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Original Article

Breast-feeding duration and children's nutritional status at age 12-24 months

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Abstract

Background Relation between breast-feeding duration and children's nutritional status is still a controversy. Positive as well as negative relation were shown. This study aimed to support this current issue on breast feeding duration and nutritional status of children aged 12-24 months.

Objective To analyze relationship between breast-feeding duration and nutritional status of children aged 12-24 months.

Methods A cross sectional study was conducted with 246 proportional stratified random coupled samples (mothers and weaned children) with inclusion criteria: normal birth weight, full-term delivery and no physical and psychological problems. Data from children were measured using Seca® digital weight scale, wooden length board, while data from mothers were collected through 1x24 Hours Food Recall Form, and a questionnaire on mother's knowledge.

Results The average of breast-feeding duration was 15 months. The prevalence of malnutrition was quite low (<10%), but the prevalence of stunting was high enough (20.7%) while wasting was moderately high (10.6%). Breast-feeding duration was significantly associated to children's nutritional status (height-for-age index and weight-for-height index). The highest correlation was found in height-for-age index (r = 0.403). Regression model revealed that breast-feeding duration, exclusive breast-feeding, diarrhea, working mother, mother's knowledge, energy intake, and protein intake were independently associated with children's nutritional status.

Conclusions As this study found that the average of breast-feeding duration was 15 months and there was a significant association between breast-feeding duration and nutritional status (height-for-age index) of children 12-24 months old, thus these findings strengthen the recommendation of WHO to continue breast feeding up to 2 years old. **[Paediatr Indones. 2010;50:56-61]**.

Keywords: *Breast-feeding, nutritional status, age 12-24 months*

Malnutrition is still one of the main nutrition problems in Indonesia[1], and breast-feeding has a very important role, as breast-feeding maintain growth and development of the children[2]. *Global Strategy for Infant and Young Child Feeding* recommends that breast-feeding has to be continued until the age of 24 months.[3] However, the practice of breast-feeding in the community is still far from what has to be done.

Controversies of the benefits of breast-feeding duration on children's nutritional status are still being discussed. Current epidemiologic studies state that in developing countries, children weaned before the age of 1 year suffer from malnutrition less than those who were breastfed for a longer duration. Grumer-Strawn study revealed that eight out of 13 studies agreed that there is a positive relationship between breast-feeding duration and children's nutritional status, two others show a negative relationship and the rest are inconclusive.[4]

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Methods

We conducted a cross sectional study in Cigugur Tengah village, Cimahi, West Java Province. We recruited 246 proportional stratified random coupled samples (mothers and weaned children) with inclusion criteria: normal birth weight, full-term delivery and no physical and psychological problems.

Data collection: (1) children's body weight, measured through digital scales Seca® with 0,1 kg accuracy, (2) body length, measured with a wooden length board with 0.1 cm accuracy; (3) food consumption pattern, using 24 Hours Food Recall Forms and (4) a questionnaire was used to collect data on child sex, exclusive breast-feeding, diarrhea, maternal work status, balanced nutrition and mother's breast-feeding knowledge. Nutrisurvey program was used to determine children's nutritional status (WHO/NCHS 1977) and processed children's food intake data. Nutrition status was calculated using Z-score based on the weight-for-age, height-for-age, and weight-for-height indexes.

$$\text{Z-score} = \frac{\text{(individual's value) – (median reference value)}}{\text{Standard deviation of reference population}}$$

Data was run in univariate, bivariate and multivariate (analyzed through independent t-test, Pearson correlation and multiple linear regression).

Results

Distribution of nutritional status of all subjects could be seen in **Table 1**.

Breast-feeding duration mean value was 15.00 (*range* 0-24, SD 6.10) months. Four children (1.6%) had already been weaned since the age of 0 (zero) days, and only nine children (3.7%) were breastfed until the age of 24 months. The proportion of breastfeeding duration less than 6 months of age was 13.8%, ≤ 12 months old was 35.8%, ≤ 18 months old was 62.6%, and < 24 months was 96.3%. There were 48.8% mothers who already weaned their children before the age of 24 months due to cessation of breast milk production.

The mean value of exclusive breast-feeding duration was 1.88 months. One hundred and two children (41.5%) were not exclusively breast-fed since birth, 60 children (24.4%) were exclusively breast-fed until the age of 4 months, and only one child (0.4%) who was exclusively breast-fed until age the of 6 months.

Table 2 depicts children's frequency distribution of covariate variables. Energy, protein, fat, and carbohydrate intake obtained through 24 hour food recall and compared to the Indonesian Recommended Dietary Allowance 2004 for children aged 0-3 years.[5] Out of 31 children who had diarrhea within the previous two weeks, 13 children were given anti diarrheal drugs, six children were treated at Public

Table 1. Children's nutritional status

Anthropometric Indexes	Nutritional Status Categories	Frequency (n)	Percentage (%)
Weight-for-Age	Severe Malnutrition	0	0
	Malnutrition	15	6.1
	Well Nourished	228	92.7
	Overweight	3	1.2
Height-for-Age	Stunted	51	20.7
	Normal	195	79.3
Weight-for-Height	Severe PEM	9	3.7
	Moderate PEM	17	6.9
	Normal	199	80.9
	Overweight	21	8.5

Table 2. Frequency of covariate variables

	Frequency (n)	Percentage (%)
Gender		
Girl	112	45.5
Boy	134	54.5
Intake		
Energy		
Inadequate	84	34.1
Adequate	162	65.9
Protein		
Inadequate	32	13.0
Adequate	214	87.0
Fat		
Inadequate	95	38.6
Adequate	151	61.4
Carbohydrate		
Inadequate	87	35.4
Adequate	159	64.6
Diarrhea		
Yes	31	12.6
No	215	78.4
Mother's knowledge		
Not good	32	13.0
Good	214	87.0
Mother's working status		
Working	88	35.8
Not working	158	64.2

Health Center, and only five children received Oral Rehydration Solution (ORS).

Pearson correlation test on breast-feeding duration and child nutritional status was only significant for height-for-age index (P<0.001, r = 0.403). The increased prevalence of malnutrition (weight-for-age index), stunted (height-for-age index), and wasted (weight-for-height index) tended inversely to the duration of breast-feeding, while addition of breast-feeding duration tended to increase the prevalence of well nourished (weight-for-age index) and normal (height-for-age and weight-for-height indexes) children, and a lower prevalence of overweight (weight-for-age index) and obese (weight-for-height index). Distribution of children's nutritional status based on breast-feeding duration listed in **Table 3**.

There was no significant relationship between sex and children's nutritional status for all anthropometric indices as well as mother's knowledge and working status variables. Diarrhea indicated a significant relationship with children's nutritional status based on weight-for-age index (P<0.001) and height-for-age index (P = 0.004), but not to weight-for-height index (P = 0.193). Energy, protein, fat, and carbohydrate intakes did not show a significant relationship (P > 0.05) with children's nutritional status.

Multiple linear regression analysis was conducted using the dependent variable height-for-age index (highest r value). The first step was selection of model through Pearson correlation test and mean comparison (t test independent). Seven variables were entered into multivariate model.

The second step was a multivariate modeling. The all seven independent variables above entered into the model (changes in B > 10%). See **Table 4**.

Existences, independency, linearity, homoscedascity, normality and multicollinearity diagnostic test were analyzed and fulfilled the requirement. Thus this model could be used to predict children's nutritional status (height-for-age index). No interaction was found. With R square 0,231 mean that all seven independent variables could explain 23.1% of children's nutritional status (height-for-age index), and with P< 0.001 (analyzed with Anova test) meaning that the seven variables could significantly predict children's nutritional status (height-for-age index). Equality of regression coefficients obtained from the box in the column B (Table 4).

Table 3. Children's nutritional status distribution based on breast-feeding duration

Breast-feeding Duration	Children's Nutritional Status								
	Weight-for-Age (%)			Height-for-Age (%)		Weight-for-Height (%)			
	Malnutrition	Well Nourished	Overweight	Stunted	Normal	Severe PEM	Moderate PEM	Normal	Overweight
0-4	17.4	78.3	4.3	82.6	17.4	0.0	0.0	78.3	21.7
5-6	18.2	81.8	0.0	72.7	27.3	18.2	0.0	45.5	36.4
7-12	11.1	87.0	1.9	38.9	61.1	5.6	9.3	75.9	9.3
13-18	4.5	95.5	0.0	3.0	97.0	1.5	7.6	84.8	6.1
19-24	0.0	98.9	1.1	1.1	98.9	3.3	7.6	85.9	3.3

Table 4. Multiple linear regression (second model)

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.706	.486		-5.564	.000		
	Breast-feeding duration (mo)	.790	.017	.347	5.357	.000	.772	1.295
	Exclusive breast-feeding (mo)	.685	.055	.263	4.252	.000	.845	1.183
	Protein intake level	-.083	.319	.017	.262	.794	.736	1.358
	Diarrhee (2 weeks before)	-.086	.307	.018	.278	.781	.815	1.227
	Mother's knowledge	-.186	.279	.039	.666	.506	.960	1.041
	Mother's working status	-.209	.205	-.062	-1.022	.308	.879	1.138
	Energy intake level	-.260	.224	.076	1.160	.247	.750	1.333

Z-score (height-for-age) =
0.706 + 0.790 breast-feeding duration
+ 0.685 exclusive breast-feeding – 0.086 diarrhea -
0.209 mother's working status –
0.186 mother's knowledge –
0.260 energy intake - 0.083 protein intake

Discussion

In this study, variables such as early initiation, parity, socio-economic status, and mother's education level were assumed to be homogenous in the community. Many types of foods, especially snacks, were not listed in *Nutrisurvey* program database, thus substituted with similar food.

Based on weight-for-age index, PEM prevalence in Cigugur Tengah Village was considered low, but the prevalence of stunted and wasted were moderately high. This strengthen the study of Ngare & Mutunga (1999) et al, Onyango et al, (Kenya) with similar population: children aged 12-23 months.[6] Stunting indicates a chronic malnutrition which might be caused by short breasfeeding duration, less optimal exclusive breast-feeding, having diarrhea, lacking of mother's knowledge, working mothers, giving low nutrition intake (quantity and quality), and early introduction of complementary foods .

Mean of breast-feeding duration was 15 months, 9 months less than global recommendation but similar to Alvarado et al[7] (2005): 65% of African children in Colombia obtained breastmilk up to average 15 months. Statistical analysis showed a positive pattern of relation between breast-feeding duration and children's nutritional status. The longer the duration of breast-feeding, the better the nutritional status for all anthropometric indexes. This study also showed that the increase in breast-feeding duration would preclude children from obesity.

Onyango et al[6] reported that breastfed children aged 9-18 months in Kenya were 3 cm higher in length compared to children who were already weaned before the age of 14 months. Boediman et al (1979) in Grummer-Strawn stated that the incidence of malnutrition was lower in children who were breastfed at least for 12 months. These results strengthen theories and previous studies that breast-feeding duration supported child linear growth in middle/lower socio-economic level population (majority low level education, densed environment, lack of hygiene and sanitation, and most mothers work outside home).

Other studies such as Briend & Bari (Bangladesh,1989) in Grummer-Strawn, Victora et al (Brazil)[4,8] reported that there was negative relationship between duration of breast-feeding and nutritional status (weight-for-age index). Having controlled exclusive breast-feeding, diarrhea, maternal work status, maternal knowledge, energy and protein intake , this study predicted that for any additional month of duration of breast-feeding there would be an increase of 0,790 nutritional status (height-for-age index) for children aged 12-24 months.

Similar study reported by Alvarado et al:[7] breast-feeding was positive predictor for linear growth (regression coefficient 0,27 cm/month; P = 0,04) for children > 12 months of age after controlled by complementary foods consumption score and morbidity (cough, fever and diarrhea). Simondon et al[9] reported that in the first two years the linear growth of breastfed children were fasterer compared to children weaned before two years old (P = 0,05).

Theoretically, child bone growth increased 100% before the age of 12 months.[10] Linear growth in breastfed children could be explained based on the composition of nutrients in breast milk. Calcium in breast milk ensure child optimal bone formation. The ratio of linoleic acid : oleic acid in breast milk could accelerate fat and calcium absorption. Palmitic acid in breast milk increase calcium absorption in intestine[11]. Vitamin D in breast milk is the precursor for establishment of 1.25-dihydroxicholecalsiferol which plays an important role in calcium metabolism by increasing calcium absorption in the intestine.[10,12] Phosphorus in breast milk helps optimal formation of child bones.[13]

Weight-for-age index is influenced by many factors other than breast-feeding. Breast milk consumption leads to more quality and quantity improvement on particular nutrient and micronutrient in children, but not on overall energy intake. The success of optimal breast-feeding is influenced by many factors, starting since pregnancy, such as good nutrition intake. Not only health workers, but also all of us (individual as well as organization), are responsible for health promotion, especially breast-feeding. Participation and empowerment of the community needs to be strengthened to obtain good nutritional status

through breast-feeding. Early initiation is the starting point of breast-feeding practices Unfortunately, the discourse of early initiation is still a problem. Most of the mothers do not know about early initiation, thus they do not practice it.

Exclusive breast-feeding has an important role in achievement of recommended breast-feeding duration. This study revealed that 32.1% children have already got bottle milk 2-3 hours after birth, and other food/drink were given other than breast milk in the first 3 days of life . It is very important for mothers to have a strong confidence of being able to give adequate breast milk for their children. For this reason breast-feeding initiation is very important as sucking process will drive the anterior hypophysis to excrete prolactin into the bloodstream. This prolactin would stimulate alveolar cells in the mammary glands to produce breast milk. The more often the baby sucks, the more prolactin is released by the hypophisis, so that more breast milk will be produced. This mechanism explains that breast milk production follows the supply and demand pattern.[12,14]

Harmani and Ansori reported that mother's knowledge of nutrition is significantly related to children's nutritional status.[15-16] No significant difference was found in nutritional status between girls and boys, as in Cigugur Tengah local cultures do not distinct feeding quantity as well as quality for boys and girls.

While this study did not reveal a significant relationship between consumption of complementary foods and child nutritional status (height-for-age index)[7], Alvarado et al did found the difference. These differences may exist due to the 24 Hour Food Recall especially in average food consumption intake. The average intake of energy and protein were adequate (≥ 80% RDA). Average fat intake was sufficient (a total of more than 4/5 of the 30% contribution of fat energy a day). Similarly with carbohydrate intake (a total of more than 4/5 of the 60% contribution of carbohydrate of daily energy). However, analysis of data showed that there were no significant relationship between energy, protein, fat, and carbohydrate intake with child nutritional status. This is probably due to the quality of macronutrient intake as 24 hours food recall indicates that the children get high energy and fat intake from snacks. Children need to get high quality nutrient (eg: egg, tempe, tofu and beans) to support optimal growth, thus limitting snacks would be an important suggestion.

Onyango et al stated that the increased consumption of complementary foods would not compensate fat and vitamin A intake obtained from breast milk. Onyango concluded that in children's second year of life,. Allen and Uauy (1994) in Onyago et al[6] stated that short breast-feeding duration in a low socio-economic child can cause some deficiencies in vitamins, minerals, and essential fatty acids.

Diarrhea was found significantly associated with children's nutritional status for weight-for-age and height-for-age indices. This finding was in line with Woge (East Nusa Tenggara), Simondon et al (Senegal, $P < 0.05$), Rowland et al (1988); De Romana et al (1989); Dan Brown (2003) in Alvarado et al.[7,9,17] Briend et al and Checkley et al studies reported a very weak correlation between child growth with diarrhea (weight-for-height index).[18-19]

In this study, infection was identified only by diarrhea, not by other symptoms such as fever, cough, runny nose. When identifying diarrhea as a symptom of infection, than both frequency and history should also be identified, making it possible to find a more clear relationship between breast-feeding duration and children's nutritional status in the case of breast milk's ability to protect infection. In line with Sinantri and Setyawan studies, this study found no significant difference in nutritional status among children with working mother compared to those whose mothers are not working.[20-21]

Based on the regression model, linear growth was predicted to follow a normal pattern, if breast-feeding and exclusive breast-feeding were optimal, avoid child from diarrhea, working mother pay attention to child intake, energy and protein intake at least 80% RDA. Further focused studies concerning breast-feeding duration and nutritional status are recommended for example using a prospective design research (cohort). It was proven that anthropometric measurements conducted by posyandu cadres were generally less accurate, thus it will lead to a wrong interpretation on nutritional status. Therefore, it is recommended to train caders through a good intensive program or activity to improve their skill. Through these efforts, it is hoped that accurate information on nutritional status could be obtained.

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