli and Mobley.¹⁰ To pretest a method of examination, data collection forms, a pilot study was performed on 10 children.

Dental occlusion examination. Occlusion examination was done while the child was closing in centric relation and the cheeks and lips were reflected by using dental mirror. Molar and canine relation, over jet, anterior open bite and posterior cross bite were measured.¹¹

Molar relationship classification. The distal relationship of the maxillary and mandibular primary second molar was classified according to Baume.¹² Straight: forming a plane. Distal step: Forming a distal step to the mandible. Mesial step: Forming a mesial step to the mandible.

Canine relationship classification. The primary canine relationships were categorized according to Foster and Hamilton.¹³

Class I: The cusp of the maxillary canine was on the same plane as that of the distal surface of the mandibular canine.

Class II: The cusp of the maxillary canine was positioned anteriorly to the distal surface of the mandibular canine.

Class III : The cusp of the maxillary canine was positioned posteriorly to the distal surface of the mandibular canine

Overjet. which is the horizontal space between maxillary and mandibular incisors.

¹³ Over jet was measured directly in the children’s mouth, using millimetric rulers. The degree of over jet is measured from the palatal surface of the mesial corner of the most protruded fully erupted maxillary incisors to the labial surface of the corresponding mandibular incisor.¹¹

Anterior open bite. Characterized by the absence of an overbite between the maxillary and mandibular incisors.¹⁴ The clinical examination was performed when the posterior teeth were in occlusion, anterior open bite was recorded as the presence of a lack of vertical overlap equal to or greater than 3 mm between the primary incisors.¹⁵

Posterior cross bite. When at least one

maxillary posterior teeth occluded lingually to the vestibular cuspids of the mandibular posterior teeth, the two type of posterior crossbite, the unilateral cross bite: when reverse buccal overjet on one side of the mouth were present or bilateral cross bite: when reverse buccal overjet in both posterior segments were present¹⁴ were recorded if present.

Statistical analysis. Data were analyzed using statistical package for social sciences (SPSS version 19). Chi square test of association was used to compare between proportions. When the expected count of more than 20% of the cells of the tables was less than 5, Fishers exact test was used. Students t - test was used to compare between means of two independent samples. Analysis of Variance (ANOVA) was used to compare between three means or more. A "P" value of ≤ 0.05 was considered significant.

Results

Table (1) shows the percentages of distribution of preschool children according to their type of feeding out of 500 children involved in the study, table (2) shows percentage distribution of preschool children according to their history of non –nutritive sucking.

Table (1): Percentage distribution of preschool children according to their type of feeding.

Type of feeding	N	%
1-Breast feeding	177	35.4
2-Bottle feeding	117	23.4
3-Both feeding	206	41.2
Total	500	100

Table (2): Percentage distribution of preschool children according to their history of non –nutritive sucking.

History of non-nutritive sucking	N	%
1-No History.	276	55.2
2-Finger sucking only	28	5.6
3- Pacifier sucking only	178	35.6
4- Finger and pacifier use	18	3.6

Caries evaluation. Table (3) shows the effect of type of feeding on early childhood caries development (dmfs). $P=0.260$ indicating that type of feeding (breast bottle or both) has no effect on caries experience in preschool children.

Occlusion evaluation. Statistical analysis showed high significant association between type of feeding and canine relation ($P <$

0.001) for right and left sides as seen in table (4). It was found that the prevalence of Class II canine classification was higher in bottle and both feeding than in breast feeding. In bottle feeding it was (32.5%) in right side and (29.1%) in left side, while in both (breast and bottle) feeding it was (24.8%) in right side and (25.7%) in left side.

Table 3: Caries severity (dmfs) in deciduous dentition according to type of feeding.

Type of feeding	Caries experiences					P value
	N	%	Mean	S.D	S.E	
1.Breast feeding	177	35.4	9.81	11.67	0.877	0.260
2.Bottle feeding	117	23.4	7.64	11.97	1.107	
3.Both feeding	206	41.2	8.28	12.16	0847	
Total	500	100	8.67	11.95	0.534	

*not significant

Table 4: Prevalence of canine classification in preschool children according to type of feeding.

Type of feeding	Canine relation						Total	Rt. & Lt.	P value
	Class I		Class II		Class III				
	Rt.	Lt.	Rt.	Lt.	Rt.	Lt.			
1.Breast feeding	N	151	153	21	22	5	2	177	P<0.001
	%	85.3	86.4	11.9	12.4	2.8	1.1		
2.Bottle feeding	N	79	83	38	34	0	0	117	
	%	67.5	70.9	32.5	29.1	0.0	0.0		
3.Both feeding	N	148	150	51	53	7	3	206	
	%	71.8	72.8	24.8	25.7	3.4	1.5		
Total	N	378	386	110	109	12	5	500	
	%	75.6	77.2	22	21.8	2.4	1.0		

*high significant

The Effect of non-nutritive sucking on occlusion development. The effect of non-nutritive sucking on anterior open bite development was significant ($P<0.001$) When compared with children who don't have history of non-nutritive sucking as shown in table (5). (Appendix III).

Table (6) shows the prevalence of posterior

cross bite in children with no history and with history of sucking habits. Unilateral posterior cross bite development has been observed mostly in children with history of fingers sucking and the prevalence of posterior cross bite was (3.6%) for right side and (14.3%) for left side.

Table (5): The effect of non–nutritive sucking on anterior openbite development in preschool children.

Prevalence of non-nutritive sucking	Anterior open bite				P value	
	No		Yes			Total
	N	%	N	%		
1.No History	270	97.8	6	2.2	P<0.001	
2.Finger sucking only	23	82.1	5	17.9		
3. Pacifier sucking only	90	50.6	88	49.4		
4. Finger & pacifier use	8	44.4	10	55.6		
Total	381	78.2	109	21.8		500

*Pearson Chi-square test

Table (6): The effect of non –nutritive sucking on posterior cross bite development in preschool children.

Prevalence of non-nutritive sucking habits		Posterior crossbite				Total
		No		Yes		
		N	%	N	%	
1.No History	Rt.	275	99.6	1	0.4	276
	Lt.	274	99.3	2	0.7	
2.Finger sucking only	Rt.	27	96.4	1	3.6	28
	Lt.	24	85.7	4	14.3	
3. Pacifier sucking only	Rt.	163	91.6	15	8.4	178
	Lt.	164	92.1	14	7.9	
4. Finger & pacifier use	Rt.	16	88.9	2	11.1	18
	Lt.	16	88.9	2	11.1	
Total	Rt.	481	96.2	19	3.8	500
	Lt.	478	95.6	22	4.4	

*Pearson Chi-square test

When logistic regression analysis was used, finger sucking was found to be not significantly associated with right side posterior cross bite development (P=0.124) as shown in (appendix IV). While in the left side the association between posterior cross bite development and history of finger sucking was significant (P<0.001) as shown in (AppendixV). Pacifier sucking was significantly associated with posterior cross bite inright side (P=0.005, B=2.953), and in the left side (P=0.004, B=2.241), similar association was found in children with both finger and pacifier sucking (P=0.011, B=3.212) for the right side, and (P=0.014, B=2.553) for the left side as seen in (Appendix IV, V).

Discussion

The results of the present study showed that when multiple regression was used, early childhood caries found to be not clearly related to the type of feeding in this sample (P=0.203, P=0.315 respectively for bottle and both feeding) as shown in appendix II. Another studies.^{16,17} confirm that results, This is because dental caries is a multifactorial disease and its development depend on interaction of several factors not only type of feeding. High significant association (P<0.001) between type of feeding and CLI canine relation was found. Breast fed children showed higher prevalence of CLI canine relation than in bottle and both fed children. Class II canine relation prevalence

in bottle fed children was (32.5%, 29.1% respectively for right and left sides) which is higher than the prevalence of CLII canine relation in breast and both (breast and bottle) fed children. That is in contrary with result of another study in which they stated that bottle feeding is not a risk factor for the development of CLII canine.¹⁸ Although Chi-square test showed that high significant association ($p < 0.001$) between type of feeding and anterior open bite development, logistic regression showed no association ($P = 0.272$) between type of feeding and development of anterior open bite. The results of current study were in agreement with the results of studies.^{5,19} who found the type of feeding has no influence on anterior open bite development. Non-nutritive sucking was significantly associated with the development of anterior open bite ($P < 0.001$) as shown in (appendix III). Non-nutritive sucking was considered as a risk factor for the development of anterior open bite (OR=9.145, 39.443, 52.574 respectively for finger, pacifier sucking only and both sucking). Another study by Vaasconcelos et al.²⁰ showed that there is association between non-nutritive sucking and development of anterior open bite in children with non-nutritive sucking habits. The logistic regression analysis showed that the association between finger sucking and posterior cross bite development was significant only in the left side ($P < 0.001$) while the association between finger sucking and posterior cross bite was not significant in the right side

($P = 0.124$) indicating that finger sucking was associated with unilateral posterior cross bite in primary dentition (appendix III and IV). Unilateral posterior cross bite is common in primary dentition.^{21,22} Unilateral posterior cross bite that caused by the effect of habits like thumb or fingers could results from downward displacement of tongue with increased pressure from cheeks that result in constriction of the maxilla.²³ Unilateral posterior cross bite can be easily explained by the placement of the fingers in one side of the mouth. According to the present study, non-nutritive sucking is considered as risk factor for the development of posterior cross bite in primary dentition that's because teeth are maintained in its position most of the time by balanced forces of cheeks from the buccal side and tongue from the lingual side and the harmful effect of non-nutritive sucking (like finger sucking) on posterior segment results from increased cheeks activity during sucking that apply an extra pressure on posterior teeth buccally a combined by abnormal tongue position.²⁴ the resultant muscle imbalance that leads to posterior cross bite. The current study showed that children that were not exposed to non-nutritive sucking were protected against the development of malocclusion like anterior open bite and posterior cross bite which was supported by an epidemiological study done by Sham²⁵ concluded that whenever there is no history of non-nutritive sucking, anterior open bite and posterior cross bite prevalence will be minimized.

Appendix I: The questionnaire to be used in the study

Health centre name:	Patient number	Gender: 1-Male 0-Female
Age (in months):	Mother's age:	phone number
Type of delivery:	1-Normal	2-Caeserian
Habits: Thumb or finger sucking	1-Yes 0-No	Pacifier sucking: 1-Yes 0-No
Type of feeding (as classified by Ganesh)¹⁹		
1- Breast feeding alone	2- Bottle feeding alone	3- Combination
Weaning:	1-Yes 0-No	Age of weaning (in months):

Appendix II: Clinical examination

Height in cm:

Weight in Kg:

Occlusion examination Molar classification Cl..... Canine classification Cl.....

Anterior openbite: 1-Yes 0-No

Posterior crossbite: 1-Yes 0-No

Increased overjet: 1-Yes 0-No

Dental examination

<i>R-L</i>	<i>Upper</i>				
	<i>M</i>	<i>O</i>	<i>D</i>	<i>B</i>	<i>L</i>
<i>E</i>					
<i>D</i>					
<i>C</i>					
<i>B</i>					
<i>A</i>					
<i>A</i>					
<i>B</i>					
<i>C</i>					
<i>D</i>					
<i>E</i>					

ds..... ms.....

<i>R-L</i>	<i>LOWER</i>				
	<i>M</i>	<i>O</i>	<i>D</i>	<i>B</i>	<i>L</i>
<i>E</i>					
<i>D</i>					
<i>C</i>					
<i>B</i>					
<i>A</i>					
<i>A</i>					
<i>B</i>					
<i>C</i>					
<i>D</i>					
<i>E</i>					

fs..... dmfs.....

Appendix III. The results of logistic regression analysis between anterior open bite as variable dependent variable with type of feeding and history of Non-nutritive sucking as independent

Variable	B (regression coefficient)	P	OR (odds ratio)	95%C.I. for OR	
				Lower	Upper
Type of feeding		0.272			
Breast (reference)			1		
Bottle	.563	0.123	1.755	.858	3.588
Both	.214	0.534	1.238	.631	2.432
Sucking		<0.001			
No Sucking (reference)			1		
Finger only	2.213	<.001	9.145	2.578	32.447
Pacifier only	3.675	<.001	39.443	16.508	94.244
Both	3.962	<.001	52.574	15.144	182.512
Constant	-3.993	<.001	.018		

Appendix IV. The results of logistic regression analysis between right side posterior cross bite as dependent variable with type of feeding and history of non-nutritive sucking as independent variables

Variable	B (regression coefficient)	p	OR (oddsratio)	95%C.I. for OR	
				Lower	Upper
Type of feeding		0.253			
Breast(reference)			1		
Bottle	1.637	0.133	5.141	.607	43.539
Both	1.758	0.098	5.800	.724	46.486
Sucking		0.035			
No sucking(reference)					
Finger only	2.211	0.124	9.121	.547	152.017
Pacifier only	2.953	0.005	19.155	2.470	148.521
Both	3.212	0.011	24.827	2.103	293.47
Constant	-6.855	<0.001	.001		

Appendix V. The results of logistic regression analysis between left side posterior cross bite as dependent variable with type of feeding and history of non-nutritive sucking as

Variable	B (regression coefficient)	p	OR(odds ratio)	95%C.I. for OR	
				Lower	Upper
Type of feeding		0.187			
Breast(reference)			1		
Bottle	1.133	0.173	3.103	.608	15.852
Both	1.432	0.069	4.186	.897	19.543
Sucking		0.006			
No sucking(reference)			1		
Finger only	3.086	0.001	21.881	3.742	127.940
Pacifier only	2.241	0.004	9.406	2.074	42.669
Both	2.553	0.014	12.846	1.668	98.910
Constant	-5.847	<0.001	.003		

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