



Comparison of Deciduous Dental Occlusion in Breastfed Versus Bottle-Fed Children

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ABSTRACT

Background and aim: The effect of different nutritional pattern consumption patterns in infants on the formation of dental occlusion is one of the issues under discussion. Due to the lack of specific results in this regard, the purpose of this study was to determine the occlusion of deciduous teeth in breastfed and bottle-fed pre-school children.

Materials and methods: This is a descriptive-analytical study on 316 children aged 4-5 years old. This study was based on clinical examination and completing questionnaire. The examination was done at kindergartens and in sitting position using a dental mirror and with under the natural light to natural light. The occlusal relationship, overjet, overbite, and crossbite were examined through direct observation in the centric occlusion. The questionnaires were completed by the mothers. The basis of this study was the responses that mothers gave in the questionnaire based on the type and duration of breastfeeding or bottle-feeding. The collected data were statistically analyzed by Chi-square test. Significance was considered at the level of $P < 0.05$.

Results: The results of this study showed a significant relationship between nutrition with formula and increased overjet ($P = 0.048$) and distal step occlusion ($P = 0.001$). The duration of milk consumption showed no significant relationship with any of the studied variables.

Conclusion: Malocclusion was more frequently observed in bottle-fed children.

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Introduction:

The mother's milk is the most suitable food for the child up to the age of one year.⁽¹⁾ Considering that in this period, sucking is the child nutritional method and at the same time affects the development and growth of the maxillomandibular complex, the study of the feeding pattern during infancy is of particular importance.⁽²⁻⁴⁾ Generally, in breastfeeding, the facial muscles are more active, with more movements of the lips and the tongue, compared to bottle feeding.⁽⁵⁾ Also, a nursing bottle has less flexibility than the breast of the mother, which can exert greater pressure on the anterior region of the jaws, leading to decreased transversal growth of the palate and increased probability of anterior open bite.⁽⁶⁾ Breastfed children have a sufficiently developed base of the maxillary and mandibular bones in the frontal (anterior-posterior axis), transverse (longitudinal axis), and sagittal (lateral axis) planes, which can properly affect the occlusion of deciduous teeth.⁽⁷⁾ Some studies have reported breastfeeding as a protective factor against malocclusion and have linked prolongation of breastfeeding with a reduction in the ratio of children with malocclusion requiring orthodontic treatment.^(2,3,8,9) Conversely, there are reports on the lack of relationship between the duration of breastfeeding in the first year of birth and occlusal and dental arch parameters.⁽¹⁰⁾

Two systematic reviews on this subject have reported a variety of outcomes. In 2013, Narbutyte et al concluded that breastfeeding can be linked to dentoalveolar malocclusions (especially posterior crossbite), which increase with increasing the feeding time.⁽¹¹⁾ Hermont et al reported in 2015 that available scientific evidence does not show any association between the types of malocclusion and the infant feeding manner as well as the duration of feeding.⁽¹²⁾ Therefore, despite the importance of breastfeeding in the physical and psychological development of the child, its impact on the development of the maxillofacial system is still associated with many controversies.⁽⁷⁾ Given the importance of breastfeeding based on religious doctrines and the proposal of the World Health Organization (WHO) and due

to ambiguities regarding the effects of nutritional methods in infancy on the maxillofacial growth, we decided to investigate the effect of nutritional habits including sucking the mother's breast and nursing bottle on the development of deciduous dental occlusion of children in Rasht city in 2014.

Materials and Methods:

This research was descriptive-analytic, and the population under study comprised 314 children aged 4-5 years old. Participants were selected from 21 private and public kindergartens in Rasht; from each kindergarten, 15 children were randomly selected. The sample size, according to Viggiano et al⁽⁶⁾ and based on OR=2.43 and P=18% with 95% confidence interval (CI) and 95% test power, was estimated to be 314 persons. Exclusion criteria:

Having oral habits such as finger sucking, pacifier use, mouth breathing, having one or more extracted deciduous teeth, having large interdental caries, history of trauma to the craniofacial complex, congenital tooth missing, and being in the mixed dentition period.

After insertion of the child's personal characteristics in the questionnaire, the teeth surfaces were cleaned with a sterile gauze, and the examination was done using a single-use dental mirror in an appropriate room with normal light by the examiner. The recorded items included the relation of deciduous molars (mesial step, distal step, flush terminal plane), the amount of overjet (normal value is about 2 mm), and the amount of overbite (the normal value of 2 mm upon the contact of the incisal edge of the lower deciduous incisors with the palatal surface of the upper deciduous incisors in the centric occlusion).⁽¹³⁾

At the same time, a questionnaire was filled by the parents of the children, which included information about the child's age and sex, occupation and education level of the parents, the number of children in the family, the type of infant feeding (breast milk, nursing bottle or a combination of both), the duration of feeding with milk, and the age of the start of the combined infant formula (starting time and duration).⁽¹⁴⁾

The determined criterion for the duration of lactation was less or more than the age of 2 years, based on the researchers' decision.⁽⁷⁾

Statistical analysis:

The collected data were entered into SPSS 21 software (SPSS Inc., Chicago, IL, USA), and the status of the children's occlusion was statistically analyzed by Chi-square test according to the nutritional method (breastfeeding, bottle feeding). Significance was considered at the level of $P < 0.05$.

Results:

This study was conducted on 316 children aged 4-5 years old including 157 girls (49.7%) and 159 boys (53.3%). Of these, 58.2% were breastfed, 14.9% consumed dry milk, and 25.9% consumed a combination of breast milk and dry milk. Table 1 shows the distribution of the children studied by gender, number of children, and the duration of nutrition by breast milk and dry milk. Chi-square test did not show any significant relationship between the type of nutritional pattern and the sex or the feeding duration, but there was a significant statistical relationship between the number of children in the family and the infant feeding pattern such that in the families with one child, breastfeed-

ing was

more common. Maternal occupation and lactation method were found to be significantly correlated such that in the group of housewives, breastfeeding was more common compared to other groups, but there was no significant relationship between mother's education and father's job with the lactation method (Table 1).

Level of significance was considered as $P < 0.05$.

Figure 1 shows the frequency of deciduous occlusal relationships in children according to two milk consumption patterns. There was a significant correlation between the relationship of deciduous molars and type of nutrition. In breastfed children, mesial step relation was more frequently observed, but in the dry milk group, the percentage of distal step relation was higher ($P < 0.001$).

Figure 2 shows a significant relationship between the type of consumed milk and the type of occlusion. In breastfed children, normal overjet was more frequently observed ($P = 0.048$). There was no significant correlation between overbite and the type of nutrition of infants ($P = 0.104$; Figure 3). There were also no cases of anterior or posterior crossbite in the children.

Table 1. Frequency distribution of the type of consumed milk in terms of gender, duration of infant feeding, and the number of children in the family

		Breast milk	Dry milk	Combination	Significance
Gender	Boy	(52.4%) 98	(46.8%) 22	(47.6%) 39	0.66
	Girl	(47.6%) 89	(53.2%) 25	(52.4%) 43	
Number of children	1	(69%) 129	(57.5%) 27	(58.8%) 10	0.04*
	2	(25.5%) 48	(29.8%) 14	(35.3%) 6	
	3 and more	(5.5%) 10	(12.7%) 6	(1.2%) 1	
Duration of infant feeding	Less than 2 years	(75.4%) 141	(72.4%) 34	(69.5%) 57	0.59
	Over 2 years	(24.6%) 46	(27.6%) 13	(30.5%) 25	
Mother's occupation	Housekeeper	(52.5%) 98	(40.4%) 19	(22 %) 18	0.001*
	Employee	(41.7%) 78	(51.1%) 24	(67.1%) 55	
	Self-employed	(5.8%) 11	(8.5%) 4	9(10.9%) 9	
Mother's level of education	Under diploma	(80%) 12	(2.12%) 1	(2.4%) 2	0.07
	Diploma	(68.8%) 53	(23.4%) 11	(15.9%) 13	
	Master's degree and higher	(54.4%) 122	(74.4%) 35	(81.7%) 67	
Father's occupation	Employee	(57.2%) 107	(53.2%) 25	(64.6%) 53	0.11
	Self-employed	(42.8%) 80	21	29	
Mother's age (year)		33.09±4.79	34.7±5.28	34.16±5.08	0.06
Father's age (year)		37.5±5.67	39.3±5.45		0.14
Total		(100%) 187	(% 100) 47	(% 100) 82	

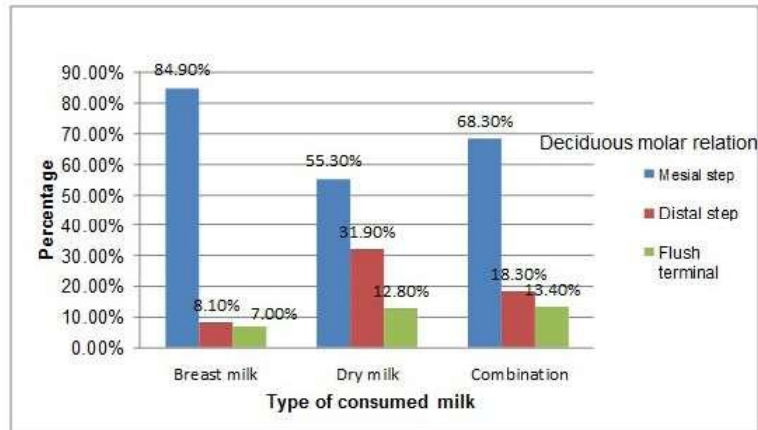


Figure 1: Frequency of deciduous occlusal relationships in children according to three milk consumption patterns

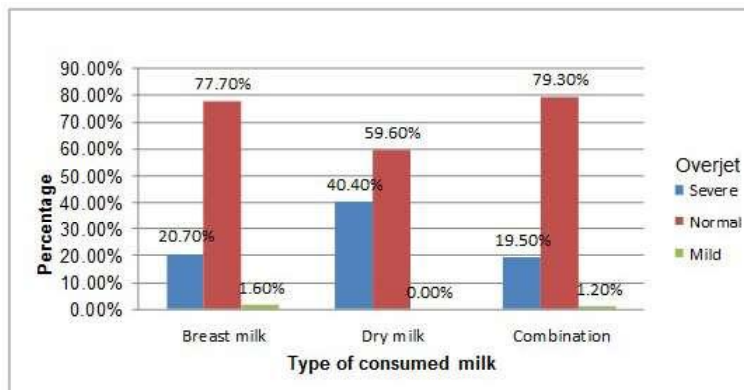


Figure 2: Frequency of different types of overjet in children according to three milk consumption patterns

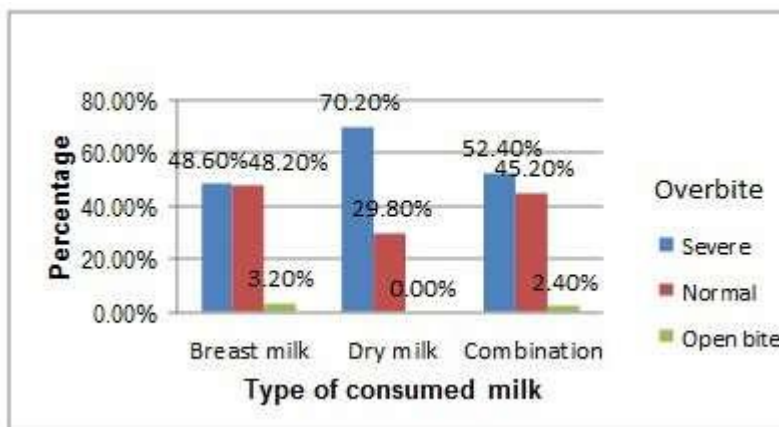


Figure 3: Frequency of different types of overbite in children according to three milk consumption patterns

Also, based on the findings, no significant relationship was found between the duration of infant feeding (breast milk or dry milk for more than or less than 2 years) and observation of anterior open bite and posterior crossbite cases ($P>0.05$).

Discussion:

This retrospective study was conducted with the aim of determining the effects of nutrition with breast milk and nursing bottle on the occlusion of deciduous teeth in 4-5-year-old children at kindergartens in Rasht city. Based on the results of this study, 58.2% of children were only breastfed, 14.9% were fed only with bottle fed with infant formula, and 25.9% were fed by the combined method.

According to the findings of this study, there is a significant correlation between the relation of deciduous molars and the type of consumed milk ($P=0.001$). In breastfed children, mesial step molar relation was more frequent in comparison with other groups (84.9%), whereas in children who were fed with a nursing bottle, compared to the breastfed group, distal step molar relation was more frequently observed (31.9% vs. 8.1%).

This finding is consistent with the findings of several studies in this field, which indicate that breastfeeding and the duration of feeding are behavioral factors that contribute to the prevention of malocclusion along with decreasing parafunctional habits in children,^(2,4,8,15) and the longer the breastfeeding period, the lower is the possibility of distal step molar relation.⁽¹⁵⁾ Chen et al also reported that in children who are bottle-fed for over 18 months, the risk of non-mesial step molar relationships is 1.45 times higher.⁽²⁾

The choice of feeding method (breast milk or dry milk) was significantly correlated with the number of children in the family such that by increasing the number of children in the family, the infant feeding pattern was more inclined towards dry milk ($P=0.04$), which was in line with the findings of a study by Taylor and colleagues, in which with an increase in the number of children from 2 to 5 or more, the frequency of breastfeeding decreased.⁽¹⁶⁾

Based on our results, there was no significant relationship between the level of maternal education and the choice of lactation method, which is consistent with the findings of Motee et al.⁽¹⁷⁾ This finding can be due to a change in the views of mothers and a lack of desire for more traditional methods of feeding children with an increase in their level of education. Of course, this finding contradicts the findings of two studies conducted by Taylor et al in years 2006 and 2008; it has been reported that with increasing maternal

education, the prevalence and duration of breast-feeding increase.^(16,18) In these two studies, a very large sample size (2115 persons), mothers with a very wide age range (15-44 years), and comparison of grades higher and lower than high school have been considered.^(16,18)

Our findings show that there is a significant relationship between maternal occupation and the child's nutrition pattern such that 72.6% of housewives feed the child exclusively with their milk, but this percentage was lower in the working mothers group, and the combined pattern of nutrition (the combination of breast milk and dry milk) was more common. Working mothers seem to be using other methods such as using a nursing bottle to feed their children due to their lack of continuous presence at home. Therefore, the prevalence of breastfeeding is lower among working mothers.^(17,19,20) Unlike mothers, there was no significant relationship between father's job and the type of feeding of infants; contradictory results have reported in the references in this regard. Our findings are consistent with the results of a study by Ziaie et al⁽²¹⁾ and inconsistent with the findings of a study by Kamali et al⁽²²⁾; it seems that in the latter, the difference in the findings can be attributed to the assignment of the father's job to two medical-related and non-medical related groups.

One of the findings of our study was the existence of a significant relationship between the type of overjet and milk consumption pattern. In breastfed children, the relative frequency of normal overjet was higher than in those fed with dry milk, which was consistent with the findings of Viggiano et al and Sum et al.^(6,23) Sum et al reported that the probability of increased overjet is significantly lower in children who are only breastfed for over six months.⁽²³⁾ Contrary to the results of the present study, Jabbar et al reported that bottle feeding alone does not directly correlate with increased overjet in deciduous teeth, and due to the fact that the chance of sucking a pacifier in bottle-fed children is higher, bottle feeding is not the main factor in increasing the overjet.⁽¹⁴⁾ As we know, the sucking mechanism varies in these two patterns of milk consumption. In the sucking of milk from the mother's breast, the child squeezes the nipple by the tongue toward the hard palate and sucks the milk with a peristaltic-like motion.

In sucking a nursing bottle, the baby presses the tip to the hard palate with a piston-like motion, in which there is a stronger sucking activity on the lips and the cheek plus more powerful forces on the palate. The higher consistency of the tip of the nursing bottle, in comparison to the mother's nipple, needs more upward pressure from the tongue to extract milk from the bottle than the mother's breast. As the research suggests, breastfeeding is an ideal stimulus for the physiological development of the muscles and the orofacial complex. Therefore, bottle feeding influences the development of the anterior segment.⁽⁶⁾

The present study showed that the type of nutrition probably does not have much effect on anterior open bite and posterior crossbite. The findings in this regard are not in agreement with the study by Romero et al, which indicated that bottle feeding up to 12 months of age increases the risk of anterior open bite to 9 times higher.⁽³⁾ A review study by Narbutyte et al in 2013 suggests that non-nutritive habits in the first few months of life have a significant impact on anterior open bite compared to feeding method, and it seems that breastfeeding does not cause posterior crossbite or open bite and has protective effects against their formation.⁽¹¹⁾ In our study, children with oral habits were excluded; therefore, the lack of observation of crossbite and open bite can be attributed to this fact.

Also, there was no significant relationship between the duration of infant feeding (breast milk or dry milk) and the observation of anterior open bite and posterior crossbite, which was consistent with studies by Raftowicz-Wójcik et al and Warren and Bishara.^(9,10) What all studies have a similar opinion about is that there is a negative relationship between the duration of breastfeeding and the incidence of malocclusion, and breastfeeding plays a protective role against the formation of open bite and crossbite in the deciduous dentition.⁽⁵⁾

In a review study conducted by Narbutyte et al in 2013, the prevalence of posterior crossbite inversely correlated with the duration of breastfeeding.⁽¹¹⁾ Viggiano et al and Larsson also separately showed that posterior crossbite in breastfed children is less prevalent than in bottle-fed children, even if these children simultaneously have non-nutritive sucking habits.^(6,24)

According to Viggiano et al, the coexistence

of bottle feeding with finger sucking increases the likelihood of posterior crossbite by three times and its concurrence with the habit of using a pacifier doubles the posterior crossbite incidence.⁽⁶⁾ Also, the coincidence of eating milk from a bottle with two oral habits of finger sucking and pacifier use increases the risk of posterior crossbite by four times, which suggests that the coexistence of several non-nutritive feeding habits may have a cumulative effect on the incidence of posterior crossbite.⁽⁶⁾ Various dental changes that may occur due to non-nutritive sucking habits vary depending on the severity, duration, and frequency of the habit; duration plays the most important role in dental movements caused by these habits.⁽¹⁰⁾

Breastfeeding is a natural and preferred nutritional method for all infants,⁽¹⁾ which reduces the risk of many diseases in mothers and children of the developed countries,⁽²⁵⁾ and based on the results of the present study, breastfeeding was accompanied by a higher frequency of mesial step occlusion and the absence of open bite and posterior crossbite.

At the same time, considering the fact that malocclusion has a multifactorial nature and factors such as genetics, nutrition, oral habits, etc. are effective in producing it, only the type of nutrition was assessed in this study. It is clear that more studies are needed to examine the impact of other factors. Also, this study was retrospective, and part of the required information was obtained through the questionnaires filled by parents. Another limitation of this study was the inability of some parents to accurately remember the duration of infant feeding. It is suggested to examine the occlusion of parents to better determine the genetic or environmental aspects of malocclusion.

Conclusion:

In this study, we concluded that malocclusion is more common in bottle-fed children.

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