ORIGINAL ARTICLE

Relationship between breastfeeding duration and prevalence of posterior crossbite in the deciduous dentition

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Introduction: This cross-sectional retrospective epidemiologic study assessed the relationship between exclusive breastfeeding duration and the prevalence of posterior crossbite in the deciduous dentition. **Methods:** Clinical examinations were performed in 1377 Brazilian children (690 boys, 687 girls), 3 to 6 years old, from 11 public schools in São Paulo, Brazil. Based on questionnaires answered by the parents, the children were classified into 4 groups according to the duration of exclusive breastfeeding: G1, never (119 subjects); G2, less than 6 months (720 subjects); G3, 6 to 12 months (312 subjects); and G4, more than 12 months (226 subjects). The statistical analyses included the chi-square test ($P < 0.05$) and the odds ratio. **Results:** The posterior crossbite was observed in 31.1%, 22.4%, 8.3%, and 2.2% of the children, in groups G1, G2, G3, and G4, respectively. The results showed a statistically significant relationship between exclusive breastfeeding duration and the prevalence of posterior crossbite. **Conclusions:** Children who were breastfed for more than 12 months had a 20-fold lower risk for the development of posterior crossbite compared with children who were never breastfed and a 5-fold lower risk compared with those breastfed between 6 and 12 months. (Am J Orthod Dentofacial Orthop 2010;137:54-8)

Mothers' milk is a highly nutritious food that diminishes infant mortality, helps to prevent diseases, promotes immunologic and antiallergic protection, and reduces obesity and gastrointestinal problems; it is also directly linked to the baby's emotional and affective needs.[1-3] From the oral-health viewpoint, the method and duration of infant feeding have been related to the development of severe early childhood caries.[4-6] Furthermore, some authors have pointed out that breastfeeding provides the advantage of greater oral muscle exercise over bottle feeding.[7-9] In 2002, based on a systematic review of the literature, the World Health Organization[10] recommended a minimum of exclusive maternal breastfeeding up to the age of 6 months. Moreover, in orthodontics, breastfeeding might influence craniofacial growth and development, help to prevent nonnutritive sucking habits, and stimulate the harmonious functional development of the stomatognathic system.[11-14]

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Because alterations in occlusal development might be the result of genetic or environmental factors, various authors have studied the relationship between breastfeeding and malocclusion, but the literature is still controversial about this subject.[15] Some authors found no relationship between breastfeeding and the development of malocclusions.[16,17] Warren and Bishara,[17] after assessing 372 children, 4 to 5 years old, found no statistically significant associations between breastfeeding duration and the prevalence of anterior open bite, posterior crossbite, and increased overjet. However, other studies have pointed out that insufficient breastfeeding duration is related to malocclusions, particularly posterior crossbites.[18-21] Because this type of malocclusion develops early and rarely self-corrects, the deciduous dentition is an excellent phase to promote preventive or interceptive measures. Therefore, the purpose of this research was to analyze the relationship between exclusive breastfeeding duration and the prevalence of posterior crossbite in the deciduous dentition.

MATERIAL AND METHODS

This cross-sectional study was done according to the Resolution Act 196/96 from the Brazilian National Committee of Health.

The sample consisted of 1377 Brazilian children (690 boys, 687 girls) in the complete deciduous dentition phase, from 3 to 6 years of age, enrolled at 11 public schools in eastern São Paulo, Brazil. Furthermore, other

Table I. Prevalence of the types of posterior crossbite according to age in the total sample

	Age (y)									
	3		4		5		6		Total sample	
Posterior crossbite	n	%	n	%	n	%	n	%	n	%
Absent	141	87.6	415	85.2	450	83.3	142	75.1	1,148	83.4
Bilateral	4	2.5	11	2.3	14	2.6	10	5.3	39	2.8
True unilateral	7	4.3	16	3.3	29	5.4	9	4.8	61	4.4
Functional unilateral	9	5.6	45	9.2	47	8.7	28	14.8	129	9.4
Total	161	100.0	487	100.0	540	100.0	189	100.0	1,377	100.0

inclusion criteria for sample selection were no extensive carious lesions, missing teeth, dental anomalies of shape, number, structure, and eruption, as well as no history of orthodontic treatment, traumatic injuries to the craniofacial complex, or oral surgeries. These criteria were used to exclude changes in occlusal relationships that could interfere with our results.

The clinical examinationss were performed by 3 previously calibrated orthodontists (kappa: 0.89-1.00; r >0.90). The occlusal relationships were examined by direct visual inspection with the teeth in centric occlusion. Posterior crossbite was diagnosed when an inverted relationship of occlusion was observed between at least 1 posterior tooth (deciduous canine or molar) in the transverse plane.[22,23] Posterior crossbite in the deciduous dentition was classified into 3 categories: bilateral, true unilateral, and unilateral with functional deviation of the mandible.[22,24]

Based on questionnaires answered by the mothers, a retrospective investigation was made concerning the length of time that children were exclusively breastfed. Accordingly, children were classified into 4 groups: group 1 (G1), never breastfed (n = 119); group 2 (G2), breastfed for less than 6 months (n = 720); group 3 (G3), breastfed for 6 to 12 months (n = 312); and group 4 (G4), breastfed for more than 12 months (n = 226). Information on nonnutritive sucking habits was also requested in the questionnaires.

Statistical analyses were performed with Stata software (version 8.0, StataCorp, College Station, Tex). The Pearson chi-square test was used to verify the association between posterior crossbite prevalence and breastfeeding duration (P <0.05). In addition, the odds ratio (OR) was used to measure the strength of the association and the relative chances of developing the investigated malocclusion.

RESULTS

For the total sample, the results showed a posterior crossbite prevalence of 16.6%, with 2.8% of the children having bilateral crossbite, 4.4% with true unilateral crossbite, and 9.4% having functional unilateral crossbite (Table I). Posterior crossbite was more prevalent in older than in younger children during the deciduous dentition (Table I).

Table II. Distribution of the sample and prevalence of posterior crossbite in the 4 groups analysed, according to breastfeeding duration irrespective of gender

	Sample		Presence of posterior crossbite	
Group	n	%	n	%
G1	119	8.6	37	31.1
G2	720	52.3	161	22.4
G3	312	22.7	26	8.3
G4	226	16.4	5	2.2
Total	1,377	100.0	229	16.6

G1, Never breastfed; *G2,* breastfed for <6 months; *G3,* breastfed for 6-12 months; *G4,* breastfed for >12 months.

Table II shows that 8.6% of the children were never breastfed (G1), 52.3% were exclusively breastfed for less than 6 months (G2), and 39.1% were exclusively breastfed for more than 6 months (G3 and G4). Furthermore, the prevalence of posterior crossbite gradually decreased as breastfeeding duration increased: 31.1% for G1 and only 2.2% for G4.

There was a statistically significant relationship between exclusive breastfeeding duration and the prevalence of posterior crossbite (Table III) in the 6 comparisons in the 4 groups, particularly between groups G1 and G3, G1 and G4, G2 and G3, and G2 and G4 (P = 0.0000). Therefore, children who had never been breastfed exhibited a higher prevalence of posterior crossbite compared with children who were exclusively breastfed between 6 and 12 months (OR = 4.9) and also compared with children who were breastfed for more than 12 months (OR = 19.9). Children who were breastfed for less than 6 months had a 3-fold higher risk compared with children who were exclusively breastfed between 6 and 12 months, and a 12-fold higher risk

Table III. Intergroup comparisons for prevalence of posterior crossbite (total sample)

Comparison	*Chi-square*	P *value*	*OR*
G1/G2	4.31	0.0378	1.57
G1/G3	35.67	0.0000	4.96
G1/G4	60.63	0.0000	19.94
G2/G3	28.84	0.0000	3.17
G2/G4	48.21	0.0000	12.73
G3/G4	9.03	0.0027	4.02

G1, Never breastfed; *G2,* breastfed for <6 months; *G3,* breastfed for 6-12 months; *G4,* breastfed for >12 months.

Table IV. Prevalence of posterior crossbite in the groups, excluding children with nonnutritive sucking habits

	Sample		*Presence of posterior crossbite*	
Group	*n*	*%*	*n*	*%*
G1	22	4.4	4	18.2
G2	161	32.0	18	11.2
G3	132	26.2	1	0.8
G4	188	37.4	0	0
Total	503	100.0	23	4.6

G1, Never breastfed; *G2,* breastfed for <6 months; *G3,* breastfed for 6-12 months; *G4,* breastfed for >12 months.

compared with children who were breastfed for more than 12 months.

Table IV shows the distribution of posterior crossbite prevalence according to the breastfeeding period only for children with no nonnutritive sucking habits (finger or pacifier). Again, a gradual decrease in the prevalence of this malocclusion was observed as breastfeeding duration increased, particularly in groups G3 and G4, comprising children breastfed for more than 6 months. In these 2 groups, only 1 child with posterior crossbite was found, indicating a combined prevalence of 0.31%. When the chi-square test was applied in the group of children without nonnutritive sucking habits (Table V), statistically significant relationships were seen between exclusive breastfeeding duration and the prevalence of posterior crossbite between groups G1 and G3 (P <0.0000) and G2 and G3 (P <0.0003). Children who were never breastfed had a 29-fold higher risk for developing posterior crossbite compared with the children who were exclusively breastfed between 6 and 12 months. Children breastfed for less than 6 months had a 16-fold higher risk compared with children whose exclusive breastfeeding was interrupted between 6 and 12 months. For the other paired comparisons involving G4, it was not possible to estimate the OR because of a null prevalence of posterior crossbite in this group, making mathematical calculations unfeasible.

Table V. Intergroup comparisons for prevalence of posterior crossbite, excluding children with nonnutritive sucking habits

Comparison	*Chi-square*	P *value*	*OR*
G1/G2	0.89	0.3449	—
G1/G3	18.11	0.0000	29.11
G1/G4	—	—	—
G2/G3	12.95	0.0003	16.49
G2/G4	—	—	—
G3/G4	—	—	—

G1, Never breastfed; *G2,* breastfed for <6 months; *G3,* breastfed for 6-12 months; *G4,* breastfed for >12 months.

DISCUSSION

Only 3 studies suggested a relationship between longer breastfeeding and lower prevalence of posterior crossbite.[18,19,21] Viggiano et al,[18] with logistic regression, compared 1099 children with nonnutritive sucking habits who were breastfed with those with nonnutritive sucking habits who were bottlefed. They found that children with nonnutritive sucking habits who were bottlefed had a higher risk of developing posterior crossbite compared with the children with similar sucking habits who were exclusively breastfed. Karjalainen et al[19] assessed only 148 children (age, 3 years) and found that the mean exclusive breastfeeding duration in the total sample was 5.8 months, whereas, in the children with posterior crossbite, the mean duration was only 3.6 months. Furthermore, Peres et al[21] examined 359 children (age, 6 years) and verified that those who were breastfed for less than 9 months and also had nonnutritive sucking habits between 1 and 4 years of age showed a 7.5-fold higher risk compared with those who were breastfed for more than 9 months and had no habits.

On the other hand, Ogaard et al[16] and Warren and Bishara[17] found no significant relationship between breastfeeding duration and prevalence of posterior crossbite. Nevertheless, these studies showed high percentages of mothers who never breastfed their children; this could have made it difficult to make comparisons among the breastfed groups.

In relation to the previous studies, our investigation had some particularities, since it was especially designed to evaluate the relationship between breastfeeding and a specific kind of malocclusion—posterior crossbite. Furthermore, analyses were carried out in both the total sample and the group of children with

no nonnutritive sucking habits. This last procedure excluded the influence of this variable, considering that many studies have proved the relationship between persistent nonnutritive sucking habits and the development of posterior crossbite.[7,8,12,13,17-19,21,24-28]

In addition to the aspects discussed previously, our results also seem to suggest that the use of the feeding bottle could have a deleterious effect on the development of occlusion, perhaps as a predisposing factor for posterior crossbite. This hypothesis can be raised because children who were not breastfed were necessarily bottlefed. Some authors have argued that the feeding bottle is considered a deleterious habit, particularly for the development of the anterior segment of the dental arches.[28-30] Our study suggests that this relationship should be better investigated, since various physiologic aspects of muscular mechanisms are involved in breastfeeding and bottlefeeding.[7-9] The results demonstrated that, in children who were never breastfed and had no nonnutritive sucking habits (G1; Table IV), there was a prevalence of 18.2% for posterior crossbite, whereas in group G1 of the total sample, which also included children with nonnutritive sucking habits (Table II), the prevalence of this malocclusion was 31.1%. This difference points to the fact that the absence of nonintuitive sucking habits reduced the prevalence of posterior crossbite by almost 50%, but was not sufficient for the total prevention of this malocclusion. On the other hand, in G3 and G4 of the total sample, their combined prevalence was 5.76%, as opposed to only 0.31% in the children without nonnutritive sucking habits. Therefore, simply breastfeeding a child exclusively for more than 6 months can sharply reduce the prevalence of posterior crossbite, compared with children who were never breastfed (31.1%), even without excluding the deleterious influence of nonnutritive sucking habits. Moreover, when this latter factor was eliminated, the prevalence was practically reduced to zero. These results seem to point to an effect of breastfeeding that is, at least, doubly beneficial: reduction in nonnutritive sucking habits and protection against posterior crossbite. This last effect was mentioned by Viggiano et al[18] and Karjalainen et al.[19] Furthermore, exclusive breastfeeding reduces the use of feeding bottles, which probably overstimulates buccinator muscle contraction activity, generating negative pressures inside the oral cavity and perhaps predisposing to a reduction in the maxillary dental arch width. During breastfeeding, the muscular mechanisms involved are different, with repeated advance and withdrawal of the tongue and mandible. Probably other beneficial effects of breastfeeding might be related, such as strengthening the immunologic system and the consequent reduction in respiratory problems, which can also interfere with the development of dental occlusion.[31]

Furthermore, Victora et al[29] affirmed that introduction of the feeding bottle could predispose the child to early weaning because the milk is obtained more easily, causing the baby to gradually reject the breast. On the other hand, early weaning or complete absence of breastfeeding might be caused by other factors—eg, insufficient mother's milk, unfavorable breast anatomy, mother's lack of interest or emotional problems, or even because maternity leave has ended. In these cases, the first habit to be introduced to feed the child is almost always the feeding bottle, which satisfies only the baby's physiologic hunger but not its need to suck, which is generally compensated by introducing the pacifier.

Various factors could explain the origins of so many controversies with respect to the relationship between breastfeeding duration and the development of malocclusions. Many studies suggested that breastfeeding seems to help reduce the acquisition of nonnutritive sucking habits.[8,11,12,18,19,21,28-30,31,32] Because these habits are well-known etiologic factors of malocclusions, it could be expected that breastfeeding for prolonged periods would help to prevent the acquisition of such habits and, consequently, the associated malocclusions.[7,8,12,13,17-19,21,24-28,30,32,33] Nevertheless, the question appears to be more complex, since most published studies could not clearly show a well-defined interrelationship between exclusive breastfeeding duration and the development of malocclusions. How can it be explained? There are many possible hypotheses, ranging from factors related to the size of samples, inclusion and exclusion criteria, calibration of examiners, the method of dividing the sample groups, malocclusion assessments and classification modes, interference of nonnutritive sucking habits and feeding methods, and many others. Therefore, it is not surprising to find many controversies. This study seems to have overcome some of these limitations, by working with a sample sufficiently large, combined with enhanced selection criteria, careful division of the subgroups, adequate assessment methods, and the use of statistical analyses compatible with the nature of this study. These data indicated that prolonged breastfeeding duration can strongly reduce the prevalence of posterior crossbite during the deciduous dentition.

Our results agree with and provide additional support for the World Health Organization's recommendation that children should be exclusively breastfed for a minimum of 6 months.[10] Moreover, our results also point out that lengthening this period can have additional beneficial effects, since the group of children

breastfed for more than 12 months had a prevalence of posterior crossbite of only 2.2%, whereas the group breastfed between 6 and 12 months had a prevalence of 8.3% for this malocclusion. In contrast, the group of children who were never breastfed had a 31.1% prevalence of posterior crossbite.

CONCLUSIONS

These results show an association between exclusive breastfeeding duration and the prevalence of posterior crossbite in the deciduous dentition. Children who were breastfed for more than 12 months had a 20-fold lower risk for the development of posterior crossbite compared with children who were never breastfed and also a 5-fold lower risk compared with those breastfed between 6 and 12 months.

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