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MILK CONSUMPTION IMPROVES THE NUTRITIONAL ADEQUACY OF 12-24 MONTHS OLD CHILDREN IN BEJI, DEPOK, INDONESIA

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Abstract

Background: Weaning period is crucial to ensure appropriate nutritional status. Proper complementary feeding can help children reach optimal growth. Milk as part of complementary feeding is evidently beneficial. The aim of this study was to determine difference in nutritional status between children who consumed milk as a part of complementary feeding and children who did not. **Methods:** Cross-sectional study was conducted on 102 children aged 12-24 months in Depok City. Data was obtained from height and weight measurements, 1x24-hour food recall, and validated semi-quantitative food frequency questionnaire. **Results:** Nutritional status of children who consumed milk was better at all indicators compared to those who did not, especially in length-for-age, shown by the stunting prevalence (not consuming 26.2%; consuming milk 19.5%). Children who consumed milk also had significantly higher nutrient adequacy. Nutrient intake of mothers who still provided breast milk which demand higher nutritional need, turned out to be lower than the requirements. **Conclusion:** Milk consumption might benefits children aged 12-23 months for their nutritional status and to meet their nutrients adequacy. Results are expected to be consideration to assess regulations related to milk promotion for children.

Keywords: milk, nutrition adequacy, nutrition intake, nutritional status, complementary feeding.

Introduction

Early child nutritional status is important basis for human's health, growth, and development. This condition will affect life quality in the next period. Nutritional problems in children have a long-term impact and wide dimensions ranging from cognition, productivity, and non-infectious diseases in adulthood and elderly. As an effort to optimize child nutritional status, adequate complementary feeding program should be implemented.

Danger period begins at the age of 6 months.[1,2] Infant nutritional status at this age generally decreases from the previous month and continuously decreases up to the age of 36 months. Danger period occurs because in this weaning period, the energy from foods provided to the infant is inadequate and the hygiene is less guaranteed. This makes the child undernourished and susceptible to diseases. In this period, according to their development tasks, children like to put objects into their mouths, so that dirt and bacteria are easily swallowed. On the other hand, their immune system are still developing. This situation increase the risk of illness occurance, such as diarrea and upper respiratory track infection (URTI) among young children, which need heavier effort on the feeding strategy.[3] Psychologically, the children are also at the stage of rapid motor development, therefore, they prefer to explore and be less interested in food.

In Indonesia, currently stunting becomes a major issue because of the higher prevalence and its impact on quality and productivity of human resources. National Basic Health Research (2018) shows that even though decreasing form previous years, stunting is still a health problem with national prevalence at 30,8%.[4,5] There are still 25.7% stunted toddlers found in Depok City. [6]

In this period, complementary feeding education program for mothers is needed so as they can prepare good and qualified complementary feeding for their infants.[7] Provision of milk such as fortified growing-up milk to infants after 12 months of age was found beneficiaries to meet the nutritional needs.

World Health Assembly (WHA) on May 2016 released new guidance with one of main points mentioning that milk other than breast milk is not allowed to be promoted or introduced to targeted children aged under three years old. As reported in the document of WHA, this guidance appears as a form of WHO's commitment in promoting the importance of exclusive breastfeeding within the first six months of child's life and recommendation to continue exclusive breastfeeding up to the age of two years. The document was generally accepted, except critic on the expansion of restriction up to three years.[8] Besides, it is important to note that complementary feeding guidances from WHO, UNICEF, and FAO all include milk as distinct food that can help meet the nutritional needs of children.[7,9]

Many studies had found positive results of child consuming supplementary growing-up milk in addition to their daily meal. A study in East Jakarta area stated that the needs of macro and micro nutrients in children aged 12-24 months are not met if milk is eliminated from their complementary food menu.[10] Other study found that consuming fortified growing-up milk can protect children age 18-36 months against incident of URTI.[3] In addition, Southeast Asia Nutrition Survey (SEANUTS) in 2011 presented that in Indonesia, milk and its processed products are types of foods most often consumed by infants at the age group of 6-11 months.[11] If milk for certain age group of children is not allowed to be promoted, it is possible that the absence of child's milk consumption might cause the decrease of overall nutrient

intake. This study aimed to determine differences between nutritional status and energy consumption of children aged 12-24 months that received growing-up milk (further referred to as milk only) as addition and part of complementary feeding and the children who did not receive milk.

Methods

This is a cross-sectional quantitative study involving children of 12-24 months in semi urban area in Beji District, Depok City, West Java Province on November 2016 – May 2017. Subjects of study were children aged 12-24 months living in the location of study. Respondents were mothers of the subjects. This study was approved by the Commission of Research Expert and Research Ethics of Faculty of Public Health, Universitas Indonesia (Letter of Approval No.180/H2.F10/PPM.00.02/2015 dated 20th April 2015).

Inclusion criteria were children aged 12-24 months, willing to participate at study, and the mothers were willing to be interviewed. Exclusion criteria included children with congenital diseases or disability, such as inability due to physical disability, down syndrome, or other genetic disorders. Percentage of exclusive breastfeeding in this population was relatively high because subjects involved in prior study on breastfeeding mother's milk supplementation intervention to support provision of 6-month exclusive breastfeeding.

Before data were collected, the trained enumerators first explained informed consent by reading aloud the consent form to be respondents and written informed consent were obtained from all subjects/ respondents. Dependent variable of this study was nutritional status of children aged 12-24 months, and the main independent variable was milk

consumption. Other independent variables were child's nutrient intakes, socioeconomic status, food provision pattern, and family sociodemography. Anthropometry data were entered using WHO Anthro 2005 software.[12] Consumption data was in forms of 1x24-hour recall and FFQ processed using 2007 Nutrisurvey with food items in Indonesian food composition table, consumable weight conversion, raw food – cooked conversion, as well as oil uptake adjustment were referred to 2013 Total Diet Study (SDT).[13]

We analyzed the data by comparing two groups: children who consumed milk as part of their complementary feeding and children who did not. Data were analyzed in univariate and bivariate to determine nutritional status and energy consumption of children aged 12-24 months in each group. In bivariate analysis, categorical data was analyzed with chi-square test, and continuous data that was child's nutritional status index was analyzed with t-test, while the rate of nutrient intake of mother and child was analyzed with Mann-Whitney test.

Results

Table 1 presents general characteristics of mothers and children based on milk consumption. In general, median of child age was 18 months with average age of 16 months. Two-third of respondents were living as nuclear family (consisting of mother, father, and children) and the remaining were still living with their parents or parents-in-law. Most respondents attained senior high school level or bachelor degree. More than 50% of respondents were housewives and unemployed. There was no significant difference in all characteristics of both groups.

Table 1. General Characteristics of Mothers and Children Based on Milk Consumption (n = 102)

General Characteristics	Not consuming milk (n = 61)	Consuming milk (n = 41)	All respondents (n = 102)	*p*-value[2]
Children				
Age (month)[1]	17 (14, 19)	18 (16,19)	18 (15, 19)	.326
Sex, male, n (%)	33 (54.1)	21 (51.2)	54 (52.9)	.775
IMD[3], n (%)				
Yes	34 (55.7)	29 (70.7)	63 (61.8)	.127
IMD successful	31 (50.8)	21 (72.4)	52 (50.9)	.373
Excusive breastfeeding, n (%)	56 (91.8)	38 (92.7)	94 (92.1)	.871
Family				
Type of family living together (n=98), n (%)				
Nuclear family	40 (69)	23 (57.5)	63 (61.8)	
Extended family	18 (31)	17 (42.5)	35 (35.7)	.244
Mother				
Education level, n (%)				
< Senior high school	16 (26.2)	10 (24.4)	26 (25.5)	.834
≥ Senior high school	45 (73.8)	31 (75.6)	76 (75.5)	
Occupation, n (%)				
Civil servant/private employee	3 (4.9)	4 (9.7)	7 (6.9)	.723
Entrepreneur	4 (6.6)	2 (4.9)	6 (5.9)	
Teacher	2 (3.3)	2 (4.9)	4 (3.9)	
Housewives	52 (80.5)	33 (85.2)	85 (83.3)	
Father				
Education level, n (%)				
< Senior high school	15 (25)	10 (26.8)	27 (26.5)	.834
≥ Senior high school	45 (75)	31 (73.2)	75 (73.5)	
Occupation, n (%)				
Jobs with special skills *(civil servant/employee, teacher, etc)*	41 (67.2)	25 (61)	66 (64.7)	.745
Jobs without special skills *(driver, motorbike taxi rider, labor, office boy, etc)*	18 (29.5)	15 (36.6)	33 (32.4)	
Unemployed	2 (3.3)	1 (3.4)	3 (2.9)	

[1]Data are presented in median
[2]Differences between groups of children consuming and not consuming
[3]IMD (Inisiasi Menyusui Dini) = Early Breastfeeding Initiation

Furthermore, Table 2 describes the comparison between child total nutrient intake among those who received and those who did not receive milk. Median value of nutrients intake (carbohydrate, protein, fat, calcium and iron) were below the recommendation. This was especially true among children who did not consume milk. Nutrients intake of children who received milk was significantly better than those who did not. Protein intake of children

who consumed milk could meet the recommendation.

Table 2. Child's Nutrient Intake based on Milk Consumption (n = 100[1])

Nutrient	Not consuming milk (n = 60)	Consuming milk (n =40)	All respondents (n=100)	Recommended Dietary Requirement (2013)[14]	*p*-value[2]
Energy (kcal)	674.5	929.5	741	1125	.005
Carbohydrate (gram)	88.5	114	97.5	115	.008
Protein (g)	19	28	21	26	.004
Fat (g)	24	37	27	44	.008
Calcium (mg)	162.5	324.5	192.5	650	.000
Fe (mg)	2	4	3	8	.000

[1]The total of subjects minus two persons until the end of study because they had not been successfully reached as to take their nutrient consumption data.
[2]p value is comparison between subjects who do not consume and those consume growing-up milk

Table 3 exhibits mothers' nutrient intake where mothers whose children did not consume milk (mothers who mostly still provided breast milk and demand higher nutritional need for breast milk production) turned out to have lower nutrient intakes than mothers whose children consuming milk. The main differences were found in energy and carbohydrate intakes.

Table 4 presents child nutritional status based on weight for age, length for age, and weight for height following references of Ministry of Health and WHO nutritional status.[15–17] Results of analysis showed that there were 17.6% undernourished children, 23.5% stunted children, and 6.9% wasted. There were no significant differences in child's nutritional status between groups of milk consumption. However, in all indicators, proportion of children with sub-standard nutritional status were higher among those who did not consume milk.

Table 3. Comparison between Consumption of Respondents (Mothers) with Children Consuming and Not Consuming Milk in Beji District, Depok City, 2016 (n = 102)

Nutrient[1]	Not consuming milk (n = 61)	Consuming milk (n =41)	All respondents (n=201)	Recommendation of Nutritional Adequacy Rate (2013) [14]	*p*-value[2]
Energy (kcal)	1869.5	2015.5	1959.3	2530	.215
Carbohydrate (gram)	281.0	302.5	285.3	361	.348
Protein (gram)	69.0	69.5	69.5	76.5	.751
Fat (gram)	56.0	67.0	63.0	87.5	.312
Fiber (gram)	15.0	13.0	15.0	36	.604
Calcium (mg)	510.1	509.5	510	1300	.937
Fe (mg)	11.5	11.0	11.5	32	.811

[1]Data are presented in median
[2]p Value is comparison between group of children consume and do not consume milk.

Table 4. Comparison between Nutritional Status of Subjects Aged 12-24 Months Consuming and Not Consuming Milk in Beji District, Depok City, 2016 (n = 102)

Nutritional Status	Not consuming milk (n = 61)	Consuming milk (n = 41)	All subjects (n=102)	*p*-value [1]
Weight for age				
Average/Median	-1.08 / -1.03	-1.02 / -1.01	-1.05 / 1.02	.901
Undernutrition (< -2 SD), n (%)	11 (18.0)	7 (17.1)	18 (17.6)	
Good nutrition (≥ -2 SD), n (%)	50 (82)	34 (82.9)	84 (82.4)	
Length for age				
Average/Median	-1.19 / -1.29	-1.20 / -1.13	-1.19 / -1.25	.433
Short/stunting (< - 2 SD), n (%)	16 (26.2)	8 (19.5)	24 (23.5)	
Normal (≥ -2 SD), n (%)	45 (73.8)	33 (80.5)	78 (76.5)	
Weight for length				
Average/Median	-0.70 / -0.70	-0.59 / -0.81	-0.64 / -0.72	.516
Wasting (< - 2 SD), n (%)	5 (8.2)	2 (4.9)	7 (6.9)	
Normal (≥ -2 SD), n (%)	56 (91.8)	39 (95.1)	95 (93.1)	

Discussion

Results of analysis showed no significant differences in general characteristics between group of subjects consuming and not consuming growing-up milk. This indicates that group of respondents/subjects had similar characteristics, thus reduce the possible confounding of those factors included in characteristics.

This study describes that most children were consuming breastmilk, complementary food, but no other milk. Therefore, to ensure adequate amount of breastmilk, mother's intake during lactation should be optimal. However, based on maternal intake data (Table 3), nutrients intake of this group of mothers were lower than recommendation, while mother's intake whose children not regularly consume milk was lower than those mothers whose children consumed other milk. This should be concerned due to the fact that for the children not consuming other milk, the only nutrient supply is breastmilk and, therefore necessitates adequate energy intake of the lactating mothers. Unfortunately, the situation is on the contrary. Study in Jakarta, Depok, and Bekasi found that maternal energy consumption during lactation is below the recommendation.[18,19] Accordingly, nutrients intake of lactating mothers is lower compared to pregnant women.[19] This will result to decreased breast milk production. Sihite et al reported that maternal energy consumption continuously decreased over postpartum period.[20]

Stunting is a nutritional status indicator which indicates the occurrence of the accumulation of undernutrition in children. Under-consumption confirmed by many studies as the most risking factors of stunting. Besides, a good quality nutrition intake leads to less occurance of illness [21,22] as well as possibility to grow more happily.[23] This study found that children who received complementary food only without milk (either breast milk and/or other milk) had worst nutritional status with weight-for-age (WAZ), length-for-age (LAZ), and weight-for-length (WLZ) indicators showed sub-standard z-scores. Two of those children had WLZ z-score around -2 SD.

Although there was no significant differences in child's nutritional status between those

consuming and not consuming milk, the proportions of undernutrition status based on three indicators (WAZ, LAZ, and WLZ) were higher on those who did not consume milk. Study in Canada in 2017 found that 3-year-old children who do not consume cow's milk (plant-based milk) as daily supplementary have the average height of 1.5 cm shorter than the children who regularly consume milk.[24] In that study, significant difference was found since the children aged 3 to 6 years. In this study, the average age of children was 18 months. A follow-up study may be needed to determine differences at older age. Another factor to be considered is the study design which cannot capture a significant differences during the longer period of time.

On the other hand, WHA's statement regarding marketing limitation of growing-up milk for children aged under three years, needs further review. This study found that subjects who consumed milk always had significantly higher value of macronutrients and micronutrients intake compared to those who did not consume milk. Children aged under two years old might have sufficient nutrients intake, and can grow up normally if the children adequately consumed substitutes animal protein, such as fish and meat.[25] However, study in Indonesia shows that most children at the age of 6-24 only consumed small amounts of animal protein sources. SEANUTS study in 2011 found that Indonesian children aged 6 months to 12 years, both in rural and urban areas, rarely consume protein rich food, both from animal or plant origin, including meat, egg, fish, tempeh, and tofu.[10] Cohort data of DARLING (Davis Area Research on Lactation, Infant Nutrition and Growth) study in 1991, found that most children at that age would have left over of solid food provided (not completely eaten/not eaten).[22] On the other hand, beverages, in WHO's document, is considered as part of complementary feeding.[7,25] Milk is categorized as type of beverage that is rich in nutrients.[22]

Calcium adequcy in subjects who did not consume milk was only half of calcium adequacy among subjects who consumed milk. The result of this study is in line with study in the United States of America, which found that children who avoid milk consumption have calcium consumption much lower than children who regularly consume milk.[24,26] Moreover, the study also found that children aged 3-10 years not consuming milk were significantly shorter, having a smaller volume of skeleton, lack of some minerals other than calcium, and having lower bone density in some certain areas.[26] Further study among adolecents in Korea found regular milk consumption help to improve the bone mineral density without increasing body weight.[27]

Iron adequacy of subjects in both groups was much lower than the recommended. The average iron consumption in all subjects of this study was even lower than the total obtained by studies in Bogor, Jakarta, and Tangerang that is 7.5 mg.[28] The low levels of iron in this study may not be an indicator of low levels of iron in the blood of children. It should be noted that the subjects' iron needs in this study are not met.

Conclusion

This study shows that nutritional status especially in length-for-age z-score of children aged 12-24 months who consume milk tended to be better than those who do not. There is significant difference in children's daily consumption of macro- and micronutrients at both groups. We suggest to evaluate the milk promotion and selling regulation for older age children after exclusive breastfeeding period. Moreover, further studies are needed to determine the effect of milk consumption on nutritioinal status for longer periods.

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Conflict of interest

The authors declare no potential conflicts of interests.

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