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Breastfeeding and Its Effects on Dentocraniofacial Growth and Development of 4 - 5 Years Old Children in Batak Ethnic

Susy Adrianelly Simaremare, Ngema Ria, Manta Rosma, Rosdiana Tiurlan Simaremare
Health Polytechnic of Health Department in Medan

Abstract

Objective: Breastfeeding has many positive effects on infants but there is a lack of promotion on it from the health of dental and oral. There is a benefit while sucking since breastfed may stimulate the growing of the jaws up and strengthen orofacial muscles maximally. **Materials and Methods:** The type of research which was carried out was observational with retrospective cohort study, aimed at having average different of vertical cephalic index, dental arch and palatal depth between who were given breastmilk babies were given breastmilk and no breastmilk in Batak ethnic. **Results :** The result of the analysis showed that there's significant association between giving breastmilk during infancy with cephalic height, cephalic length, maxillary canine arch width, maxillary molar arch width, anterior segment arch length and palatal depth ($p < 0.05$) and it was known that there's no significant association between breastfeeding during infancy with vertical cephalic index, maxillary canine arch depth and posterior segment arch length ($p > 0.05$). **Conclusion :** Exclusive breastfeeding may stimulate the growth and development in dentocraniofacial and may also influence the size of dental arch as the main factor to avoid malocclusion.

Keywords: Breastfeeding, Growth and development, Dentocraniofacial

INTRODUCTION

Coverage of exclusive breastfeeding in Indonesia has not shown a significant increase over the years. According to the Basic Health Research Data (*Riskesdas*) in 2010, the exclusive breastfeeding rate was only 15.3% whereas the national target of it was at 80% (Wiji, 2013). *Riskesdas* data in 2013 described that exclusive breastfeeding had increased to 30.2% (Agency for Health Research and Development, Ministry of Health of Indonesia, 2013). A study conducted by the World Breastfeeding Trends Initiative (WBTI) in 2012 indicated that only 27.5% of mothers in Indonesia managed to provide exclusive breastfeeding. Thus, these results are still far from the target of the Ministry of Health of Indonesia in 2010 with 61.5% rate of exclusive breastfeeding.

Socialization on exclusive breastfeeding has not reached an optimum result and there is a lack of promotion on the benefits of breastfeeding from the field of oral health. Several studies state that the positive effect of exclusive breastfeeding is the growth of jaw including the formation of *pallatum durum* (Legovic, 1991; Radzi, 2005; Lopez, 2006). When the baby sucked the nipple the position of the baby's lips touched the mom's areola while the tongue sucked in the milk from the nipple, the movement of the tongue towards the mouth reached the hard palate. The tongue then sent the signal to oropharynx and the mandible slowly moved backwards to aid the swallowing process (Woolridge, 1986; cited in Kobayashi et al., 2007). Breastfeeding within 12 months can reduce the depth of the palatal, showing that breastfeeding is an important element for the craniofacial development (Neto et al., 2012).

Infant growth and development process starts from prenatal to the infancy. The dentocraniofacial growth and development include the growth and development of occlusion, dental arch as well as the upper and lower jaw bones and related to the craniofacial growth and development. The dentocraniofacial growth in this study is revealed through the measurement of vertical cephalic index, baby's dental arch and palatal depth of the Batak children.

MATERIALS AND METHODS

Research Types and Design

This study is observational research with a retrospective cohort study, aiming to find out the average variant of dental arch and palatal depth between breastfed and not breastfed children in Batak ethnic.

Inclusion criteria: 4 to 5 years old children, teeth which were needed in the dental arch examination were complete in the oral cavity, teeth needed were free from caries, children of Malay ethnic and Bataknese, no hereditary abnormality history, willing to be taken impression of the teeth and examination of the teeth with the parents' permission.

Materials

Questionnaires, stationary, arch caliper, digital caliper, stainless steel ruler, 0.14 mm stainless steel wire, impression trays, rubber bowl and spatle, correct quick impression materials, xantalgin and molastone dental stone

Methods of Collecting Data

Data collection at each location of this study was conducted by the researcher with the assistant of two dentists who had previously equipped with a standardised data collection method.

Vertical Cephalic Index Data

The measurement of the height and length of the child's cephalic was applied directly in children.

- Cephalic height was measured by using a digital caliper, by placing each end of the caliper at the point of nasion to gnation. The distance of both ends of the caliper was recorded.
- Cephalic length was measured using arch caliper, by placing each end of the caliper on the point of glabella toinion. The distance of both ends of the caliper was measured using a ruler and the results were recorded.

The value of the vertical cephalic index was gained from this formula :

$$\text{Vertical Cephalic Index} = \frac{\text{Cephalic height}}{\text{Cephalic length}} \times 100$$

The measurement of the dental arch and palatal depth was taken on upper arch impression on the children.

Maxillary arch width was measured as maxillary canine arch width from cusp tip to cusp tip and intermolar arch width was measured between the mesiobuccal cusp tips of the right and left second primary molars.

- Maxillary arch depth was measured at two levels: anterior arch depth (canine arch depth) was defined as the length of line running perpendicularly from the midpoint between the central incisors to a line connecting the distal contact points of the right and left canines, and posterior arch depth (molar arch depth) was defined as the length of a line perpendicularly from the midpoint between the central incisors to a line connecting the most distal points of the right and left second primary molars.
- Maxillary arch length was measured as segments on the right and left sides as follows: the anterior segment, from the contact area of the central incisors to the contact area between the canine and the first primary molar, and the posterior segment from the contact between the canine and the first primary molar to the most distal point of the primary second molar.
- Palatal depth was measured as the length of a line from the deepest point in the palate to a line connecting the mesiolingual cusp tips of the primary second molars (Warren and Bishara, 2002).

DATA ANALYSIS

Univariate analysis, to see the distribution frequency of the retrospective variable. Bivariate analysis, to analyse the association of independent variable and dependent variable so the Fisher's Exact was taken.

RESULTS

In order to obtain measurements data of Batak ethnic, the research was conducted in Tarutung, North Tapanuli Regency. The dominant tribe in Tarutung is Batak Toba. The distance from the city of Medan to Tarutung is about 294 km. The selection of the location for the field study was considering that the site was populated by the original tribes of the Batak people and therefore it was appropriate as the required samples in this study, in which the subject of the study has to have two generations from both mother and father who were originally of Batak ethnic.

Univariate Analysis

Characteristics of Breastfed 4 to 5 Years Old Children in Batak Ethnic

From the samples obtained, the amount of Batak children was in total 95 children, which consist of 58.9% male and 41.1% female. The majority was the older children (48.4%) in the age of 5 years (see table 1).

Table 1 Frequency Distribution of Breastfed 4 to 5 Years Old Children in Batak Ethnic

Children Characteristic	Number/ Percentage	
	n	%
Sex		
- Male	56	58,9
- Female	39	41,1
Total	95	100
Age		
- 3 years old	16	16,9
- 4 years old	33	34,7
- 5 years old	46	48,4
Total	95	100

Frequency Distribution of Mothers Characteristics 4 to 5 Years Old Children in Batak Ethnic

The total number of mother was 95 people and 74 people (77.9%) who provided breastmilk. Mothers who

provided breast milk are characterized by having level of higher education/ college (59,5%) and working mothers 86,5%, see table 2 below:

Table 2 Frequency Distribution of Mother Characteristics of Children age 4 to 5 Years Old Children in Batak Ethnic

Mother Characteristic	Breastfeeding Status		
	No Breastmilk	Breastmilk	Total
EDUCATION			
Primary-junior high school	0 .0%	1 1,4%	1 1,1%
Senior High School	8 38,1%	29 39,2%	37 38,9%
College/ University	13 61,9%	44 59,5%	57 60,0%
Total	21 100,0%	74 100,0%	95 100,0%
OCCUPACION			
Not working	3 14,3%	10 13,5%	13 13,7%
Permanent job	15 71,4%	46 62,2%	61 64,2%
Part-time job	3 14,3%	18 24,3%	21 22,1%
Total	21 100,0%	74 100,0%	95 100,0%

Breastfed Children Aged 4 to Years in Batak Ethnic

The data of breastfeeding was obtained from mothers with questioner, in which 22,10% did not provide breast milk to the child, 25,2% provided breast milk for 4-5 months and 34,8% provided breast milk for minimum 6 months. The duration of breastfeeding, in particular directly from mothers to baby was only up to less than 1 year (36,5%), as described in Table 3:

Table 3 Breastfeeding Frequency Distribution of Children Aged 4 to 5 Years Old Children in Batak Ethnic

No.	Breastmilk providing	Number/ Percentage	
		n	%
1.	Age of breast milk		
	- without breastmilk	21	22,1
	- 1 month	5	5,3
	- 2 months	3	3,2
	- 3 months	9	9,4
	- 4 -5 months	24	25,2
	- ≥ 6 months	33	34,8
2.	Duration of breastfeeding		
	- < 1 year	27	36,5
	- 1 year	23	31,1
	- > 1 year	24	32,4

Distribution Frequency of the Average Vertical Cephalic Index, Dental Arch and the Palatal Depth between the Breastfed and No Breastfed of Aged 4 to 5 Years Old Children in Batak Ethnic

The results of the analysis showed no variation in the average of cephalic height and cephalic length between the breastfed and not breastfed children ($p < 0.05$) and no variation in the average of vertical cephalic index between the breastfed and not breastfed children ($p > 0.05$).

The results of the analysis exhibited that there is a significant distinction on the average of maxillary canine arch width, maxillary molar arch width, maxillary molar arch depth, anterior segment arch length and palatal depth between the breastfed and no breastfed children ($p < 0.05$). However, there is no significant variation between the breastfed and not breastfed children in terms of the average of maxillary canine arch depth and posterior segment arch length ($p > 0.05$).

Table 1 Distribution Frequency of the Average Vertical Cephalic Index, Dental Arch and the Palatal Depth of Aged 4 to 5 Years Old Children in Batak Ethnic

VARIABLE	Status of Breastmilk		p value
	Breastmilk	No breastmilk	
Cephalic height	8.29	7.96	0.000
Cephalic length	16.00	15.50	0.000
Vertical cephalic index	51.63	51.63	0.982
Maxillary canine arch width	30.24	29.34	0.000
Maxillary molar arch width	45.71	44.25	0.003
Maxillary canine arch depth	10.40	8.92	0.085
Maxillary molar arch depth	27.64	26.73	0.044
Anterior segment arch length	38.14	34.34	0.005
Posterior segment arch length	36.00	33.90	0.330
Palatal depth	13.39	14.00	0.015

DISCUSSION

Characteristics of Sample

The sample of the study was children between the age three to five who were breastfed and no breastfed in Batak ethnic. In this study, the determination of the subjects' age was due to dental arch which have been relatively stable or with minimum changes (Nakata, 1998) and at the age of 3 years old, the baby tooth has all grown (Houston, 1991; Mokhtar, 1998). The subject of the study was more on male children with the age of 5 years.

Indonesia is a multiethnic country where each ethnic tends to have its own unique shape of skull and jaws, although these patterns are often influenced individual variations. Batak ethnic is considered as among the group of Proto Malay (Djoena et al., 2005).

Breastfed Children Aged 4 to 5 Years Old Children in Batak Ethnic

The study shows that 22.10% of mothers did not provide breast milk to their children, 25.2% expressed breast milk to the children for 4 to 5 months and 34.8% provided breast milk for minimum 6 months. In order to support the exclusive breastfeeding programme in Indonesia, in 1990 the government declared national movement to improve breastfeeding (PP-ASI) with one of the objectives was to socialise the exclusive breastfeeding behaviour from the infant arrives up to four months. In 2004, in line with the World Health Organisation (WHO) recommendation, the breastfeeding duration was extended up to 6 months. According to Roesli (2005), the 6 months duration for breastfeeding was due to the reason that solid food enzymes would only be complete and ready at the age of 6 months.

From the data obtained, there are many mothers who did not provide breast milk to their children. Rusli (2009) argues that it is because of the lack of information to mothers on how to breastfeed correctly and to the medical staff. There is massive advertisement on formula milk in media; on the other hand, the information on the right breastfeeding is not always available.

In terms of duration of breastfeeding, only 32.4% mothers provided breast milk to infants for more than a year. According to the Global Strategy on Infant & Young Child Feeding, there were four important things which have to be done by mothers in providing the right and optimal food to children in the age of 0 to 2 years, i.e. (1) breastfeeding at the soonest in 30 minutes after the infant arrives (early breastfeed initiation); (2) providing exclusive breastmilk until the age of 6 months; (3) providing supplementary food since the age of 6 months until 24 months and extended the breastmilk up to 24 months or more (Yulianti, 2010). The low percentage of mothers who extended providing breastmilk until after a year was with the assumption that 86.5% of the mothers were working mothers.

The difference in average of vertical cephalic index, dental arch and palatal depth between the breastfed and no breastfed children in Batak ethnic.

The result of the analysis shows that there were significant difference on the average of cephalic length and cephalic height of the breastfed and no breastfed children ($p < 0.05$). Similarly, there was significant difference on the average of the maxillary canine arch width, maxillary molar arch width and maxillary molar arch length between the breastfed and no breastfed children ($p < 0.05$). The result of the study does not indicates significant difference on the vertical cephalic index, maxillary canine arch depth and posterior segment arch length between the breastfed and no breastfed children ($p > 0.05$).

Batak children genetically tend to have oval cephalic shape (*dolichocephalic*), long, narrow and deep maksila tooth arch. With breastfeeding, the average measurement on each dimension grows bigger, except the vertical cephalic index. The data of measurement result shows that breastfed children have similar average vertical cephalic index with the no breastfed children.

Breastfeeding allows infant jaw which is still in the process of growth and development to shape in better form. Infant would breastfed appropriately if the mammae areola area enters maximally into the infant's

mouth, so all ductus lactiferus which located in the end of mother's breast at the back of the nipple would be pushed by the infant's jaw. The pressure of the breast when touching the infant's cheek works as compressor which can push the jaw toward inside the infant's mouth. If the infant only wean, it will only obtain few of breast milk and if infant suck by maximally entering the areola mammae and the stronger it suck then the amount of breast milk will be more breast milk. When the infant actively latch on, it does the regular and continuous mouth movement. This process could influence the dentokraniofasial growth and development. According to Sum et al., (2015), breastfeeding can stimulate development from three dimension, i.e. sagittal, transversal and vertical.

Many benefits gained by children in relation with breastfeeding. Oral motoric v²⁵ maximally function, which will positively effects the craniofasial and dental growth and development (Radzi et al., 2005; Neto et al., 2012; Salone et al., 2013). Thro¹⁸ breastfeeding, the continuous movement of lips, tongue, lower jaw and cheek provide beneficial effect to the development of the infant's jaw muscles (Kobayashi et al., 2010; Narbutyte et al., 2013). The movement of jaw when sucking breast milk provide the main stimulant for the growth of temporomandibular joints which effect the harmonious growth and development of the face area (Sanchez et al., cited in Pires et al., 2012).

The muscles involved in breastfeeding, especially massater, are the muscles which then would do chewing function (from the age of 6 and afterwards). The process of sucking breast milk will also stimulate the orofacial muscle (Rochelle et al., 2007). The correct way of breastfeeding would contribute in creating muscle functional balance which will affect to the functional balance of muscle which further affects the development of lower jaw and upper jaw which then would be much needed for the stability of tooth occlusion (Gomes et al., cited in Pires et al., 2012).

Putri's research (2010) indicated that the average measurement of the width of anterior arch tooth and the width of posterior arch tooth is different meaning between the breastfeeding with bottlefeeding children ($p < 0,005$). Similarly, the result of study by Ganesh et al., (2005) explained in which difference of anterior arch tooth width with posterior arch tooth width between the breastfed and not breastfed children. Aznar et al., (2006) mentioned that the not breastfed children have smaller posterior arch width of upper jaw compared with the breastfed children.

CONCLUSION

1. The average of cephalic height, cephalic length, maxillary canine arch width, maxillary molar arch width, maxillary canine arch depth and maxillary molar arch depth of the breastfed children are bigger compared with the no breastfed children.
2. The result of the analysis showed that there's significant association between giving breastmilk during infancy with cephalic height, cephalic length, maxillary canine arch width, maxillary molar arch width, anterior segment arch length and palatal depth ($p < 0,05$) and it was known that there's no significant association between breastfeeding during infancy with vertical cephalic index, maxillary canine arch depth and posterior segment arch length ($p > 0,05$).
3. The Bataknese children, genetically had *dolichocephalic* head which were followed by a long and narrow upper arch and also a narrow, long and deep palate. The Bataknese children who didn't receive breastmilk during infancy would have the tendency to have malocclusion.
4. Breastfeeding will stimulate the dento-cranio-facial growth and development, which will influence the size of dental arch and palatal depth which are the main factor for the achievement of proper dental occlusion.

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