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Research Article

Golden Standard Feeding and the Risk of 25-60 Month-Old Underweight Children in Central Sulawesi, Indonesia

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Abstract

Background and Objectives: Children with underweight have a greater risk of having common infection. The frequency and severity of the infection increase and contribute to delayed recovery. This study aimed to assess the golden standard feeding practice as a risk factors of underweight Children aged 25-60 months in Central Sulawesi, Indonesia. **Materials and Methods:** This study uses analytical survey with case control approach. The sample in this research involved 33 cases and 66 controls of the same age and gender. Univariate and multivariate logistic regression analyses were conducted. Crude odds ratio and adjusted odds ratio with 95% confidence interval were analyzed. **Results:** Logistic regression analyses revealed that not practising early initiation of breastfeeding (Odds ratio = 5.56, 95% confidence interval = 1.70-18.15), inappropriate complementary feeding (Odds ratio = 6.09, 95% confidence interval = 1,32-28.06), less varied complementary food (Odds ratio = 9.81, 95% confidence interval = 2.62-36.68) were associated with underweight, while exclusive breast feeding (Odds ratio = 0.75, 95% confidence interval = 0.15-3.64) and breast feeding up to 2 years old (OR = 0.85, 95% CI = 0.24-3.02) were not associated with underweight. **Conclusion:** The golden feeding standard of babies and young children which includes early initiation of breastfeeding, appropriate complementary food, variation of complementary feeding. However, it excludes exclusive breastfeeding and breastfeeding up to 2 years or beyond are the protective risk of underweight in Palu, Indonesia.

Key words: Underweight, breastfeeding variation, complementary feeding, severity infection, delayed recovery

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Underweight is a form of under nutrition and it has been a serious public health problem in Indonesia¹. Nearly 20% of 0-5 year-old children suffered from underweight in 2013 with 5.7% was severely underweight and 13.9% was underweight. The number of underweight children continued to rise from 17.9% in 2007-18.4% in 2010. The target of Millenium Development Goals to reduce the prevalence of underweight children to 15.5% in 2015 failed².

The number of underweight children in Central Sulawesi is higher compared to other 21 provinces from the total 33 provinces in Indonesia³. In 2013, the prevalence decreased to 3.5% from 24.1% in 2007. Unfortunately, the national target or 15.5% was also not met⁴.

Children with underweight have a greater risk of having common infection. The frequency and severity of the infection increase and contribute to delayed recovery. Undernutrition in the first 1000 days of children life can also inhibit brain development and is linked with impaired cognitive ability which is irreversible and impact their performance in the later day of life⁴.

During 1000 days of the first life WHO and UNICEF recommend a golden standard feeding of infant and young children. Soon after the babies are born, mothers are suggested to practise early initiation of breastfeeding within 1 h of baby birth. The mothers also are highly recommended to exclusive breastfeed their babies for the first 6 months of their babies life. They need also to introduce nutritionally-adequate and safe complementary foods when the babies at 6 months. The mothers also suggest to continue breastfeeding their babies up to 2 years of age or beyond. The standard has been introduced as a key to promote child healthy growth, including preserving children from underweight⁵.

Early initiation of breastfeeding within 1 h of birth helps the newborn successful to be breastfed exclusively and continue to be breastfed up to 2 years or beyond. Dietary needs for babies can also be fulfilled until they reach 2 years old⁶⁻⁷. The initiation also protects newborn babies from acquiring infection⁸.

Babies need to be breastfed exclusively for the first 6 months of their life to fulfill all their nutrition needs optimally. The risk to get infectious diseases is also low⁹. As a result, it will reduce risk of being underweight.

When babies reaches 6 months old, the dietary needs could not be fulfilled with only breast milk¹⁰. Introducing complementary food in this age is crucial. The solid food shall meet their nutrition requirements. Varied food can be used as

an indicator of the quality of infant feeding practice. In this stage, if food is given inappropriately, it may lead babies to being underweight¹¹.

To complete young child feeding, breast milk shall be given up to 2 years old or more. From 12 months ahead breast milk can only fulfill 30% of babies needs. However, the enormous benefit is found in giving breast milk to babies in that time interval. High quality of nutrition as well as immunity benefit obtained from breast milk can help reduce the risk of being underweight¹².

How those standards associated with children underweight was only assessed separately in some studies¹³⁻¹⁴. This study aims to assess the golden standard of feeding infant and young babies related with the incidence of underweight in Palu, Indonesia. Whether or not all the standards can reduce the risk of underweight was examined in the research.

MATERIALS AND METHODS

Analytic survey with case and control approaches was employed in this study. Golden feeding standard of infant and young children involving early initiation of breastfeeding (yes/no), exclusively breastfeeding (yes/no), proper complementary food including time (yes/no) and meals variety (yes/no) as well as breastfeeding up to 2 years old (yes/no) was examined using a standardized questionnaire.

Underweight status was assessed using anthropometric measurements. Thirty-three children aged 25-60 months with weight for age ≤ -2 standard deviation were selected as cases and 66 children with weight for age > -2 standard deviation (normal weight) were assigned as control. All those cases and control were matched by age and sex.

The study was conducted from August-December 2016 at Taipa Sub-district, Palu City. Taipa is sub-district with the highest percentage of underweight children (13.5%) in Palu City. It is situated in pubic health centre working area with the highest increasing prevalence of underweight children in 2014.

Statistical analysis: Chi-square test at 5% level of significant was used to see the homogenous characteristics of case and control group while logistic regression was used to analyze the association between early initiation of breastfeeding, exclusive breastfeeding, proper complementary food, breastfeeding up to 2 years old and underweight. Odds ratios (OR) and their respective 95% confidence intervals (CI) were used as presented result. OR were considered to be statistically significant if the 95% CI excluded the value of 1. The data was analyzed using WHO anthro and SPSS 7 edition¹⁵.

RESULTS

A total of 33 cases and 66 controls were involved in the study. Both respondents of case and control group were homogenous in age, education job, family income, number of family members as well as the baby's birth weight (Table 1).

Among the total participants, mothers, who did not participate in early initiation of breastfeeding in case group were higher in number compared to those of control. Mothers in the case group were also less likely to breastfeed their

children exclusively compared to control (Table 2). Water, formula milk and honey were the most commonly used foodstuff for prelacteal feeding.

Mothers significantly higher with (OR = 2.93, 95% CI 1.06-8.06) and decline to (OR = 0.75, 95% CI 0.15-3.64) after multivariate analysis in proportion in the case group gave complementary feeding inappropriately in time compared to those of control. Mothers in case group accounting also provided unvaried complementary food to their children while less mothers in control group did the same thing (Table 2). The most foods which were consumed by the children were

Table 1: Respondent characteristics between case and control group

Categories	Incidence of underweight				p-value
	Case		Control		
	N	%	N	%	
Age group (years)					
20-23	4	12.1	8	12.0	0.89
24-27	6	18.2	12	18.2	
28-31	8	24.4	14	21.2	
32-35	4	12.1	9	13.5	
36-39	5	15.2	12	18.1	
40-43	4	12.1	10	15.0	
44-47	2	6.0	0	0.0	
48-51	0	0.0	1	1.5	
Latest education					
Not school	0	0.0	1	1.5	
Not finished primary school	2	6.1	3	4.5	
Finished primary school	10	30.3	22	33.3	0.52
Graduated from JHS	10	30.3	25	37.9	
Graduated from SHS	10	30.3	12	18.2	
Diploma/S1	1	3.0	3	4.5	
Job					
Housewife	28	84.8	52	78.8	0.62
Civil servant	0	0.0	2	3.0	
Entrepreneur	0	0.0	2	3.0	
Labor	3	9.1	1	1.5	
Trader	1	3.0	5	7.6	
Honorary staff	1	3.0	4	6.1	
Family income					
Low	26	78.8	48	72.7	0.52
High	7	21.2	18	27.3	
Number of family member					
Small	9	27.3	20	30.3	0.76
Big	24	72.7	46	69.7	
Gender					
Male	19	57.6	38	57.6	1.00
Female	14	42.4	28	42.4	
Toddler age (months)					
25-36	12	36.4	32	48.5	0.39
37-48	15	45.5	23	34.8	
49-60	6	18.2	11	16.7	
Birth weight (g)					
<2500	8	24.2	9	13.6	0.19
≥2500	25	75.8	5	86.4	

Table 2: Risk factors associated with underweight children under five in Central Sulawesi, Indonesia

Variables	Incidence of underweight				OR (CI 95%)
	Case		Control		
	N	%	N	%	
Early initiation of breastfeeding					
No	27	81.8	26	39.4	6.92
Yes	6	18.2	40	60.6	(2.51-19.07)
Exclusive breastfeeding					
No	27	81.8	40	60.6	2.93
Yes	6	18.2	26	39.4	(1.06-8.06)
Exactness of complementary feeding					
Wrong	24	72.7	18	27.3	7.11
Correct	9	27.3	48	72.7	(2.78-18.17)
Variation of complementary feeding					
Not varied	29	87.9	28	42.4	9.84
Varied	4	12.1	38	57.6	(3.10-31.19)
Breastfeeding up to 2 years					
No	14	42.4	22	33.3	1.47
Yes	19	57.6	44	66.7	(0.62-3.48)

OR: Odds ratio, CI: Confidence interval

Table 3: Association between golden feeding standards and underweight children in Central Sulawesi, Indonesia

Variables	OR	95% CI	
		Lower	Upper
Early initiation of breast feeding	5.56	1.70	18.15
Exclusive breast feeding	0.75	0.15	3.64
Exactness of complementary feeding	6.09	1.32	28.06
Variation of complementary feeding	9.81	2.62	36.68
Breast feeding up to 2 years	0.85	0.24	3.02
Infectious diseases	1.99	0.59	6.78

OR: Odds ratio, CI: Confidence interval

porridge, green beans, tempe (soybean cake), banana, orange, watermelon, spinach, yellow pumpkin, carrot and fish. Mothers of the control group also tend to breastfeed their children up to 2 years or beyond while mother in the case group did not (Table 2).

Only early initiation of breastfeeding, exactness of complementary feeding and variation of complementary feeding remained statically and significantly associated with the risk of underweight in children while exclusive breastfeeding and breastfeeding up to 2 years were not significantly associated anymore after multivariate analysis (Table 3).

DISCUSSION

The study aimed to assess the golden standard of feeding infant and young babies with the risk of underweight in Palu, Indonesia. The results showed that early initiation of breastfeeding, exclusive breastfeeding, exactness of complementary feeding and variations of complementary

feeding are significant risks of underweight children. Only early initiation of breastfeeding, exactness of complementary feeding and variations of complementary feeding remain statically significant risk of underweight children after multivariate analysis.

Mothers practising early initiation of breastfeeding have a lower risk of underweight children compared to those, who did not practise early initiation of breastfeeding. During early initiation of breastfeeding, infants acquire harmless bacteria (good bacteria). Babies will also receive colostrum (first breast milk) rich in antibodies (immune substances) and intestinal cell growth factor¹⁰. Failure in early initiation of breastfeeding is potential to cause nutritional deficiency in infants, which leads to undernutrition¹⁶⁻¹⁹.

Exclusive breastfeeding practice was also found to be associated with undernourishment in children. Mothers, who breastfeed exclusively have protective risk to have underweight children compared to those, who did not give exclusive breastfeeding to their children (OR = 2.93, 95% CI 1.06-8.06). However, after multivariate analysis, the significant risk was reduced (OR = 0.75, 95% CI 0.15-3.64).

Children, who are given exclusive breastfeeding have more endurance so that they do not get sick easily. Breast milk is also ideal and safe food for infants so infants' growth and development can be optimized. Nevertheless, undernourishment attacks children simply because of insufficient nutritional needs^{14,20-22}. Mothers may exclusively breastfeed their children but the nutritional needs can still not be met because they lack breastfeeding duration and frequency. Duration of breastfeeding was <8 times/day is a risk factor of undernourished²³⁻²⁴.

The result shows that the exactness of complementary feeding is a risk factor for the incidence of underweight (OR = 7.11, 95% CI: 2.78-18.17). The association remain statistically significant after adjusting for other variables (OR = 6.09, 95% CI 1.32-28.06). Children with inappropriate complementary food or being introduced to solid food less or more than 6 months old have higher risk to be underweight compared to those, who are introduced to solid food exactly at 6 months old^{13,25-26}.

The most appropriate age to introduce complementary feeding is 6 months. In general, nutritional needs of infants less than 6 months can still be met by breast milk. Giving complementary feeding too early can reduce the amount of breast milk consumption of babies. When it is too late, infant malnutrition can occur. After 6 months of age, babies usually require energy and nutrients twice or more to grow^{1,5-6,27-28}.

Similar results²⁵⁻²⁶ also state that inappropriate complementary feeding raises the risk of being undernourished. In contrast, the study conducted by Wong *et al.*²⁸, concludes that the first time infants are weaned is not associated with the incidence of underweight (p-value = 0.780). This is due to infectious disease (fever/diarrhea/flu) from which babies suffer each month (OR = 2.79, 95% CI = 1.06-7.31) as well as the worm infection experienced by the infants (OR = 3.48, 95% CI = 1.25-9.70). This study shows that infectious disease did not have stastically significant association in the study (OR = 1.99, 95% CI = 0.59-6.78), meaning that the risk of underweight that was higher in children with inappropriate complementary feeding compared to those, who received appropriate complementary feeding in this study was due to insufficient nutrition intake for the children.

Variation of complementary feeding was also found to be stastically and significantly associated with children nutritional status. Children, who consumed complementary feeding with no variation had 9.81 (CI:2.62-36.68) times greater risk in terms of experiencing underweight compared to children, who consumed various complementary feeding²⁹⁻³².

Babies need nutrients in large quantity to support the growth of the entire body. Children, who eat varied complementary food eat enough amount of food and more frequently³². In this study, underweight children were known to consume more rice (carbohidrat food source) 3 times a day while consumption of nuts (protein sources) was very less compared to the control group. Only five infants consumed food from nuts with a frequency of 3 times a day. The food usually consumed by children was green bean porridge once a week, tofu and tempe (soybean cake) 1-3 times a week. The consumption of vegetables and fruit only took 1-3 times a

week with the most common vegetables and fruit consumed were moringa (kelor), carrots, tomatoes, kale, oranges and bananas. The consumption of food from animal such as quail eggs, eggs, fresh fish was only done 1-3 times a week.

Significant association between breastfeeding up to 2 years with underweighed children (OR = 1.47, CI:0.62-3.48) was not found in this study. The association remained stastitically insignificant even after adjusting for other variables (OR = 0.85, CI: 0.24-3.02).

Breastfeeding remains a critical source of nutrients for young children even after complementary foods have been introduced. One half of an infant's energy needs up to the age of 1 year is still provided by breastmilk and up to one third during the 2nd year of life. However, breast milk alone without adequate complementary feeding cannot meet dietary requirement of infants at 6 months up to 2 years or beyond³³. That may also explain non statistically significant association between breastfeeding up to 2 years old or beyond with the risk of underweight children in this study.

This study only observed the frequency and variety of food for children at the age ≤ 2 years regardless of the amount of food consumed. Duration of breastfeeding, intake of carbohydrates and protein were not investigated in the study. However, this study is the first study providing information about the golden feeding standard for infant and young children, including infection as a potential confounding with the risk of underweight in Indonesia.

CONCLUSION AND FUTURE RECOMMENDATION

In conclusion, the early initiation of breasfeeding, appropriate complementary food, variation of complementary are includes in feeding babies and young children golden feeding standard factors. However, exclusive breastfeeding and breastfeeding up to 2 years or beyond are the protective risk of underweight in Palu, Indonesia. Amount of food intake as well as breastfeeding duration need to be seen in the future study in order to have clearer association between golden feeding standard and risk of underweight in children.

SIGNIFICANCE STATEMENTS

This study discover that golden standard feeding that was introduced by WHO and UNICEF were associated with underweight children in Indonesia, that can be beneficial for a recommendation in reducing the prevalence of underweight children worldwide especially in Indonesia. In addition, the golden feeding standard of babies and young children which includes early initiation of breasfeeding, appropriate

complementary food, variation of complementary feeding. This study help the reseachers to uncover critical area of combination of those standards in contributing to underweight reduction that many researchers have not explore yet.

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