

Factors Associated with the Appropriate Time of Complementary Feeding among Infants in Jeneponto Districts, South Sulawesi

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Abstract

Background: Nutritional problems in infants aged 6-11 months are strongly influenced by complementary feeding. The inaccuracy of time in complementary feeding to infant.

Aims : To examine the factors associated with the appropriate time of complementary feeding to infant in Jeneponto districts.

Method: This was a cros sectional study. The sample were mothers who had infants aged 8 and 10 months with total 125 infants. Bivariate analysis using chi-square and multivariate logistic regression were conducted.

Results: The results of the bivariate analysis showed that frequency of following ANC ($p = 0.045$), birth weight status ($p = 0.025$) and mother occupation ($p = 0.029$) were independently associated with the appropriate time of complementary feeding. Based on multivariate analysis indicated that mothers who visited to ANC [AOR: 4.14 (95% CL: 1,576-10,885)], mothers who had normal birth weight status of infants (95% CI: 2.142-88,628)] and mother who consumed iron capsules [AOR 5.27 (95% CI: 1.72-16.06)] were found key factors the appropriate time of complementary.

Conclusions: The appropriate time of complementary feeding was significantly associate with maternal occupation, frequency of visiting ANC and birth weight status. The variable that most influences the appropriate time of complementary feeding was birth weight status.

Keywords: *Complementary feeding, infant, determinant.*

Introduction

Complementary feeding is defined as a process that starts when breast milk alone is no longer enough to meet a baby's nutritional needs, and therefore other foods and fluids are needed, along with breast milk (1). Infants (ages 0-11 months) are a golden period as well as a critical period because at this time there is rapid growth and development which reaches a peak at the age of 24 months where nutritional deficiencies and diseases contribute globally to higher levels of malnutrition among children children under the age of five¹.

The problem of malnutrition causes four out of one hundred babies born each year to not survive more than

five years, which are generally victims of diseases and conditions exacerbated by these nutritional problems; one in three toddlers has a growth disorder and almost one fifth of toddlers experience less weight².

The problem of malnutrition still a major problem in Indonesia. This is evidenced by the still finding cases of malnutrition in children in various regions. One factor that can affect nutritional status is intake. A person's nutritional status is a picture of what he consumes. Children aged 6-24 months get nutritional adequacy from breast feeding and complementary feeding³.

Child development will be disrupted if complementary feeding are not introduced at the age of 6

months, or given in an improper way. Because at the age of 6 months, the baby’s needs for energy and nutrition begin to exceed what is provided by breastfeeding, and complementary feeding is needed to meet those needs.

Nationally, based on 2013 basic health research, national stunting prevalence reached 37.2% consisting of 18.0% very short children and 19.2% short children, increased from 2010 (35.6%) and 2007 (36, 8%)⁴.

Babies are very vulnerable during the transition period when complementary feeding begins. Ensuring their nutritional needs are met thus requires that complementary food be on time-meaning it is introduced when energy and nutrients are needed beyond what can be provided through exclusive breastfeeding and often⁵.

Provision of prolonged exclusive breastfeeding has the potential to cause a lack of energy and nutrition when the introduction of complementary food is incorrect or delayed. Meeting the nutritional needs of infants aged 6-12 months based on the intake of advanced breastfeeding on Demand and complementary feeding. Age of infants 6-12 months is the age that is susceptible to malnutrition due to the provision of complementary feeding which is not appropriate both time and composition. Inappropriate time is <6 months or <7 months, while the improper composition is lack or excess nutrients. Some complementary feeding babies lack fat intake and some excess carbohydrates derived from simple carbohydrates, the introduction of food taste in infants 6-12 months will determine the eating habits of these children⁶.

Introducing complementary feeding at an earlier risk of obesity at a higher economic level and delaying complementary feeding causes the supply of energy and protein and other micronutrients to be inadequate for babies⁷.

Other studies have shown that early feeding can increase the risk of eczema. However, there are few data that support the relationship between early solid feeding and other allergic conditions⁸. In addition, the initial introduction of solid foods can cause malnutrition results such as low iron stores by displacing rich energy and iron which is highly bioavailable in breast milk, and continues to increase the risk of diarrheal disease. The aims of this study was to look at factors associated with the timing of complementary feeding in infants in Jenepono Districs.

Materials and Method

This type of research is observational analytic with crosssectional study design. The location of the study was carried out in the district with a population of 482 babies The sample in this study were mothers who had babies aged 8 and 10 months as many as 125 children. The reason for choosing samples that were 8 and 10 months old was because that age was a transition of complementary feeding at texture and frequency. The sampling technique is accidental sampling. Data collection through interviews using a questionnaire. Data analysis using bivariate with chi-square and multivariate with logistic regression.

This research was carried out after obtaining approval from the Ethics Commission of the Faculty of Public Health, Hasanuddin University number UH16090723. Before the implementation of measurements and interviews will be given an explanation of the actions to be taken for each respondent (Mother and baby). After the explanation, the respondents were asked for approval to participate in this study by signing an informed consent

Results

Table 1: Characteristics of Infant

Variable	n (125)	%
Sex of infant		
Boys	68	54.4
Girls	57	45.6
Maternal Age		
<20	25	20.0
20-24	25	20.0
25-29	33	26.4
30-34	24	19.2
≥35	18	14.4
Intervensi		
Moringa flour	40	32.0
Iron	50	40.0
Moringa extract	35	28.0
Parities		
One	47	37.6
Two	49	39.2
More than two	29	23.2
Maternal Occupation		
Housewife	108	86.4
Employed	17	13.6

Variable	n (125)	%
Maternal education		
Low	90	72.0
High	35	28.0
Household Income		
< 2 million	91	72.8
≥ 2 million	34	27.2
Number of ANC follow up		
<4 times	71	56.8
≥ 4 times	54	43.2
Place of delivery		
Home	1	5.6
Health Institution	118	94.4
Birth weight Status		
BBLR	8	6.4
Normal	117	93.6
Post Natal Care		
Yes	35	28.0
No	90	72.0

Table 1. The results of univariate analysis showed that the sex of boys was 54.4% and women were 45.6%, the maternal age ≥ 35 years was 14.4% and 25-29 years were 26.4%, intervention Moringa flour 32.0%, iron 40.0% Moringa extract 28.0%, second child 39.2% and children more than 2 by 23.2%, maternal occupation as a housewife by 86.4% and Employed by 13.6%, low maternal education level 72.0% and high by 28.0%, household income > 2 million at 72.8% and ≤ 2 million at 27.2%, frequency of ANC <4 times at 56.8% and ≥ 4 times at 43.2%, place of birth at home 5.6% and health services 94.4%, birth weight status the LBW is 6.4% and Normal is 93.6%, Post Natal care is 28.0% and not 72.0%.

Table 2. Relationship characteristics with Complementary Feeding

Variable	Timely of Initiation Complementary Feeding N(%)		P-Value
	<6 bulan	≥6 bulan	
Sex of infant			
Boys	22 (32.4)	46 (67.6)	1.000
Girls	19 (33.3)	38 (66.7)	
Maternal Age			
<20	7 (28.0)	18 (72.0)	0.165
20-24	6 (24.0)	19 (76.0)	
25-29	14 (42.4)	19 (57.6)	
30-34	11 (45.4)	13 (54.2)	
≥35	3 (16.7)	15 (83.3)	

Variable	Timely of Initiation Complementary Feeding N(%)		P-Value
	<6 bulan	≥6 bulan	
Intervensi			
Moringa flour	17 (42.5)	23 (57.5)	0.174
Iron	12 (24.0)	38 (76.0)	
Moringa extract	12 (34.4)	23 (65.7)	
Parities			
One	18 (38.3)	29 (61.7)	0.582
Two	14 (28.6)	35 (71.4)	
More than two	9 (31.0)	20 (69.0)	
Maternal Occupation			
Housewife	31 (28.7)	77 (71.3)	0.029*
Employed	10 (58.8)	7 (41.2)	
Maternal education			
Low	26 (28.9)	64 (71.1)	0.200
High	15 (42.9)	20 (57.1)	
Household Income			
< 2 million	27 (19.7)	64 (70.3)	0.315
≥ 2 million	14 (41.2)	20 (58.8)	
Number of ANC follow up			
<4 times	29 (40.8)	42 (59.2)	0.045*
≥ 4 times	12 (22.2)	42 (77.8)	
Place of delivery			
Home	3 (42.9)	4 (57.1)	0.866
Health Institution	38 (32.2)	80 (67.8)	
Birth weight Status			
BBLR	6 (75.0)	2 (25.0)	0.025*
Normal	35 (29.9)	82 (70.1)	
Post Natal Care			
Yes	9 (25.7)	26 (74.3)	0.401
No	32 (35.6)	58 (64.4)	

Table 2. The results of bivariate analysis showed that the factors of the sex of the baby (p = 1,000), maternal ages (p = 0.165), intervention group (p = 0.174), the sequence of children (p = 0.582), maternal education (p = 0.200), household income (p = 0.315), place of delivery (p = 0.856) and post natal care (p = 0.401) with the time of complementary feeding were not related. The maternal occupation (p = 0.029), Frequency of following ANC (p = 0.045), BBL status (p = 0.025) with the time of complementary feeding was related.

Table 3. Factor Affecting complementary Feeding practice among children 6-12 months

Socio Demographic Features	OR Crude (95% CI)	OR Adjusted* (95% CI)
Maternal Age		
<20	1.0 (reference)	1.0 (reference)
20-24	1.23 (0.34-4.37)	0.96 (0.225-4.163)
25-29	0.52 (0.17-1.60)	0.41 (0.114-1.490)
30-34	0.46 (0.14-1.50)	0.27 (0.066-1.116)
≥35	1.94 (0.42-8.85)	2.18 (0.372-12.771)
Maternal Education		
Low	1.0 (reference)	1.0 (reference)
High	0.54 (0.24-1.21)	0.36 (0.136-0.989)
ANC		
< 4 times	1.0 (reference)	1.0 (reference)
≥4 times	2.41 (1.08-5.36)*	4.14 (1.576-10.885)*
Birth weight Status		
BBLR	1.0 (reference)	1.0 (reference)
Normal	7.02(1.35-36.54)*	13.77 (2.142-88.628)*
Intervensi		
Moringa flour	1.0 (reference)	1.0 (reference)
Iron	2.34(0.95-5.77)	5.27 (1.72-16.06)*
Moringa leaf extract	1.41(0.55-3.62)	1.98 (0.65-6.00)

Table 3. The results of multivariate analysis showed that the possibility of giving complementary feeding correctly to mothers who during pregnancy were ANC visits ≤ 4 times higher than ANC > 4 times [AOR: 4.14 (95% CL: 1,576-10,885)], possible complementary feeding in infants born with normal weight is higher than babies born with low body weight [AOR: 13.77 (95% CI: 2.142-88,628)] and the possibility of giving complementary feeding correctly to mothers given capsules iron is higher than those given Moringa flour [AOR 5.27 (95% CI: 1.72-16.06)].

Discussion

This study found that the frequency of participating in ANC was a determining factor in the time to introduce complementary feeding. Pregnant women who follow ANC $> = 4$ times may introduce complementary feeding correctly compared to pregnant women who participate in ANC < 4 times this is because visits that are more frequent to health services make it possible to obtain information from health workers about the importance of providing complementary feeding properly time to baby. This study is consistent with studies conducted in Ethiopia that children whose mothers have antenatal care

visits (ANC) are more likely to introduce complementary feeding on time than children whose mothers have never had antenatal care services when they are pregnant⁹⁻¹¹.

BBL status is a determining factor in the time to introduce MP-ASI. Normal-born babies are more likely to introduce complementary feeding in a timely manner than babies born with a weight below normal (< 2500). Babies born normally are faster growth and development because exclusive breastfeeding is not problematic compared to those below normal birth weight so it is possible to delay of complementary feeding earlier. Whereas babies born under normal have problems at birth due to having to be hospitalized so they part with their mothers. This causes low exclusive breast feeding and is replaced by formula milk. This study is consistent with the results of a study in Brazil showing that the relationship between types of breastfeeding and difficulties in providing complementary food, especially in food rejection, as well as an increased chance of formula-fed infants having difficulty serving complementary meals compared to other types of breastfeeding. In addition, they also need prolonged hospitalization, contributing to low milk production or even disrupting mother-baby bonds that might reduce the possibility of forming a full breastfeeding pattern^{12,13}.

Tablet Fe consumption during pregnancy is a determining factor in the time to introduce complementary feeding. Babies born to mothers who consume Fe tablets during pregnancy may introduce complementary feeding in a timely manner compared to babies born to mothers who consume Moringa flour capsules and Moringa extract. Supplements given to pregnant women in order to prevent anemia. Prevention of anemia during pregnancy will prevent low birth weight, this is consistent with other studies that say that the treatment of anemia in pregnant women must be done because it has an impact on fetal growth and development such as low birth weight (LBW) and this will have an impact on later growth and development¹⁴⁻¹⁶. If the baby is born normally, the growth and development is in accordance with his age so that the time of introduction of complementary feeding can be appropriate.

Conclusion

This study showed that the timing of the introduction of complementary feeding was significantly associated with ANC visits at the time of pregnancy, consumption of Fe tablets during pregnancy and birth weight. The

more pregnant women go to health services, the more exposed they are to information about the importance of introducing MP-ASI to babies. For the next researcher, it is expected to look deeply into the reasons for the mother not introducing MP-ASI on time by using a qualitative research design.

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Reference

1. WHO. Appropriate complementary feeding. 2019.
2. Unicef I. Summary of the Study, Mother & Child Health. 2012.
3. Afrianto A, Ss D, Anggraini MT. Relationship between breastfeeding and complementary feeding (MP-ASI) with nutritional status of children aged 4-24 months (study in the area of Wonodri Subdistrict, South Semarang District, Semarang City) Status In The Range of Age 4 to 24 Months. (Stu. :55–62.
4. Riskesdas. Basic Health Research. 2013;
5. Butte, Mardia, Alarcon G. Nutrient Adequacy of Exclusive for The Term Infant During The First Six Months of Life. 2002;
6. Yuan WL, Nicklaus S, Lioret S, Lange C, Forhan A, Heude B, et al. Early factors related to carbohydrate and fat intake at 8 and 12 months: results from the EDEN mother–child cohort. *Eur J Clin Nutr* [Internet]. 2017;71(2):219–26. Available from: <http://www.nature.com/doi/10.1038/ejcn.2016.216>
7. Schack-Nielsen L, Sørensen TIA, Mortensen EL, Michaelsen KF. Schack-Nielsen, L., Sorensen, T. I. A., Mortensen, E. K., & Michaelsen, K. F. (2010). Late introduction of complementary feeding, rather than duration of breastfeeding, may protect against adult overweight. *American Journal of Clinical Nutrition*, 91(3), 6. *Am J Clin Nutr*. 2010;(7):1–9.
8. Tarini, Carroll, Sox C. Systematic Review of the Relationship Between Early Introduction of Solid Foods to Infants and the Development of Allergic Disease. 2006;160(May):502–7.
9. Tafesse, Badacho K. Timely Introduction of Complementary Feeding among Caregivers of Children. 2018;1–7.
10. Gibson RS, Bailey KB, Gibbs M, Ferguson EL. A review of phytate, iron, zinc, and calcium concentrations in plant-based complementary foods used in low-income countries and implications for bioavailability. 2010;31(2):134–46.
11. Sisay W, Edris M, Tariku A. Determinants of timely initiation of complementary feeding among mothers with children aged 6–23 months in Lalibela. *BMC Public Health* [Internet]. 2016;1–9. Available from: <http://dx.doi.org/10.1186/s12889-016-3566-z>
12. Steinberg C. Complementary feeding in infants born prematurely *Alimentação complementar em lactentes*. 2018;1782(6):1–7.
13. Varaschini, Molz P. Nutritional profile of newly-born premature admitted to an ICU and neonatal UCI. 2015;16(1):5–8.
14. Anwar Mallongi, Anwar Daud, Hasanuddin Ishak, Ruslan La Ane, Agus Bintara Birawida, Erniwati Ibrahim, Makmur Selomo and Stang Abdul Rahman, Clean water treatment technology with an up-flow slow sand filtration system from a well water source in the Tallo district of Makassar. *J. Environ. Sci. Technol.*, 2017; 10: 44-48.
15. Azniah Syam, Muhammad Syafar, Ridwan Amiruddin, Muzakkir, Darwis, Sri Darmawan, Sri Wahyuni and Anwar Mallongi, 2017. Early breastfeeding initiation: impact of socio-demographic, knowledge and social support factors. *Pak. J. Nutr.*, 16: 207-215.
16. Iskandar I, Hadju V, As 'ad S, Natsir R. Effect of Moringa Oleifera Leaf Extracts Supplementation in Preventing Maternal Anemia and Low-Birth-Weight. *Int J Sci Res Publ* [Internet]. 2015;5(1):2250–3153. Available from: www.ijsrp.org