Breastfeeding Effect on Primary Teeth Emergence in Relation to Craniofacial Growth among Iraqi Infants

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Abstract

Background: Breastfeeding is more than just nutrition; it can be viewed as a natural orthotic device for the harmonious development of the face. Sucking has an impact on a child's premaxillary region's growth, and mandibular movements encourage mandibular growth. Along with the advantages for general health, breastfeeding also helps with the right development of teeth, face muscles, and occlusion. Hence symmetric, well-proportioned face and appropriate occlusion depend on balanced facial growth. **Objectives:** This study aims to evaluate the effect of breastfeeding on the timing of teething in relation to craniofacial development. **Materials and Methods:** This study is a cross sectional comparative study concerning craniofacial growth assessment, with prospective view concerning timing of eruption. Sample was composed of 100 breastfed infants compared with 100 infants depending on formula milk. Clinical examinations and follow-up for teeth emergence was done for whole sample. **Results:** Breastfeeding was found to be associated with early teeth emergence. Additionally, although, there were no significant differences between facial growth and feeding pattern there was a significant correlation between delay eruption time of primary dentition and facial growth parameters (mandible and maxilla depths) among bottle-feeding group. **Conclusion:** The current study confirms the effect of breastfeeding on the early teething emergence of primary dentition; however, there were no significant differences between type of feeding and facial growth parameters. While a significant relation between delay eruption time and facial growth parameters (mandible and maxilla depths) was found among bottle-feeding infants.

Keywords: Breastfeeding, craniofacial growth, primary teeth emergence

Introduction

Human milk is the recommended diet for infants and is known as the "gold" standard for baby nutrition because of its nutritious balance, immunological protection, and other growth-promoting ingredients.[1,2] In addition to breastfeeding's positive effects on general growth,[3] it also plays a crucial role in establishing proper craniofacial development because it encourages vigorous orofacial exercise, which enhances the development of the functions of breathing, swallowing, chewing, and phonation. Breastfeeding, according to some schools of thought, is beneficial for the oral cavity's growth.[4] Among them is better hard palate contouring, which leads to the deciduous dentition being aligned correctly and less malocclusion issues.[5] According to reports, breastfeeding is a habitual nutritive sucking strategy that guards against malocclusion in the primary dentition. Infants' sucking methods for nursing and bottle feeding may differ, and the sucking mechanism utilized for bottle feeding may increase the risk of a newborn developing a malocclusion.[6,7] Admittedly, human breasts can alter shape to resemble the oral cavity because they are soft and flexible. On the nipple-squeezing movements, there is agreement that they encourage appropriate lip closure during repose and the correction of physiological mandibular retrognathism. Additionally, because of the tonicity acquired from the high tongue muscle activity, these movements encourage

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proper tongue alignment in the central incisor palatine region.[8]

Facial growth, which refers to the expansion of the face and cranium bones as well as the general process of postnatal facial development, is crucial for the plastic surgeon. Numerous genetic and craniomaxillofacial illnesses can be diagnosed with the use of facial morphology, a crucial phenotypic trait.[9] When a newborn infant's skull is proportionally compared to that of an adult, it is clear that the infant has a relatively much larger cranium and a considerably smaller face; this transition is a key component of the pattern of facial growth.[10] The face is one of the more intricate parts of the skull. It consists of about a dozen separate bones and combines a variety of anatomical and functional areas. Simple soft tissue points that lie on top of these bone landmarks can be used to measure the skull. Although soft tissue provides fluctuation, anthropometry nevertheless enables one to directly monitor an individual's growth.[11] However, variations in skeletal dimensions, muscular development, and environmental factors including diet, health, and climatic effects, which are significant determinants of growth and development, all affect face proportion.[12] For the detection of facial morphological malformations, facial width and height are helpful. Undoubtedly, a short, wide face is mirrored by a subnormal index, whereas a long, narrow face is reflected by a supernormal index. Both Class III and Class II malocclusions are characterized by an unbalanced ratio of the height and width of the face, which affects the occlusion between the dental arches and the patient's esthetics.[13] In order to achieve a harmonic soft tissue relationship, the underlying dental, skeletal, and neuromuscular systems must be in harmony because they are all interrelated.[14] According to academics and scholars, symmetry is the most important factor in beauty and appeal. Perfect symmetry can be seen on a perfect face. Larger eyes, a narrower nose, and a proportional face overall. There are early indications that people like attractive faces, even at youthful children.[15] According to research, certain infants' facial symmetry made them appear more appealing than others.[16] Planning for cosmetic and reconstructive facial surgery requires a facial anthropometric analysis.[17] For a quantitative evaluation of the face, there are two anthropometric techniques:

- Manual anthropometry: Typically, anthropometric measures are acquired directly from the patient using calipers, necessitating close proximity to the person. Inevitably, the operator's expertise and experience will determine how accurate the measurements are.[18]
- Digital anthropometry: Since the development of stereophotography, it has become feasible to obtain a realistic 3D image of the face with true color and texture. These stereophotographic systems are made up of multiple pairs of similar cameras that are angled at particular angles to collect 3D surface data using specialized software.[19]

Breast milk composition affects mother nutrition and environment.[20,21] Therefore, considering breastfeeding status is a possible source of variation in the teeth's emergence time.[22,23] Human milk contains necessary nutrients for healthy teeth development such as phosphate, calcium, and vitamins A, C, and D. For hydroxyapatite crystals to form properly, calcium and phosphorus are necessary. So, deficiency in the previous nutrients can have an effect on tooth development.[24,25] The eruption of teeth is a constant biological process by which evolving teeth emerge across jaws and the overlying mucosa into the oral cavity.[26] Tooth eruption also reflects the body's growth in general. Thus, when tooth eruption is delayed, the body's growth in general can be said to be constrained. It is a complex and tightly regulated process; hence many factors can influence tooth eruption, for instance: genetics, ethnical, racial, geographical differences, hormones, gender, and nutritional differences.[27,28]

As far as there were no previous Iraqi studies concerning the breastfeeding effect on primary teeth emergence in relation to craniofacial growth among infants, therefore, this study was conducted in order to evaluate the effect of breastfeeding on the timing of teething in relation to craniofacial development.

Materials and Methods

Cross-sectional comparative study is the study's methodology, concerning craniofacial growth assessment, with longitudinal prospective concern for timing of eruption. The selected sample consisted of (100) breastfed infants compared with (100) infants depending on formula milk. All infants examined and followed for timing of teeth emergence. Both groups examined when they attended the health centers of Baghdad during primary health care. Infants aged between 4 and 9 months were selected in the study. The time of primary teeth emergence in infants was examined through the intraoral examination by using the index finger, feel the incisal edge or tooth cusp tip on the alveolar ridge. When the tooth's crown edge was clearly visible in the oral cavity, it was regarded to have erupted.[29] Early and delayed teething were taken into consideration when dividing the eruption time into monthly intervals (5–6, 7–8, 9–10, and +11). The infant was placed in the mother's lap during the intraoral examination, which was done knee to knee position. A mouth mirror was used to inspect the mouth without the use of radiographs. Infants with no teeth emerged at monthly intervals, until the precise eruption time was recorded. Parents were instructed to consider a tooth erupted as soon as any part of the crown emerged through the gingival surface, and to record the date at which this occurred. Craniofacial growth was measured throughout the manual anthropometric measurements of the infants' face. Measurements were taken directly from the infant using standard spreading caliper and measuring tape according to standard anthropometric methods.[30] Many of these landmarks are easily recognizable visually and measured with a measuring tape, but a few of them require palpation to be located. These landmarks are marked with a face painting marker pen to aid in precise measurement; the tips of a caliper are then placed on the landmarks after inspection and/or palpation. A measurement was deemed asymmetrical if there was a 2 mm or more disparity between the two sides.[31,32] During measurement, the infants were tried to sit at a rest position on their mother's lap.[18] The anthropometric landmarks referenced in this study: endocanthion (en); exocanthion (ex); gnathion (gn); nasion (n); subnasale (sn); zygion (zy); tragus (t); cheilion (ch). However, the main distances in the face were measured in this study are: interchanthal distance (en-en); exterchanthal distance (ex-ex); face height (n- gn); face width (zy-zy); and both left and right measurements for all the maxillary depth (t-sn); mandibular depth (t-gn); palpebral fissure length (en-ex); oropalpebral distance (ex-ch). These facial characteristics were measured using the approach outlined by Hall *et al.*[30] with the child's head in the Frankfurt horizontal position as shown in Figure 1. This study also assesses the facial index, which describes the ratio between the interzygomatic widths to facial height.[17,18] Additionally, Farkas proportion index (Farkas ratios) to evaluate the growth of maxilla in relation to mandible for both sides, and the differences between right and left were also calculated.[33]

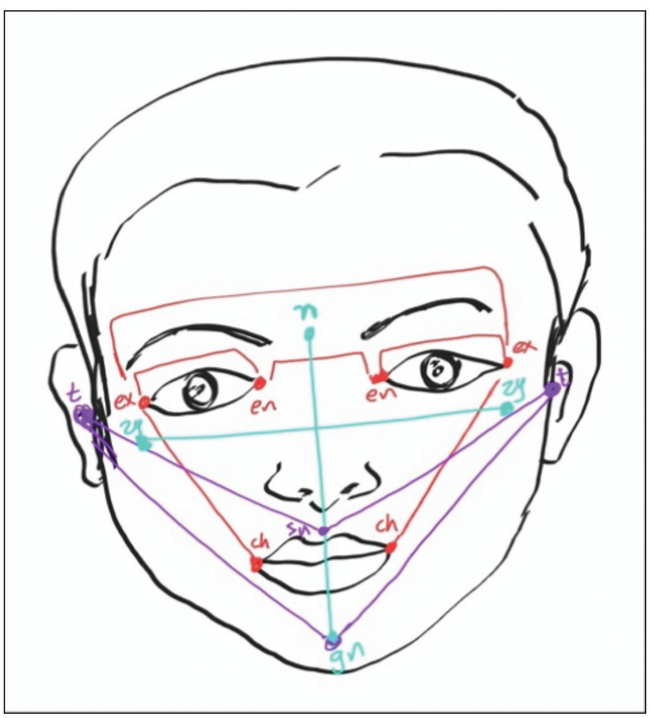

Figure 1: Facial landmarks in the Frankfurt horizontal position

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Exclusion criteria

Infants with malnutrition, chronic illness or systemic diseases were excluded. Infants with mixed feeding also were excluded.

Inclusion criteria

Apparently healthy infants, which are absent of systemic congenital abnormalities. Only the Iraqi Arab infants aged between 4 and 9 months were included in this study; at this age the infants depend mainly on breastfeeding as essential nutrition, with taking in consideration the matching in complementary food intake.

Ethical considerations

The ethical committee of the College of Dentistry/ University of Baghdad approved this study at the date of: 2021-4-4, and number: 325. Legal permission was obtained from the Ministry of health to perform clinical examinations at health centers. Also, a special informed consent in accordance with the College of Dentistry in University of Baghdad prepared and distributed to mothers to obtain permission to participate in this study. The Declaration of Helsinki, the World Medical Association's code of ethics for studies involving humans, guided the conduct of this work.

Statistical analysis

Statistical analysis using Statistical Package for social Science (SPSS version 22, Chicago, IL), mean and standard error (SE), inferential statistics are: Student *t*test, one way analysis of variance (ANOVA), and Pearson correlation, level of significance is at 0.05.

Results

Infants' eruption time for primary teeth in relation to feeding pattern is shown in Table 1. The data show that the eruption time was significantly higher among bottle feeding infants. Moreover, the relation between facial growth and feeding pattern is shown in Table 2. This result reveals that all parameters were lower among breastfeeding than bottle-feeding group, although all differences were not significant. In addition, the result illustrates that the facial proportion indices variability by feeding pattern, were no consistent differences, as well as no significant differences occurred bilaterally as can be seen in Table 3.

The correlation between eruption time of primary dentition and facial anthropometric measurements by feeding pattern is shown in Table 4. This result showed that although there were no significant correlations in

Table 1: Eruption time (mean ± SE) by feeding pattern

Feeding pattern	Mean	SE	*T* test	*P* value
Breastfeeding	8.440	0.1863	2.363*	0.019
Bottle-feeding	9.095	0.2052		

*Significant $P \leq 0.05$

Table 2: Facial landmarks (mean ± SE) by feeding pattern

Facial landmarks	Feeding pattern				*T* test	*P* value
	Breastfeeding		Bottle-feeding			
	Mean	SE	Mean	SE		
zy-zy	9.15	0.06	9.21	0.06	0.68	0.49
n-gn	7.99	0.06	8.17	0.07	1.80	0.07
en-en	2.61	0.02	2.64	0.02	0.82	0.41
ex-ex	8.93	0.06	9.08	0.05	1.86	0.06
rt-sn	9.83	0.05	9.86	0.05	0.35	0.72
lt-sn	9.85	0.05	9.88	0.05	0.40	0.68
rt-gn	10.02	0.05	10.09	0.06	0.78	0.43
lt-gn	10.03	0.05	10.11	0.05	0.93	0.35
ren-ex	2.95	0.02	2.95	0.02	0.07	0.93
len-ex	2.95	0.02	2.95	0.02	0.24	0.81
rex-ch	5.03	0.04	5.11	0.03	1.38	0.16
lex-ch	5.03	0.04	5.11	0.03	1.46	0.14

Table 3: Facial index and Farkas proportion index (Farkas ratios) (mean ± SE) according to feeding pattern

Facial proportion indices	Feeding pattern					
	Breastfeeding		Bottle-feeding		*T* test	*P* value
	Mean	SE	Mean	SE		
Facial index (FI)	87.66	0.78	88.95	0.83	1.12	0.26
Farkas ratios (t-sn/gn-t) right	0.98	0.00	0.97	0.00	0.77	0.44
Farkas ratios (t-sn/gn-t) left	0.98	0.00	0.96	0.00	1.35	0.17
Paired *T* test (R&L)	0.33		0.98			
P value	0.73		0.32			

both groups, there was a highly significant correlation in bilateral facial measurements (maxillary depth (t-sn); mandibular depth (t-gn)) and teething time among bottle-feeding groups. Additionally, Table 5 shows the facial index mean values according to the eruption time by feeding pattern. Data analyses in each feeding group showed that there was no significant difference in facial index among different eruption time intervals. Moreover, data analyses in each feeding group also indicated that there was no difference that was meaningful in Farkas ratios (bilaterally) among different eruption time periods as shown in Table 6.

Discussion

This study was performed to assess how breastfeeding affects the timing of teething in relation to craniofacial growth, and because of no previous Iraqi research works studied these relationships, this study was conducted. The findings of the current study indicate that the breastfed infants have earlier eruption time in comparison with those depending on bottle feeding. This finding is confirmed by many previous studies.[22,34] This could be attributed to the fact that breast milk contains nutrients in nearly optimum amounts.[23,35] In addition to other components that aid in the absorption of essential nutrients such as calcium, phosphorus, and vitamins A, C, and D. To create hydroxyapatite crystals successfully, calcium and phosphorus are needed.[23,25] Also the optimum stimulus for the physiological development of the skeletal and muscular components of the orofacial complex, as well as the emergence of teeth, has been suggested to be breastfeeding.[36] However, the present results were disagreed with several studies who did not show the effect of breastfeeding on the timing and pattern of tooth emergence within the first 12 months of children's life.[37,38] This study revealed no significant differences of all facial parameters and facial proportion indices by feeding pattern, and this may confirm the actual impact of breastfeeding on early primary teeth emergence. This is parallel with studies that found no relation between the child's growth and teething period.[39,40] Therefore, it is recommended to evaluate the impact of feeding practices on orofacial growth using more retrospective research with older age children and larger sample sizes. However, there was a highly significant correlation in bilateral facial measurements (maxillary depth (t-sn); mandibular depth (t-gn)) and teething time among bottle-feeding groups. This result may confirm delay teething time associated with facial growth gain, especially with mandibular and maxillary depths according to the bottle-feeding group. This is parallel with studies that found positive correlation between bottle-feeding and the craniofacial growth or malocclusion, and concluded that breastfeeding has a positive impact on dental occlusion, and this impact may be greater if breastfeeding lasts for at least six months. Conversely, insufficient breastfeeding and excessive bottle feeding can result in an increase in the frequency of these nonnutritive sucking habits, which are linked to a risk for developing malocclusions.[7,8,40] Although there was no more evidence available for the relation between facial anthropometric measurements and teething time according to feeding pattern. Therefore, more longitudinal studies need to evaluate the occlusion growth in relation to teething emergence by feeding pattern.

Table 4: The correlation between eruption time of primary dentition and facial anthropometric measurements by feeding pattern

Feeding pattern	Facial anthropometric measurements	Eruption time	
		r	*P*
Breastfeeding	zy-zy	–0.040	0.694
	n-gn	–0.057	0.576
	en-en	–0.012	0.906
	ex-ex	–0.145	0.149
	rt-sn	–0.064	0.530
	lt-sn	–0.054	0.592
	rt-gn	–0.080	0.430
	lt-gn	–0.118	0.243
	ren-ex	0.009	0.929
	len-ex	0.003	0.974
	rex-ch	–0.149	0.139
	lex-ch	–0.149	0.139
Bottle-feeding	zy-zy	0.000	0.998
	n-gn	0.030	0.768
	en-en	–0.064	0.526
	ex-ex	0.028	0.784
	rt-sn	0.248*	0.013
	lt-sn	0.284*	0.004
	rt-gn	0.242*	0.015
	lt-gn	0.246*	0.013
	ren-ex	0.010	0.924
	len-ex	0.010	0.924
	rex-ch	0.140	0.163
	lex-ch	0.159	0.114

*Significant $P \leq 0.05$

Infants' age restricts the use of manual method for easily identifiable facial landmarks, despite the disadvantages of this direct method, such as variations in tension and thickness as well as the compressibility of soft tissues are major sources of mistake with this technique. Difficult to achieve the meeting interview (on the infants follow up) due to presence of coronavirus at the time of the study, only calling follow-up interview for assessment teeth emergence.

Conclusion

The current study confirms the effect of breastfeeding on the early teething emergence of primary dentition; there were no significant differences between type of feeding and facial growth parameters. Moreover, there was a significant correlation among bottle-feeding infants between delay eruption time and facial growth parameters (mandible and maxilla depths); however, they were not significant among breast-feeding groups. Furthermore, no facial symmetrical differences by feeding pattern were found in this study. More longitudinal studies recommended confirming this evidence.

Table 5: Facial index (FI) (mean ± SE) according to the eruption time by feeding pattern

Eruption time	Feeding pattern					
	Breastfeeding		Bottle-feeding		*T* test	*P* value
	Mean	SE	Mean	SE		
5–6	89.33	1.04	85.96	0.11	0.02	0.11
7–8	86.72	1.35	88.91	0.27	0.23	0.27
9–10	86.68	1.59	90.08	0.15	0.13	0.15
11+	89.76	2.18	89.19	0.83	0.23	0.83
F	0.23		0.34			
P value	0.40		0.57			

Table 6: Bi-lateral Farkas proportion index (Farkas ratios) (mean ± SE) by eruption time according to feeding pattern

Eruption time	t-sn/gn-t (right)						t-sn/gn-t (left)					
	Breastfeeding		Bottle-feeding		*T* test	*P* value	Breastfeeding		Bottle-feeding		*T* test	*P* value
	Mean	SE	Mean	SE			Mean	SE	Mean	SE		
5–6	0.98	0.008	0.97	0.01	0.11	0.86	0.97	0.008	0.97	0.007	0.110	0.73
7–8	0.98	0.007	0.97	0.004	0.21	0.30	0.98	0.005	0.94	0.027	0.210	0.21
9–10	0.97	0.005	0.98	0.008	0.24	0.43	0.98	0.005	0.98	0.007	0.314	0.70
11+	0.98	0.011	0.97	0.004	0.01	0.22	0.98	0.010	0.98	0.003	0.120	0.54
F	0.11		0.23				0.23		0.12			
P value	0.91		0.44				0.66		0.38			

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

Data availability statements

The data are original and available online.

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