

Original Article



Complementary Feeding Practices and Influencing Factors Among Children Under 2 Years of Age: A Cross-Sectional Study in Indonesia

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Conflict of Interest

The authors have no financial conflicts of interest.

ABSTRACT

Purpose: This study aimed to analyze the practice of complementary feeding and its influencing factors in children under 2 years of age in Indonesia.

Methods: This cross-sectional study used data obtained from the 2017 National Socioeconomic Survey. The sample totaled 1,751 households with children under 2 years of age, who received complementary feeding in urban and rural communities. Furthermore, the practice of complementary feeding was evaluated on the basis of the variations in provided food grouped into two categories: complete and incomplete. This study applied bivariate and multivariate analytical methods. Multivariate analysis was performed using binary logistic regression.

Results: The proportion of children under 2 years of age who received complementary feeding with complete variant food was 15.9%, while that with incomplete variant food was 84.1%. Furthermore, the factor influencing the practice of complementary feeding among the children was the mother's educational level (odds ratio: 1.481, 95% confidence interval: 0.245-0.943).

Conclusion: Complete complementary feeding, which involves a variety of food sources, is the best approach to improve the nutritional status of infants. Therefore, the source of food for complementary feeding must be accessible to all communities.

Keywords: Complementary feeding; Nutritional status; Indonesia

INTRODUCTION

One in three children under 5 years of age in Indonesia experiences acute nutritional problems [1]. This occurs because of the poor nutritional intake during the first 1,000 days of life (270 days in the womb and 730 days after birth), which is a golden period for children's development. During this period, quality nutritional intake, including complementary feeding, is necessary for children [2].

Complementary feeding is the process of giving food to infants to meet their nutritional needs, in addition to breastfeeding [3]. Infants aged 6-23 months require additional nutritional intake to supplement that gained from breastfeeding [4]. Complementary food must meet the nutritional standards required by infants. These nutritional needs have been

adjusted for the growth and developmental phases [5]. Complementary feeding also acts as a training tool for infants to enable them to determine various types of food taste, which will be given to them after the period of breastfeeding or entering the age of 2 years [6]. Therefore, it is important for the life phase of infants at the age of 6-23 months [7].

One good complementary feeding practice is the variation of quality nutritional food suitable for the needs of infants, which includes carbohydrates, proteins, fats, minerals, and vitamins. The adequacy of nutrient content differs between infants based on age, growth, and developmental conditions [8]. Infants aged 6-8 months require 200 calories daily with a feeding frequency of 2-3 times daily, while infants aged 9-11 months need 300 calories per day with a feeding frequency of 3-4 times daily [9]. The older the infants, the greater the number of calories required.

Improving the consistency and variety of food needs to be performed in the provision of complementary feeding. Infants should be accustomed to regular feeding frequencies with textures that are continually adjusted to their adaptation to food [10]. A variety of food is also required to provide adequate nutrition for infants. Furthermore, infants are expected to recognize more types of food. The variations in these foods can consist of mineral water, cereals, beans, meat, fish, milk, eggs, vegetables, and fruits. These foods can be combined according to the nutritional needs of infants [5].

However, not all households can provide complementary feeding that varies and suits the needs of infants. Parents are required to have adequate economic status, parental knowledge, and access to food sources [11,12]. Infants from poor families tend to receive poor complementary feeding [13], which is influenced by the limited ability of these households to access quality and varied complementary food sources [14]. In regions where food is expensive, poor families cannot afford it.

In addition, the low level of family access to complementary food sources can be attributed to the lack of food supplies, as not all regions produce diverse food sources [15]. To meet these needs, certain regions must import food from other regions. This affects the selling price of food, which is expensive, making it difficult to access. However, even when there is an abundant source of food, it cannot be guaranteed that all households will use it to provide good complementary feeding. There are still many parents who lack knowledge in providing good complementary feeding to their infants [16,17].

Some parents lack knowledge on the importance of a balanced nutritional intake during the practice of complementary feeding in infants [18,19]. Having this knowledge will guide parents to prepare the best types of complementary food for their infants. It will also enable them to choose the appropriate type of food, quality, serving, and duration of feeding [20]. The smart practice of complementary feeding has an impact on infant growth and health and reduces the risk of malnutrition [21-23].

This study aimed to analyze the practice of complementary feeding in children under 2 years of age based on variations in the type of food provided as well as the influencing factors, including the social, economic, and demographic factors of households.

MATERIALS AND METHODS

This cross-sectional study used the 2017 data obtained from the National Socioeconomic Survey, conducted annually by the Indonesian Central Bureau of Statistics. The survey sample included households and individuals and covered aspects of demography, education, employment, health (disease, health insurance, health services, immunization, exclusive breastfeeding, complementary feeding, fertility, and family planning), household consumption, living conditions, social protection, and environment. The sample of this study totaled 1,751 households with children under 2 years of age, who received complementary feeding in urban and rural communities in Indonesia.

The practice of complementary feeding was evaluated on the basis of the type of food given to children under 2 years of age, which included carbohydrates, proteins, vegetables, fruits, mineral water, and milk. This study classified this practice into two categories: complete and incomplete. Complete complementary feeding was defined when the children received all types of complementary food during the required period of less than 2 years. Meanwhile, incomplete complementary feeding was defined when they only received some types of complementary food, including mineral water, carbohydrates, and vegetables, but not proteins, fruits, and milk.

The variables used to analyze the factors influencing the practice of complementary feeding among the children under 2 years of age included the infant's sex, socioeconomic status, community, parents' educational level, parents' age, parents' job, parents' work status, and length of time the mother worked.

Furthermore, the socioeconomic status of the households was grouped into three categories: low, moderate, and high. Grouping was performed on the basis of the average household expenditure per capita per month. Household expenditures per capita per month of <US\$ 33.3 were categorized as low; US\$ 33.3-58.4, moderate; and \geq US\$ 58.5, high.

This study used bivariate and multivariate analyses. Bivariate analysis was used to analyze the relationship between the practice of complementary feeding among the children and the socioeconomic and demographic characteristics of the respondents. Furthermore, the chi-square test and Fisher's exact test were used to analyze this relationship, with the significance level set at $p < 0.05$. Multivariate analysis was used to analyze the factors influencing the practice of complementary feeding among the children. This analytical tool involved binary logistic regression, with the significance level set at $p < 0.05$. All statistical analyses were performed using the IBM SPSS Statistics for Windows (version 26.0; IBM Corp., Armonk, NY, USA). This study was approved by the Ethics Committee of Universitas Pembangunan Nasional Veteran Jakarta (No. 2855/XII/2020/KEPK).

RESULTS

A total of 1,751 households with children under 2 years of age constituted the sample in this study. The proportion of children under 2 years of age who received complementary feeding with complete and incomplete variants was 15.9% and 84.1%, respectively. A total of 144 (16.4%) female infants and 134 (15.4%) male infants received complete complementary feeding.

A total of 102 (17.5%) infants from households with a low socioeconomic status received complete complementary feeding. Meanwhile, 80 (13.7%) and 96 (16.4%) infants from households with moderate and high socioeconomic statuses received complete complementary feeding, respectively. Furthermore, 105 (14.9%) infants from urban communities and 173 (16.5%) infants from rural communities also received complete complementary feeding.

In terms of the educational level of the household heads, 99 (13.8%) infants from households with heads with an elementary school educational level, 55 (19.45%) infants from households with heads with a middle school educational level, 82 (17.6%) infants from households with heads with a high school educational level, and 42 (14.7%) infants from households with heads with a university educational level received complete complementary feeding. In terms of the mother's educational level, 103 (15.2%) infants with mothers with an elementary school educational level, 56 (16.5%) infants with mothers with a middle school educational level, 77 (19.2%) infants with mothers with a high school educational level, and 42 (12.7%) infants with mothers with a university educational level received complete complementary feeding.

Furthermore, 248 (16.4%) infants from households with employed heads and 15 (11.8%) infants from households with unemployed heads received complete complementary feeding. A total of 96 (16.9%) infants from households with heads who worked in the formal sector (permanently and received wages) and 158 (16.1%) infants from households with heads who worked in the informal sector received complete complementary feeding. Complete complementary feeding was provided to 84 (16.4%) infants with employed mothers and 178 (15.8%) infants with unemployed mothers. A total of 36 (17.2%) infants with mothers working in the formal sector and 102 (19.0%) infants with mothers working in the informal sector received complete complementary feeding. The socioeconomic and demographic characteristics of the respondents are shown in **Table 1**.

Fig. 1 shows the practice of complementary feeding among the children based on the socioeconomic status. The most common types of complementary food among the infants were minerals and carbohydrates. Approximately 82.2% of the infants from families with a middle socioeconomic status, 80.7% of the infants from families with a high socioeconomic status, and 78.2% of the infants from families with a low socioeconomic status consumed minerals. Meanwhile, 71.1% of the infants from families with a middle socioeconomic status, 71.1% of the infants from families with a high socioeconomic status, and 69.6% of the infants from families with a low socioeconomic status consumed carbohydrates. However, there was no relationship found between the complementary feeding of minerals or carbohydrates and socioeconomic status ($p=0.227$ and 0.828 , respectively).

Furthermore, vegetables were the third most commonly consumed food, followed by proteins. Approximately 56.0% of the infants from families with a middle socioeconomic status, 55.0% of the infants from families with a high socioeconomic status, and 54.7% of the infants from families with a low socioeconomic status consumed vegetables. Meanwhile, 52.9% of the infants from families with a high socioeconomic status, 50.1% of the infants from families with a low socioeconomic status, and 50.0% of the infants from families with a middle socioeconomic status consumed proteins. However, there was no relationship found between the complementary feeding of vegetables or proteins and socioeconomic status ($p=0.898$ and 0.527 , respectively).

Table 1. Socioeconomic and demographic characteristics of the respondents (N=1,751)

Characteristic	Complementary feeding		p-value
	Incomplete (n=1,473, 84.1%)	Complete (n=278, 15.9%)	
Sex of the infant			0.310
Female	736 (83.6)	144 (16.4)	
Male	737 (84.6)	134 (15.4)	
Socioeconomic status			0.187
Low (<US\$ 33.3 per capita per month)	481 (82.5)	102 (17.5)	
Moderate (US\$ 33.3–58.4 per capita per month)	504 (86.3)	80 (13.7)	
High (≥US\$ 58.5 per capita per month)	488 (83.6)	96 (16.4)	
Community			0.196
Urban	600 (85.1)	105 (14.9)	
Rural	873 (83.5)	173 (16.5)	
Educational level of the household head			0.099
Elementary school or lower	617 (86.2)	99 (13.8)	
Middle school	228 (80.6)	55 (19.4)	
High school	384 (82.4)	82 (17.6)	
University	244 (85.3)	42 (14.7)	
Age of the household head (yr)			0.699
<22	9 (81.8)	2 (18.2)	
22–34	447 (82.9)	92 (17.1)	
35–49	587 (83.9)	113 (16.1)	
≥50	360 (85.7)	60 (14.3)	
Work of the household head			0.106
Not currently employed	112 (88.2)	15 (11.8)	
Currently employed	1,262 (83.6)	248 (16.4)	
Employment status of the household head			0.369
Informal sector worker	824 (83.9)	158 (16.1)	
Formal sector worker	473 (83.1)	96 (16.9)	
Educational level of the mother			0.106
Elementary school	576 (84.8)	103 (15.2)	
Middle school	283 (83.5)	56 (16.5)	
High school	325 (80.8)	77 (19.2)	
University	289 (87.3)	42 (12.7)	
Age of the mother (yr)			0.373
<22	92 (81.4)	21 (18.6)	
22–34	692 (82.9)	143 (17.1)	
35–49	420 (85.4)	72 (14.6)	
≥50	199 (86.5)	31 (13.5)	
Work of the mother			0.402
Not currently employed	947 (84.2)	178 (15.8)	
Currently employed	427 (83.6)	84 (16.4)	
Employment status of the mother			0.332
Informal sector worker	436 (81.0)	102 (19.0)	
Formal sector worker	173 (82.8)	36 (17.2)	
Length of time the mother worked (hr/wk)			0.602
<10	36 (76.6)	11 (23.4)	
10–19	59 (77.6)	17 (22.4)	
20–29	117 (81.8)	26 (18.2)	
≥30	397 (82.5)	84 (17.5)	

Values are presented as number (%).

Finally, the complementary food consumed the least included milk and fruits. Only approximately 41.0% of the infants from families with a low socioeconomic status, 39.4% of the infants from families with a high socioeconomic status, and 38.4% of the infants from families with a middle socioeconomic status consumed milk. Meanwhile, only 43.2% of the infants from families with a middle socioeconomic status, 42.8% of the infants from families with a high socioeconomic status, and 41.9% of the infants from families with a low socioeconomic

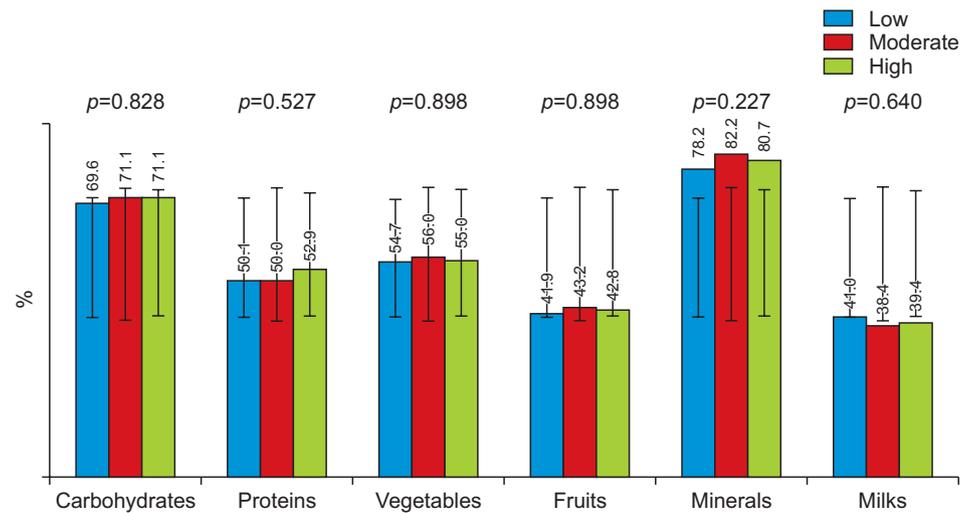


Fig. 1. Varieties of nutritional food used for complementary feeding based on the socioeconomic status.

status consumed fruits. However, there was no relationship found between the complementary feeding of milk or fruits and socioeconomic status ($p=0.640$ and 0.898 , respectively).

Binary logistic regression analysis was performed to determine the factors that influenced the practice of complete complementary feeding among the children and revealed only a single significant factor, namely, the mother's educational level (odds ratio: 1.481, 95% confidence interval: 0.245-0.943) (Table 2).

DISCUSSION

Complementary feeding supports the nutritional needs of children aged 6-23 months and children aged 0-6 months whose mothers have problems related to milk production. A good practice of complementary feeding enables children to grow and improve their quality of health [24]. The first 1,000 days of life is a golden age for children's development. During this period, children grow and develop quickly; therefore, they require good nutritional intake. Children with poor nutritional intake are at a high risk of experiencing health problems, such as obesity, stunting, and various other generative diseases [25,26].

Good complementary feeding practices must meet the following factors: age requirement for the introduction of complementary feeding, provision of responsive training, psychosocial condition of the children, cleanliness of storage, administration and quantity of complementary food according to the infants' needs, consistency and variety, considerations on food frequency and energy density, nutritional content with various types of food, additional vitamins and minerals to infants and mothers, and attention to the infants' health condition [8,27].

Food variation is required to support the provision of quality complementary feeding and to provide quality nutritional content that suits the needs of children [5]. A varied nutritional content should consist of carbohydrates, proteins, fats, vitamins, and minerals. Food consisting of mineral water, cereals, beans, milk, meat, fish, chicken, eggs, vegetables, and fruits can serve as an alternative to obtain a balanced nutritional intake for infants [28].

Table 2. Binary logistic regression of the factors influencing the complementary feeding practices (N=1,751)

Characteristic	β	Wald	Sig.	OR	95% CI	
					Lower	Upper
Sex of the infant						
Female	ref	ref	ref	ref	ref	ref
Male	0.126	0.402	0.526	1.135	0.768	1.676
Socioeconomic status						
Low and moderate	ref	ref	ref	ref	ref	ref
High	0.178	0.637	0.425	1.195	0.772	1.849
Community						
Urban	ref	ref	ref	ref	ref	ref
Rural	0.136	0.368	0.544	1.145	0.739	1.775
Educational level of the household head						
High school or lower	ref	ref	ref	ref	ref	ref
University	0.358	1.057	0.304	1.431	0.723	2.839
Age of the household head (yr)						
<22 and \geq 50	ref	ref	ref	ref	ref	ref
22–49	0.103	0.125	0.724	1.108	0.626	1.963
Work of the household head						
Not currently employed	ref	ref	ref	ref	ref	ref
Currently employed	-0.341	0.246	0.620	0.711	0.184	2.741
Employment status of the household head						
Informal sector worker	ref	ref	ref	ref	ref	ref
Formal sector worker	-0.051	0.041	0.840	0.951	0.581	1.554
Educational level of the mother						
High school or lower	ref	ref	ref	ref	ref	ref
University	0.733	4.534	0.033	1.481	0.245	0.943
Age of the mother (yr)						
<22 and \geq 50	ref	ref	ref	ref	ref	ref
22–49	-0.228	0.474	0.491	0.796	0.416	1.523
Work of the mother						
Not currently employed	ref	ref	ref	ref	ref	ref
Currently employed	-0.365	2.607	0.106	0.694	0.446	1.081
Employment status of the mother						
Informal sector worker	ref	ref	ref	ref	ref	ref
Formal sector worker	0.200	0.475	0.491	1.221	0.692	2.156
Length of time the mother worked (hr/wk)						
\geq 30	ref	ref	ref	ref	ref	ref
0–29	0.002	0.000	0.992	1.002	0.649	1.547

OR: odds ratio, CI: confidence interval.

Therefore, complete complementary feeding with quality nutritional content is necessary for infants to improve their nutritional status [29].

This study showed that many infants did not receive complete complementary feeding. This is in spite of the condition of food production in Indonesia, which is rich in various food types. Food variation for complementary feeding is very well available [15]. However, access to these food sources is still low, especially among poor families [30]. In addition, public knowledge of balanced nutrition is poor. Many complementary foods in Indonesia are rich in carbohydrates but lack proteins, fats, and vitamins [31]. Consequently, one in three children in Indonesia experiences acute nutritional problems, including stunting [1].

In this study, the mother's educational level was found to have affected the practice of complementary feeding among the children under 2 years of age. This indicates that the higher the mother's educational level, the more complete the complementary feeding given to the infant. Highly educated mothers have knowledge of the quality of nutritional intake given to their infants. This knowledge contributes to the quality of complementary feeding

provided [32,33]. Furthermore, the mother will choose the best type of complementary food with a balanced nutritional intake according to the age and development of the infant [34]. The practice of quality complementary feeding prevents infants from being at risk of malnutrition [35].

The subject of complementary feeding must be of particular concern to parents and the government. Indonesia is among the countries with an upper-middle income and a high stunting level. Data from the Indonesian Ministry of Health showed that 30.8% of children under 5 years of age experience stunting (height for age <-2 of the median World Health Organization Child Growth Standards) [1]. Therefore, there are still many infants in Indonesia who experience poor nutritional intake, especially in the first 1,000 days of life. The nutritional status of infants in the first 730 days of birth is largely determined by the practice of breastfeeding and complementary feeding. Problems in providing complementary feeding pose a risk of malnutrition in infants [36,37].

Therefore, parents must be the main pillar in improving the practice of complete complementary feeding by increasing their knowledge on such. This enables them to present various types of complementary food with a balanced nutritional content to meet the nutritional needs of infants. The government also has a role to play in providing public access to complementary feeding, especially for vulnerable groups in the society. Addressing nutritional problems among infants has become a priority. However, the implemented program did not optimally target the fulfillment of nutritional intake in the second phase in the first 1,000 days of life of infants.

Complementary feeding is widely understood by the community as an effort to meet the nutritional needs of infants. However, the knowledge of parents on good complementary feeding practices is insufficient in meeting these nutritional needs. The practice of complete and varied complementary feeding according to the nutritional content required is a significant effort to improve the nutritional status of infants. This is supported by the ability of parents to provide for their children based on their household income. In addition, the role of the government is important in ensuring the need for and access to complementary feeding for the community, especially in poor and vulnerable groups. The practice of complementary feeding is key to overcoming infant malnutrition in Indonesia.

This study has several limitations. First, the National Socioeconomic Survey only classifies samples to children under 2 years of age, who are no longer categorized by age in months. Therefore, the samples did not include children aged 6-23 months. This study did not further classify the samples by age, for example, 6-12 months and 13-23 months. Consequently, the standard nutritional intake requirements and appropriate type of complementary food according to age classification were not evaluated. Second, this study could not measure the nutritional content of each type of complementary food.

This study provides knowledge on the importance of the role of parents in providing quality complementary feeding to their infants. Further research on the issue of community access to quality food sources and complementary feeding is needed. In many low- and middle-income countries, the access to quality food sources is unequal. Poor communities have very limited access to quality food sources in comparison with rich communities. Studies on the community's ability to access quality food sources based on socioeconomic conditions are required. These are important for mapping the problem of inequality in access

between socioeconomic classes of the society. The government can therefore design an appropriate program to improve the community's access to quality food sources to provide complementary feeding to infants.

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