

RESEARCH ARTICLE

## Associations between influence of infant feeding patterns on the deciduous second molar relationship in preschool-aged children

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### ABSTRACT

Exclusive breastfeeding during the first six months of life is extremely important for the development of the dentocraniofacial structure, occlusion, breathing and swallowing during childhood. The prevalence severity rate of malocclusion in children who were breastfed is lower than those who were bottle-fed. The aim of this study is to evaluate the associations of infant feeding patterns on the deciduous second molar relationship in preschool aged children (3-5 years old children) of selected preschools in and around Medan Selayang. This study used analytic cross-sectional study design as the research method. The sampling was carried out by purposive sampling technique. This study involved 130 children aged 3-5 years as the sample, who consisted of two groups, the exclusively breastfed group and the bottle-fed group with the inclusion criteria of the children having a good oral and dental health. The result is statistically analyzed using Chi Square with a significance level of  $p < 0.05$ . There was a significant difference between children who were breastfed and those who were bottle-fed. Children who were breastfed mostly had mesial step (55, 4%), followed by distal step (27.7%) and flush (16.9%), while those children who were bottle-fed mostly had distal step (46.2%), flush (33.8%), and mesial steps (20%). Based on Chi Square test, it is shown that there is a significant relationship between infant feeding patterns to primary molar relationships ( $p < 0.001$ ).

**Keywords:** breastfeeding; bottle-feeding; primary molar relationship

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### INTRODUCTION

Mother's milk contains nutritional content to strengthen the immune system to prevent diseases. Breastfeeding for children usually starts from birth until they reach the age of two.<sup>1,2</sup> According to World Breastfeeding Trends Initiative in 2012, only 46.8% of women who exclusively breastfed their infants for up to six months and 12.5% women bottle-fed their infants.<sup>1,3</sup> In Indonesia, the percentage of exclusive breastfeeding based on RISKESDAS in 2013 was only 54.3%, with the highest percentage in West Nusa Tenggara with 79.7% and the lowest in Maluku Province at about 25.2%.<sup>4</sup>

Pediatrician and pediatric dentist agreed on the importance of exclusive breastfeeding during the first six months of life for a good development of dentocraniofacial structure, occlusion, breathing and swallowing during childhood. American Academy

of Pediatric Dentistry considers breast milk an ideal source of nutrition as it provides innumerable health-related advantages. In addition to having a lot of nutrition, breastfeeding is one of the factors in the development of facial structures and has an impact on the health of the baby. Valle et al studied 540 children who were exclusively breastfed during the duration of 6-72 months. The study proved that exclusive breastfeeding will have a good effect on the development of the mandibula.<sup>5</sup> Children who experienced pure breastfeeding for more than 6 months had a lower chance of developing a class II incisal relationship or an increased overjet, and had wider intercanine and intermolar widths.<sup>6</sup> Nutritive sucking, which includes breast-feeding and bottle-feeding and non-nutritive sucking (NNS), which includes pacifier and digit sucking, have been associated with growth and development of the maxillomandibular complex.<sup>7</sup>

Primasari et al revealed that breastfeeding through the nipple can stimulate the development of dentocraniofacial and it is a major factor in achieving a normal occlusion. An infant who did not get exclusive breastfeeding is going to have a malocclusion.<sup>8</sup>

The prevalence severity rate of malocclusion in children who are breastfed through their mother's nipples is lower than children who were bottle-fed.<sup>9</sup> Several studies have discussed the relationship between breastfeeding and bottle-feeding on the primary molar relationship. According to Dutra et al, it is very important to know the variation in the terminal relationship of primary second molars and their effect on the occlusal pathway of permanent tooth growth to prevent malocclusion.<sup>9</sup> Sargod et al stated that determining the primary molar relationship from an early age is an important step to predict the relationship of the permanent molar in the future.<sup>1</sup> For example, mesial step can be predicted as class I and the distal step can be predicted as class II Angle.<sup>3,9,10</sup>

Sargod et al. who studied 100 children revealed that 45% were exclusively breastfed, 18% were exclusively bottle-fed, and 37% were bottle-fed in addition to breastfeeding. In children, who were exclusively breastfed, 37 (84.09%) had a mesial step occlusion, 4 (9.09%) had a distal step occlusion, and 4 (9.09%) had a flush terminal plane occlusion. Meanwhile, of those children who were exclusively bottle-fed, only 4 (22.2%) had a mesial step occlusion, while 9 (50%) had a distal step occlusion, and 5 (27.7%) showed a flush terminal plane occlusion. In the children who had a combination feeding, i.e., complementary bottle-feeding along with breastfeeding, 29 (78.37%) showed a mesial step occlusion, 4 (10.8%) had a distal step occlusion, and 4 (10.8%) showed a flush terminal plane occlusion.<sup>1</sup>

Babu et al. stated that milk consumption patterns affected the occlusion and showed a significant difference between breastfeeding for 1-2 years that leads to a mesial step and bottle-feeding for 1-2 years that often leads to a distal step.<sup>11</sup> Considering the importance of primary second molar relationship as a determinant of permanent

molar relationship in the future, it is necessary to know the factors that influence the primary molar relationship. There are only a few researches to address the issue, especially in Medan areas. Therefore, this study aims to evaluate the associations between infant feeding patterns on the deciduous second molar relationship of preschool aged children.

## MATERIALS AND METHODS

This research is an analytic study with cross-sectional design approach. The population are the children aged 3-5 years old and their mothers in Medan Selayang area. The non probability sampling with purposive technique is applied to collect 130 samples in selected preschools. The chosen schools were Khansa, Galilea Hosana, and Fadhil Al Insani. In this study, samples were divided into two groups that consist of exclusively breastfed and bottle-fed groups.

The inclusion criterias were parents and their children that do not have systemic disease and the child who has complete deciduous teeth and absence of proximal caries. The exclusion criterias were the children with malformed teeth, cleft palate, cleft lip, craniofacial deformation and had history of speech therapy.

This study received ethical clearance from Health Research Ethical Committee Faculty of Medicine, Universitas Sumatera Utara (NO:502/TGL/KEPK FK USU-RSUP HAM/2018) and parents had to sign an informed consent to proceed the research. The parents were given questionnaires of feeding patterns and the duration of feeding. Caries and relationship of primary second molar examination were held to determine the criteria. Furthermore, the relationship of primary second molar were captured by a camera (Nikon D90., Nikon Corporation, Japan) for data records. Data processing was analyzed by computer analysis using Chi Square with 95% of significance level.

## RESULTS

Of the 130 sample respondents aged 3-5 years, 55.4% are male and 44.6% are female. The highest number of respondents are those aged 5 years old

by 50.8%, followed by the 4 years old with 27.7% and 21.5% of those aged 3 years old (Table 1).

Based on milk consumption and duration of milk feeding, it was found that children who were breastfed or bottle-fed had the same percentage (50%). In terms of milk feeding time span, the children who consumed milk for 1-2 years constituted as the highest number with 63.8 %, followed by those consuming milk for more than > 2 years at 24.6%, and the smallest number were found for those consuming milk for only 6 month - 1 year at 11.5%. Children who had milk feeding frequency of more than > 5 times a day constituted as the highest percentage with 78.5%, while those having 3-5 times of milk feeding a day was 21.5%. Most children spent the time for each milk feeding for about 10-15 minute (43.1%), followed by those spending time for milk feeding for about 20-30 minutes (33.8%) and the least number of children spent time for milk feeding for more than 30 minutes (23.1%) (Table 2). The examination of the primary molar relationship, 37.7% of respondents had a mesial step, 36.9% a distal *step* and 25.4% had a *flush* (Table 3).

The primary molar relationship to the length of bottle-feeding revealed that the children who received bottle-feeding for 6 months-1 year had the highest rate of flush (5 samples), followed by distal step (4 samples), and mesial step (1 sample). On the other hand, children who were bottle-fed for more than >1-2 years mostly had a distal step (17 samples), followed by a flush (11 samples), and a mesial step (9 samples), while children who were bottle-fed for more than >2 years had a flush (9 samples), a distal step (9 samples), and none had mesial steps (Table 4).

Children who were breastfed for 6 months-1 year mostly had a mesial step (2 samples), a flush (2 samples), and a distal step (1 sample). Children who were breastfed for more than >1 year-2 years mostly had a mesial step (34 samples), followed by a distal step (11 samples), and a flush as the least (1 sample). Children who were breastfed for more than >2 years mostly had distal step (6 samples) (Table 5).

The associations between infant feeding pattern and primary molars relationship reveals that the child who were breastfed mostly had a mesial step (55.4%), while the child who were bottle-fed mostly had a distal step (46.2%). The results of the statistical analysis showed a significant relationship between the infant feeding pattern and the primary molar relationship ( $p < 0.0001$ ) (Table 6).

**Table 1.** Distribution of respondents' characteristics in preschool in Medan (n = 130)

Characteristics	Amount	Percentage (%)
Gender		
Male	72	55.4
Female	58	44.6
Age		
3 years	28	21.5
4 years	36	27.7
5 years	66	50.8

**Table 2.** Distribution of milk consumption patterns in children (n = 130)

Milk consumption pattern	Amount	Percentage (%)
Feeding method		
Breastfeeding	65	50
Bottlefeeding	65	50
Length of feeding		
6 months - 1 year	15	11.5
12 years old	83	63.8
> 2 years	32	24.6
Feeding frequency		
3-5 times	28	21.5
> 5 times	102	78.5
Feeding duration		
10-15 minutes	56	43.1
20-30 minutes	44	33.8
> 30 minutes	30	23.1

**Table 3.** Distribution of primary molar relations

Characteristics	Amount	Percentage (%)
Distal step	48	36.9
Mesial step	49	37.7
Flush	33	25.4

**Table 4.** The primary molar relationship with the length of bottle-feeding

Prolonged feeding	Mesial step	Distal step	flush
6 months - 1 year	1	4	5
> 1-2 years	9	17	11
> 2 years	0	9	9

**Table 5.** The primary molar relationship with the length of breastfeeding

Prolonged feeding	Mesial step	Distal step	Flush
6 months - 1 year	2	1	2
> 1-2 years	34	11	1
> 2 years	3	6	5

## DISCUSSION

Pediatricians and pediatric dentists agree on the importance of exclusive breastfeeding during the first six months of birth for good development of the structure of the oral cavity, occlusion, breathing and swallowing functions during childhood.<sup>1,4</sup> Distribution of milk consumption patterns in children result showed that there are 63.8% mother who fed their children for 1-2 years. This result exceeded Indonesian Ministry of Health Data and Information Survey Center that stated there are 42% mother who exclusively breastfed their infants for 6 months of life and 29% others bottle-fed them. This happened due to the high level of public awareness for exclusive breastfeeding and the high flow of mother's milk that eases milk feeding.<sup>4</sup>

The distribution of relationship of primary second molar indicated that there were 49 children who had a mesial step, 48 had a distal step, and 33 others had a flush. Relationship of deciduous teeth in children that were bottle-fed for more than 1-2 years indicated there were 17 children had a distal step, 11 had a flush, and 9 had a mesial step. Furthermore, the results of primary second molar relationship in children highlighted that breastfeeding for more than 1-2 years showed that 37 children had a mesial step, 11 had a distal step and 2 others had a flush. This research confirms Babu et al. research stating that milk consumption patterns affect the occlusion and showed a significant difference between breastfeeding for 1-2 years that leads to a mesial step and bottle-feeding for 1-2 years that often leads to a distal step.<sup>11</sup> Romero stated that breastfeeding promotes adequate development of the oral myofunctional structures. Although shorter breastfeeding practices play an indirect role in the etiology of malocclusions, the extent to breastfeeding duration also plays a significant role.<sup>12</sup> Nahás-Scocate

stated that the longer the breastfeeding duration, the higher the percentage of children who did not have the bottle-feeding habit, and the longer the time span for breastfeeding, the lower the chances of presenting distal step.<sup>13</sup> Children who were not breastfed or who were breastfed for less than 3 months presented 3 or 4 times greater chances, respectively, of developing distal steps in comparison with the children who were breastfed for more than 12 months.<sup>13,14</sup>

There are relations between breastfeeding and bottle-feeding on primary second molar relationship. The results showed that 55.4% children who were breastfed tend to had a mesial step and 46.2% children had a distal step. This result confirms Sargod et al research which showed that there were 84% breastfed children who had a mesial step and 50% bottlefed children who had a distal step. Infant feeding patterns affect growth and development in children, since by the age of three, primary molar relationship will be formed and act as the key of occlusions in permanent teeth. Mesial step considers to develop as a class I and distal step develops to class II.<sup>1</sup>

There are significant relationship between breastfeeding and bottle-feeding in primary molar relationship because the physiological nipple flows milk continuously from its pores as the child sucks. When the child sucked the nipple, babies need more energy and the use of sternus muscles will stimulate the mandibular growth properly. The contractive forces on sternus muscles supply additional effect to the growth of mandibular. The flexible and soft texture of mother's nipple is beneficial in shaping the hard palate which is caused by the forces made by muscles and mother's nipple that flattens and broadens the palate. As the infant uses a peristaltic-like motion to obtain milk from mother's nipple, the hard palate is shaped by the infants' tongue to develop a U-shaped palatum physiologically. This shape will align teeth properly and reduce the incidence of malocclusions.<sup>1,5,15</sup>

Bottlefed children do not need as much energy as breastfeeding because the entire structure of the rubber surface of the milk bottle pacifier has approached the mother's nipple structure and uses

more rigid material.<sup>12</sup> The movement of tongue resembles a piston-like movement in the bottle-fed child. Children usually acquired a minimal movement in bottle-feeding than breastfeeding. Piston-like movement to obtain milk from bottle needs less muscle forces than breastfeeding. This results confirm Ria et al. research that breastfeeding stimulates dentocraniofacial growth better and can affect dental arch and palatal shape to acquire a normal occlusion. The effects of dentofacial development depend on the duration and frequency of feeding, the intensity of milk sucking, arch relations, and the energy produced naturally by the oral cavity muscles.<sup>16</sup> Sargod et al. said that risk factors to lead to malocclusion are five times greater in children who were bottle-fed. This is so because the use of cheek and tongue muscles in babies with bottle-fed is higher, but the level of efficiency is lower than that of exclusive breastfeeding.<sup>1</sup> This different suction mechanism causes babies who are bottle-fed more likely to experience crowded malocclusion.<sup>17</sup> Therefore, the children who were breastfed tend to have more mesial steps than the bottle-fed, who are predicted to develop in class I occlusions.<sup>1,5,11</sup>

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