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THE IMPACT OF COMPLEMENTARY FEEDING TYPE ON THE NUTRITION STATUS OF INFANTS 6 TO 12 MONTHS OF AGE IN SUBURBAN SEMARANG INDONESIA

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ABSTRACT

Background: *After 6 months, baby must be given complementary feeding. Many considerations behind the choice of the family on both types of weaning food, one of which is related to the impact of these foods on nutritional status and infant's healthy. Malnutrition increases as a result of complementary feeding are given to infants is not right, either type or quantity.*
Aims: *The research objective was to determine the commercial and local food practices in sub-urban areas, and determine the reason and analyze the impact of both types of weaning food on the nutritional status of infants 6-12 months.*
Methods: *This study was an observational study with a cross-sectional design. Location of research was in the work area of Kedungmundu Health Center, Semarang City Indonesia. The research samples were families with babies aged 6-12 months. A number of samples 94, selected by random. This type of analysis used was a different test.*
Results: *The results showed 55.3% of infants were fed with local weaning food, the rest were kind of commercial food. Almost all babies had been given a weaning food in less than 6 months, both derived from the type of local or commercial food. Families closed the type of commercial food, because this type was more practical, while the local food (homemade) chosen because it was more natural, safer and more economical. There were no differences in nutritional status among infants 6-12 months who had complementary feeding practices with commercial and local food.*
Conclusion: *It was concluded, infant complementary feeding practice with infant commercial and local food did not have a different impact on the nutritional status in infants 6-12 months.*

Keywords: *complementary feeding, weaning, nutrition*

INTRODUCTION

Adequate nutrition during infancy and early childhood development is the foundation of every child to achieve human potential. The period from birth to age two years is "critical window" for the improvement of optimal growth and development, health and behavioral development. Longitudinal studies have consistently shown that this is the peak age for the occurrence of stunting, lack of certain micronutrients, and childhood illnesses such as diarrhea. Once the child reaches 2 years old, very difficult to reverse the situation stunting that has occurred earlier [1].

In order to fulfill the nutritional requirements of a rapidly growing child, additions of semi-solid and solid foods are essential for breast and milk formula-fed babies. WHO now recommends the introduction of complementary foods around the sixth month of life, instead of between the fourth and sixth month, as previously recommended. WHO provides guidelines for exclusive breastfeeding from birth to 6 months of age, and introduce complementary/supplementary feeding in the age range 6-24 months while continuing breastfeeding until the age of two years or more [2]. Six months of age is the right age at which to introduce complementary foods. Giving complementary foods before 6 months of age tend to displace breast milk [3].

Weaning is described as the transitional period starting from 4 months onwards till the end of second or even third year in certain cultures so that the infant's diet progressively changes from milk alone to semi-solids and finally to the adult family food. The type of weaning foods or complementary feeding for infants generally consists of homemade foods and commercial foods [4]. This critical transitional period commences with the need to introduce food to complement breast milk and ends when the child is fully consuming the family diet. Mothers have traditionally used sugar water, barley water, rice water, corn starch, and other cereal with unfortunate consequences. With modernization, development, and opportunities or necessity for women to work outside of the home, the trend is toward earlier weaning. This is most pronounced among families migrating to, or already living in urban areas [5].

In Indonesian, weaning food in the form of local complementary feeding or so-called "complementary feeding of mother's kitchen", since 2006 encouraged and popularized by the Ministry of Health because of food was chosen is related to socio-cultural and empowerment aspects [6]. In addition to nutritional aspects, another important thing to consider in giving complementary foods is related to the impact of food on the health of the baby. The provision of safe and adequate amounts of local foods appropriate for 6 to 12-month-old infants who are just learning to eat is not as simple as it seems. Complementary foods fed to infants in the second six months of life (and beyond) are often inadequate in energy density, protein, and micronutrient concentration or quality and are often prepared, stored, or fed to children in ways that increase their risk of illness [7]. The research objective was to determine the commercial and local complementary feeding practices in sub-urban areas, and determine the reason and analyze the impact of both types of weaning food on the nutritional status of infants 6-12 months.

METHODS

This study was an observational study with a cross-sectional design. The research data consisted of primary data, include characteristics of the sample, the practice of breast milk, anthropometric data and complementary feeding consumption. Samples were families with infants 6 to 12 months who live in work area of Health Care Center Kedungmundu, Semarang City, Indonesia. Samples were randomly selected from samples frame. The sample size was determined to refer to a sample size formula for the survey [8]. Assuming the population size (N) was unknown or (N-n) / (N-1) = 1 then the sample size was calculated using the formula: Z α2 n = pq/d2 Based on previous research unknown proportion of infants aged 6 to 12 months who had been given a local complementary feeding by 56% ($p = 0.56$ and the value of $q = 1 - p$, $q = 0.44$). With a limit of error (d) of 0.1 and the value of $\alpha = 0.05$ or $Z\alpha = 1.96$, then the minimum required a number of samples of 94 samples.

The dependent variable in this study was the nutritional status of infants, while the independent variables of research were: the consumption of complementary foods. As for how data collection was done as follows: study began with the screening stage, with established criteria. Based on the results screening was arranged a sampling frame, and from the sampling frame was then randomly selected sample. The follow-up to every infant who was elected as the sample was first prompted willingness consent (informed consent) from their parents to participate in the study and underwent subsequent research stages.

Data characteristics of the sample: Data collected include infant characteristics (age and gender), family socioeconomic status. This data was taken from interviews with the help of a questionnaire. Nutritional status of infants was the condition or expression of one or more aspects of nutrition a baby as measured by anthropometric indices (weight, length), and was expressed in the value of the WAZ, WHZ, HAZ. Used of WHO-Anthro software to calculate the value of z-score. Data Provision of complementary feeding was collected through interviews with mother referring to a research questionnaire. The focus of questions to explore the complementary feeding practices such as commercial and local food. Diarrhea morbidity data were collected by interview with the mother of the sample. To collect the diarrhea incidence researchers conducted a recall of the presence or absence of symptoms of diarrhea, frequency occurred in one day and frequency as well as a long illness in the past month, based on data symptoms encountered so that researcher determined the number of episodes and duration of diarrhea suffered by the baby during the last month. For statistical analysis using SPSS and the type of test used the different test. For normally distributed data were tested by t-test, while for the data were not normally distributed were analyzed by Chi-Square test. To conclude whether there was a statistically significant relationship used $p = 0.05$.

RESULTS

Characteristics of Samples

The sample consisted of male and female as much as 46.8% and 53.2%. Age of samples according to predetermined criteria, i.e. aged 6-12 months. The education level of parents was quite good. The father who did not pass the 9-year basic education just as much as 12.8%, the remaining 87.2% passing 9-year basic education or more. Mothers, who did not pass the 9-year basic education as much as 14.9%, while 85.1% over 9 years of basic education remains or more. College-educated father reached 25.5% more than the mothers, 20.2%.

All fathers working status and most of their work in the formal sectors (68.1%) of them as civil servants, teachers, employees of private/factory, and rest as much as 31.9% were working in the informal sectors, as traders and laborers. While the number of working mothers as much as 38.3% (24.5% as much as in the formal sectors and 13.8% in the informal sectors), and the rest did not work or status as a housewife (61.7%). Judging from the level of family income, based on the criteria of the poverty line in Central Java province in March 2015 amounted to IDR 299.011, - per capita per month [9], there were 84,6 % of the families included in the criteria of poor and 15,4 % of families including the criteria were not poor. Poverty in the province of 11.85 %

Complementary Feeding Practices

The infants were grouped according to the type of weaning food items. Children in group one had local weaning items such as home-made cereals or porridge, egg, banana, fish, and vegetables. In contrast, children in group two were given commercial such as ready to-use cereals (such as Promina, Milna, Cerelac, SNM etc.), biscuits and milk (bottle). The infant proportion with commercial food was fewer than those who were given local food, as many as 44.7% versus 55.3%. Provision of complementary feeding for the first time in infants were mostly done when under 6 months In the infants who were given the type of complementary foods locally, as much as 80.77% had been given this kind at the age of fewer than 6 months, whereas in the infants who were given the type of commercial food, as much as 97.62% of the infants had been given these kinds of in this age range (Table 1). In general, the frequency of the provision of complementary foods 2-3 times a day

Table 1. Age first complementary feeding

Age (month)	Weaning food Types			
	local food		commercial food	
	n	(%)	n	(%)
0	2	(3.85)	10	(23.81)
1 – 6	40	(76.92)	31	(73.81)
> 6	10	(19.23)	1	(2.38)
Total	52	(100.0)	42	(100.0)

The reason for the choice of weaning food

Reasons for choosing the type of local complementary feeding was the perception of this type was more economical, natural and safe because there were no preservatives and more filling and children did not get bored. While the reasons for choosing the type of commercial food because it was more practical and hygienic. The results of the statistical analysis of a number of factors associated with the provision of the type of complementary feeding, it was known that the factors of poverty status, education level of the father, and employment status of the mother with regard to the choice of weaning foods (Table 2).

Table 2. Results of analysis of the factors relating to the selection of the type weaning food

Social Economic		Weaning food Types		p*
		Local food	Commercial food	
		n, (%)	n (%)	
Household income status	Poor (underline property)	44 (84,6)	28 (66,7)	0,035*
	No poor	8 (15,4)	14 (33,3)	
Highest level of completed education of father (%)	Low (< 9 years)	11 (21,6)	1 (2,4)	0,007*
	Middle and High	41 (78,8)	41 (97,6)	
Highest level of completed education of mother (%)	Low (< 9 years)	10 (19,2)	4 (9,5)	0,189
	Middle and High	42 (80,8)	38 (90,5)	
Father 's employment status	informal/unemployed	20 (38,5)	10 (23,8)	0,13
	Formal sector	32 (61,5)	32 (76,2)	
mother's employment status	informal/unemployed	45 (86,5)	26 (61,9)	0,006*
	Formal sector	7 (13,5)	16 (38,1)	

* x2 tests for categorical variables.(sig, p<0,05)

Nutrition intake

Based on the results of the recall of consumption, it was known that infants fed complementary foods locally, intake of micronutrients, especially vitamin E, vitamin B1, and zinc lower than the nutritional requirement (RDA). Table 3 shown the average intake of nutrients infants fed complementary foods locally almost all lower than commercial food ($p < 0.05$), except for the consumption of vitamin A, vitamin E, and folic acid did not differ significantly ($p > 0.05$).

Table 3. Nutrition Intake based on weaning food type

Intake nutrients	unit	Weaning food Types		RDA*	p**
		local food	commercial food		
Energy	Cal	924.5	1329.6	725	0.004
Protein	g	33.5	54.4	18	0.002
Vit. A	RE	1001.4	814.5	400	0.476
Vit. E	mg	0.06	6.22	5	0.270
Vit.B1	mg	0.37	0,83	0,4	0.000
Vit.B2	mg	0.74	1.18	0,4	0.006
Vit.B6	mg	0.53	0.70	0,3	0.049
folic acid	ug	87.42	98.65	80	0.499
Vit.C	mg	40.57	75.75	50	0.001
Calcium	mg	671.52	1344.26	250	0.000
Magnesium	mg	106.77	198.07	55	0.000
Phosphor	mg	641.02	1243.63	250	0.000
Fe	mg	8.73	16.18	7	0.000
Zn	mg	4.38	7.74	3	0.000

* RDA for Indonesian (2013) (10).
** t-test for continuous variables; x2 tests for categorical variables.(sig, p<0,05)

The incidence of diarrhea

The incidence of diarrhea over the past month in infants presented in Table 4. Based on the results analysis, found no significant difference in the incidence of diarrhea among the two groups, so if viewed episode and duration.

Table 4. The incidence of diarrhea in the last month

	Weaning food Types				
	local food		commercial food		*p**
	n	(%)	n	(%)	
Morbidity of Diarrhea					
Yes	14	(26.9)	15	(35.7)	0.359
No	38	(73.1)	27	(64.3)	
Total	52	(100.0)	42	(100.0)	
Episode (mean of frequency/month)	0.27	(± 0.490)	0.40	(± 0.734)	0.288
Duration (mean of days illness/month)	0.98	(± 2.364)	0.83	(± 1.513)	0.727

* t-test for continuous variables; x2 tests for categorical variables.(sig, p<0,05)

The impact of complementary feeding on nutritional status

Giving complementary feeding commercial and local did not have a different impact on the nutritional status of infants 6-12 months (Table 5). Judging from the average z-score of W/L, L/A, and W/A was not found significant differences between infants fed complementary feeding commercial and local food (p> 0.05).

Table 5. The impact of complementary feeding on nutritional status

Indicator Anthropometry	Weaning food Types		p*
	local food (n=52)	commercial food (n=42)	
WHZ	-1.0181 ± 1.87182	-0.7586 ± 1.75625	0,494
HAZ	0.0781 ± 2.20017	0.3338 ± 1.92670	0,555
WAZ	-0.8283 ± 1.15004	-1.0181 ± 1.87182	0,119

* t-test for continuous variables(sig, p<0,05)

DISCUSSION

One goal of this research was to determine the commercial and local food practices in sub-urban areas. The proportion of infants with commercials food were fewer than those who were given local food, as many as 44.7% versus 55.3%. A cross-sectional survey conducted in Pakistan also showed similar results, as many as 57.9% of the children were given food locally and the rest were given commercial food [4]. Location of the study had the characteristic mix of cultural towns and villages, some still attached to the custom of local food, while others were already adopting this kind of food commercial as an option to be given to the baby. In addition, the characteristics of the study sample were mostly from poor families, so that the choice of local food based on economic reasons. Whatever the reason for choosing commercial food or local food as baby food, could not be separated with the mother's perception and influence of local culture, and not based on scientific evidence. Based on the results of research conducted in Madura indicate that the choice of local food for infants was influenced by cultural factors and sometimes ended with the onset of growth faltering in children [11,12].

The practice of early feeding in infants was found in this study, and the case was quite a lot. This phenomenon could not be avoided, and this was a cause of low coverage of exclusive breastfeeding in the region. In the sample was found a number of mothers who could not breastfeed, who were unable to continue to do so for medical reasons, which really did not have sufficient milk, whose work or life circumstances of make continued breastfeeding impractical, or who choose not to breastfeed, require special consideration. For such mothers, the availability of a nutritious, safe substitute can be life-saving for the baby. In some situations this may be a substitute lactating mother or some form of locally available animal milk; in others, it may be a commercially produced infant formula. However, such proprietary products for feeding infants can, and should, be made available in ways that did not discourage breastfeeding for mothers who were willing and able to do so. To prohibit the production of such products, however, in some instances would force a return to the use of traditional cereal or starchy gruels as breast-milk substitutes with disastrous consequences for the health and survival of the infant due to an unbalanced nutritional composition [2].

The results of the statistical analysis showed family poverty status, education level of the father, and employment status of the mother with regard to the choice of complementary foods types. In the poor families more provide local food for babies, while in the wealthy families tend to be more commercial food. The low economic status will affect the quality or quantity of food consumed by the family. In general, if incomes rise, the more allocation of funds for the purchase of food, so food availability also improved and the amount and type of food tend to improve [13]. Social economic status, especially for father's education largely determines families' access to sources of income. With higher education would increase the likelihood of families earn higher incomes that would increase families' access to commercial food. High revenues would affect the availability of food at the family level. Father's education was associated also with parenting including vitamin A supplementation, immunization is complete, good sanitation and the use of iodized salt. Education related to the father of the family income because almost family income derived from income generated ayah [14]. This study found mothers who worked in the informal sector or does not work, given their babies more local food than those who work in the formal sector. Mothers who did not work or work in the informal sector allows having more time to prepare complementary foods locally. Maternal factors are also very important, because of a research reveals that mothers who had no education had a higher risk for not introducing timely complementary feeding, not meeting the minimum dietary diversity, the minimum acceptable diet, and minimum meal frequency than the mothers who had secondary or higher education [15].

Judging from the composition, complementary foods derived from local foodstuffs was already quite good, it's just the material that comes from animal foods (as a source of zinc and iron) were still relatively inadequate. These results indicate a weakness in local food was but lacking in micronutrients contribution under the decree of the Minister of Health of the Republic of Indonesia No. 75/2013 that regulates the recommended RDA for Indonesia [10]. Based on Table 3, there were a number of nutrients that had the potential deficit in the group of infants who consume complementary feeding types of local, such as vitamin E, vitamin B, and vitamin C. This was because the local food manufacturing does not use a special material formulation and taking into account nutritional aspects. One way to overcome this, in addition to improved knowledge of the mother, is to give the complementary food supplements which of a number of studies had been promising for reducing multiple micronutrient deficiencies in infants and young children living in developing countries, in the form for example, sprinkles and tablets, convenient and practical [16]. This finding is consistent with another study, that their significant statistical difference was noted in the children weaned on nutritious home-made items compared to children having commercial foods [4].

This study found that the provision of complementary feeding commercial and local didn't have a different impact on the nutritional status of infants 6-12 months. This condition can occur because of consumption of energy and protein both in the group of infants fed local and commercial food are already relatively high and above the RDA (Table 3). It is mean the local foods given to infants contain energy and proteins are relatively high. Similar conditions also occur in Pakistan, where the calorie values of foods indigenous (local) high [17]. This is in contrast to traditional food items in West Africa that are known to be of low nutritive value and high bulk [18].

There are several limitations in this study. First, the author used cross-sectional data and so the analysis cannot provide evidence of a causal relationship between the type of complementary feeding stunting and nutritional status. The author had assumed that the variation of the infant daily consumption are relatively small but is actually happenings the nutritional status caused by the accumulation of daily consumption in the long term we did not have that data. The other disadvantages associated with the bias of the food recall. Although the author had used food models at the interview food recall, but there remains the possibility that poor respondents dishonest to expose their poverty through what was actually consumed by infants. Only through longitudinal studies, all of these weaknesses would be eliminated.

CONCLUSION

Nearly all the babies were given complementary foods at age 6 months, either in the form of a kind of commercial or local food. The reason families choose the type of complementary feeding commercial, because this type of food was the more practical, while the type of local food been for more natural, safer and more economical. There were no differences in nutritional status and morbidity of diarrhea among infants aged 6-12 months by type of commercial and local food. It was concluded, the provision of commercial and local food did not have a different impact on the nutritional status in infants 6-12 months. Suggested to the holder of the program needs to more aggressively promote that local administration of complementary feeding can be a solution for the family cannot afford to keep giving nutritious complementary foods for infants. In addition, it was necessary to improve the nutritional quality and the way of presenting local complementary foods to the infant so that the quality of nutritional intake and better security so that the adverse impact on the health of the baby can be reduced

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