



The Relationship Between Complementary Feeding and Infant Nutritional Status

Kiki Rezki Aulia ^{1 *}, Rezqiqah Aulia Rahmat ²

^{*1} Midwifery Study Program , Academy Midwifery Banua Bina Husada, Indonesia

² Medical Study Programs , Bosowa University , Indonesia

Abstract

Background Complementary feeding is the process of introducing foods and beverages at around six months of age when breast milk alone is no longer sufficient to meet the nutritional requirements of infants . The timing , frequency , amount , consistency , diversity , and quality of complementary foods are important determinants of child growth and nutritional status. Objective This study aimed to determine the relationship between complementary feeding practices and the nutritional status of infants . Methods A quantitative analytic study with a cross-sectional design was conducted in October 2026 in the working area of a community health center . The sample consisted of 96 infants aged 6–23 months selected using purposive sampling. Complementary feeding practices were assessed based on timing of introduction , frequency , amount , food consistency , dietary diversity , and feeding practices . Nutritional status was assessed through weight and length / height measurements according to age using standard child growth assessment procedures . Data were analyzed using the chi-square test with a significance level of 0.05. Results Fifty- seven infants (59.4%) received appropriate complementary feeding , while 39 (40.6%) received less appropriate complementary feeding . Sixty-eight infants (70.8%) had normal nutritional status and 28 (29.2%) had normal nutritional status problems . The proportion of nutritional problems was 46.2% among infants receiving less appropriate complementary feeding compared with 17.5% among those receiving appropriate complementary feeding . The chi-square test showed a significant relationship between complementary feeding practices and nutritional status ($p=0.004$). Conclusion Complementary feeding practices were significant associated with infant nutritional status. Appropriate age of introduction , adequate frequency and consistency , dietary diversity , and responsive feeding should be strengthened through parental and caregiver education.

Keywords : Complementary Feeding, Infants, Nutritional Status, Infant Feeding, Growth

Correspondent Author : Kiki Rezki Aulia

Email : kikirezkiaulia@gmail.com

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1. Introduction

Infancy is a crucial period of growth and development characterized by rapid physical growth and increased energy and nutrient requirements. Inadequate nutritional intake during this period can impair growth and increase the risk of malnutrition and other health problems (Dewey & Brown, 2003; Stewart et al., 2013).

Breast milk is the primary source of nutrition during early infancy. However, at approximately six months of age, infants' energy and nutrient requirements begin to exceed what breast milk alone can provide, making complementary feeding necessary while breastfeeding continues. The World Health Organization (WHO, 2023) recommends introducing complementary foods at six months of age and continuing complementary feeding until 23 months, a period considered critical for preventing nutritional deficiencies and supporting optimal growth and development.

Complementary feeding is not merely the provision of additional food but an essential component of infant and young child feeding practices. Appropriate complementary feeding should consider the child's age, food quantity, meal frequency, consistency, dietary diversity, food safety, and developmental readiness. These factors are important for ensuring adequate nutrient intake and supporting healthy growth (Dewey & Brown, 2003; Pan American Health Organization [PAHO] & WHO, 2003).

The WHO recommends introducing complementary foods at six months while continuing breastfeeding. Children aged 6–8 months generally require two to three meals per day, whereas those aged 9–23 months generally require three to four meals per day, with additional nutritious snacks as needed. Food consistency and variety should also increase gradually according to the child's age and developmental abilities (WHO, 2023). These feeding practices help ensure that children receive adequate energy and nutrients during this critical period.

Dietary diversity is an important component of appropriate complementary feeding because children require nutrients from various food groups to support growth and development. A diverse diet should include animal-source foods, such as meat, fish, and eggs, as well as fruits, vegetables, legumes, and other nutrient-rich foods appropriate for the child's age. The WHO guidelines emphasize the importance of dietary diversity and nutrient-dense foods in meeting the nutritional requirements of children aged 6–23 months (WHO, 2023; UNICEF, 2020).

Inappropriate complementary feeding may include introducing foods too early or too late, providing insufficient meal frequency or quantity, offering textures that are unsuitable for the child's developmental stage, and providing an inadequate variety of foods. Such practices may prevent children from meeting their nutritional requirements and can contribute to poor growth and nutritional deficiencies (Dewey & Brown, 2003; Lutter et al., 2021). Therefore, appropriate complementary feeding practices are essential for supporting adequate nutrient intake and establishing healthy eating patterns during early childhood (PAHO & WHO, 2003).





Nutritional status is an important indicator of a child's growth and health. It can be assessed through anthropometric measurements, including body weight and length or height, interpreted according to established child growth standards. Research examining WHO infant and young child feeding indicators has investigated their associations with child anthropometry, although the relationship between feeding practices and growth may vary according to individual and contextual factors (Jones et al., 2014; Marriott et al., 2012).

A child's nutritional status is not determined solely by complementary feeding practices. Other factors, including breastfeeding, infectious diseases, birth weight, caregiving practices, sanitation, household socioeconomic conditions, parental education, and access to health services, may also influence child growth. These factors should be considered when examining the relationship between complementary feeding and nutritional status (Stewart et al., 2013; Dewey & Adu-Afarwuah, 2008).

The relationship between complementary feeding practices and nutritional status therefore needs to be examined while considering the characteristics of children and their families. Understanding this relationship can provide useful information for health workers in developing appropriate nutrition education and counseling for parents. Based on this background, this study aimed to determine the relationship between complementary feeding practices and the nutritional status of infants aged 6–23 months in the working area of a Community Health Center (Puskesmas)..

2. Methods

This study employed a quantitative analytical design with a cross-sectional approach and was conducted in the working area of a Community Health Center in October 2026. The population comprised all infants aged 6–23 months registered in child health services, with 96 eligible infants selected using purposive sampling. Inclusion criteria included infants residing in the study area whose mothers or primary caregivers were available for interviews, willing to participate, and able to undergo anthropometric measurements. Infants experiencing emergencies, having severe illnesses requiring special care, or lacking adequate anthropometric data, as well as those whose caregivers provided incomplete interviews, were excluded. The independent variable was complementary feeding practices, while the dependent variable was infant nutritional status; infant age, sex, maternal age, education, occupation, and exclusive breastfeeding history were assessed as characteristics.

Complementary feeding practices were evaluated using a structured questionnaire covering initiation age, frequency, quantity, consistency, dietary diversity, animal-source foods, fruit and vegetable consumption, responsive feeding, food hygiene, and age-inappropriate foods and drinks, based on WHO recommendations. Nutritional status was assessed through weight and length/height measurements according to age using standardized anthropometric procedures. Complementary feeding practices were categorized as appropriate or inappropriate based on key indicators. Primary data were





collected through caregiver interviews and anthropometric measurements, while secondary data were obtained from child health records and integrated health post records.

Data were analyzed using univariate analysis and the chi-square test to examine the association between complementary feeding practices and nutritional status, with statistical significance set at $(p < 0.05)$. Research ethics included informed consent, confidentiality, anonymity, respondent safety, and the right to withdraw at any time.

3. Results And Discussion

a. Result

Table 1. Baby Characteristics

Characteristics	n	%
Baby's age		
6–11 months	38	39.6
12–17 months	34	35.4
18–23 months	24	25.0
Gender		
Man	49	51.0
Woman	47	49.0
History of exclusive breastfeeding		
Yes	63	65.6
No	33	34.4

Based on Table 1, the majority of infants were in the 6–11 month age group, amounting to 38 infants (39.6%). Based on gender, there were 49 male infants (51.0%) and 47 female infants (49.0%).

Table 2. Mother's Characteristics

Characteristics	n	%
Mother's age		
<20 years	3	3.1
20–34 years	73	76.0
≥35 years	20	20.8
Education		
Basic education	21	21.9
Secondary education	58	60.4
Higher education	17	17.7
Work		
Housewife	71	74.0
Work	25	26.0

Most of the mothers were aged 20–34 years, as many as 73 people (76.0%) and had secondary education, as many as 58 people (60.4%).

Table 3. Distribution of MP-ASI Provision

Providing complementary foods	n	%
In accordance	57	59.4
Not quite right	39	40.6
Total	96	100





A total of 57 babies (59.4%) received complementary feeding according to the research criteria, while 39 babies (40.6%) received complementary feeding that was categorized as less appropriate.

Table 4. Distribution of Nutritional Status

Nutritional status	n	%
Normal	68	70.8
Nutritional problems	28	29.2
Total	96	100

Most of the babies had normal nutritional status, namely 68 babies (70.8%), while 28 babies (29.2%) experienced nutritional problems.

Table 5. Relationship between Providing Complementary Foods and Infant Nutritional Status

Providing complementary foods	Normal n (%)	Nutritional problems n (%)	Total	p
In accordance	47 (82.5)	10 (17.5)	57	0.004
Not quite right	21 (53.8)	18 (46.2)	39	
Total	68 (70.8)	28 (29.2)	96	

Based on Table 5, more nutritional problems were found in babies who received inappropriate complementary feeding, namely 18 babies (46.2%), compared to babies who received appropriate complementary feeding, namely 10 babies (17.5%). The chi-square test showed a p value of 0.004 ($p < 0.05$), so there is a significant relationship between the provision of complementary foods and the nutritional status of infants. Babies who receive inappropriate complementary feeding have a higher proportion of nutritional problems than babies who receive appropriate complementary feeding.

b. Discussion

The study results showed that 40.6% of infants received inappropriate complementary feeding (MP-ASI). This finding indicates that complementary feeding practices have not fully met the recommended requirements. Inadequacies may occur in the timing of introduction, meal frequency, food quantity, texture, dietary diversity, and food selection. These practices may be influenced by maternal knowledge, caregiving experience, household economic conditions, food availability, family habits, and information obtained from health workers (Dewey & Brown, 2003; Lutter et al., 2021). The World Health Organization (WHO, 2023) recommends introducing complementary foods at approximately six months of age and gradually adjusting food quantity, frequency, and consistency according to the child's age. Therefore, monitoring complementary feeding practices should be integrated into routine infant and young child health services.

Most infants in this study had normal nutritional status, although 29.2% experienced nutritional problems. Nutritional status results from the interaction of multiple factors. Dietary intake is an important determinant, but child growth may also be influenced by infectious diseases, birth history, breastfeeding practices, socioeconomic conditions, sanitation, caregiving practices, and access to health





services (Dewey & Adu-Afarwuah, 2008; Stewart et al., 2013). The WHO (2023) identifies the period from 6 to 23 months as an important stage for meeting children's nutritional requirements and supporting healthy growth and development. Inadequate nutrient intake during this period may contribute to growth faltering and nutritional deficiencies.

The study demonstrated a significant relationship between complementary feeding practices and the nutritional status of infants ($*p* = 0.004$). Infants receiving inappropriate complementary foods had a higher proportion of nutritional problems than those receiving appropriate complementary foods. This finding is consistent with the importance of complementary feeding in meeting increasing energy and nutrient requirements after six months of age (Dewey & Brown, 2003; PAHO & WHO, 2003). When food quantity is insufficient, dietary diversity is limited, meal frequency is inadequate, or nutrient density is low, infants may not receive sufficient nutrients to support optimal growth. Conversely, age-appropriate feeding practices that provide a variety of nutrient-dense foods can help meet nutritional requirements (WHO, 2023; UNICEF, 2020). However, the observed association does not establish a causal relationship, because other determinants of nutritional status may also contribute to the findings.

The timing of complementary feeding is an important component of appropriate infant feeding practices. The WHO (2023) recommends introducing complementary foods at approximately six months while continuing breastfeeding. Introducing complementary foods too early may displace breast milk intake and expose infants to foods before they are developmentally ready, whereas delayed introduction may increase the risk of inadequate energy and nutrient intake. Therefore, parents should receive appropriate education about the recommended age for introducing complementary foods and how to recognize their child's developmental readiness for feeding (Dewey & Brown, 2003; Fewtrell et al., 2017).

Dietary diversity is another essential component of complementary feeding. Children aged 6–23 months require a variety of foods to meet their nutritional needs, which may not be adequately fulfilled through a highly restricted diet. Animal-source foods, including meat, fish, and eggs, together with fruits, vegetables, legumes, and staple foods, should be offered in age-appropriate forms and quantities. The WHO (2023) emphasizes dietary diversity and the consumption of nutrient-dense foods as important components of complementary feeding. Providing a variety of foods can also expose children to different tastes and textures, potentially supporting acceptance of a broader range of foods over time (UNICEF, 2020; Lutter et al., 2021).

Meal frequency and food consistency should be adjusted according to the child's age and developmental abilities. According to WHO recommendations, infants aged 6–8 months generally require two to three meals per day, whereas children aged 9–23 months generally require three to four meals per day, with





additional nutritious snacks as needed (WHO, 2023). Food consistency should gradually progress from soft and mashed foods toward thicker textures and appropriately prepared family foods as children develop their feeding skills. Foods that are excessively diluted may provide insufficient energy per unit of volume, while textures that are unsuitable for the child's developmental stage may interfere with safe and effective feeding. Appropriate food consistency is therefore important for meeting nutritional needs and supporting the development of feeding skills (Dewey & Brown, 2003; Fewtrell et al., 2017).

Responsive feeding is also an essential component of complementary feeding. Parents and caregivers should recognize and respond appropriately to children's hunger and satiety cues while providing a supportive and comfortable mealtime environment. Responsive feeding encourages caregivers to support children's attempts to eat without force or coercion and is recognized in WHO guidance as an important component of feeding practices for children aged 6–23 months (WHO, 2023). Such practices may support positive feeding experiences and help children develop appropriate responses to hunger and fullness.

Parents and caregivers play an important role in determining the types, quantities, frequency, and methods of feeding provided to infants. Therefore, their understanding of appropriate complementary feeding is important for preventing nutritional problems. Parental education should extend beyond theoretical information and include practical demonstrations of nutritious menus prepared from affordable, locally available ingredients. Health workers can demonstrate balanced food combinations containing carbohydrate sources, animal or plant protein, vegetables, fruits, and appropriate sources of fat. Practical counseling and context-specific nutrition education may help families apply recommended feeding practices in their daily lives (Dewey & Adu-Afarwuah, 2008; Lutter et al., 2021; UNICEF, 2020)..

4. Conclusion

The study concluded that 57 infants (59.4%) received appropriate complementary feeding (MP-ASI), while 39 (40.6%) received inappropriate complementary feeding. Most infants had normal nutritional status (70.8%), while 29.2% experienced nutritional problems. Nutritional problems were more common among infants receiving inappropriate complementary feeding, with a significant association between complementary feeding practices and nutritional status ($p=0.004$). Community health centers, midwives, health workers, and posyandu cadres are encouraged to strengthen education, counseling, and growth monitoring. Parents should provide age-appropriate, diverse, nutritious complementary foods, maintain breastfeeding, and practice responsive feeding. Future researchers are advised to use longitudinal designs and examine other factors, including dietary diversity, nutrient adequacy, infections, sanitation, socioeconomic status, maternal knowledge, and attendance at integrated health posts.





References

- Dewey KG, Adu- Afarwuah S. Systematic review of the efficacy and effectiveness of complementary feeding interventions in developing countries . *Mother Child Nutr* . 2008;4 Suppl 1:24-85. doi:10.1111/j.1740-8709.2007.00124.x.
- Dewey KG, Brown KH. Update on technical issues concerning complementary feeding of young children in developing countries and implications for intervention programs . *Food Nutrition Bull* . 2003;24(1):5-28.
- Dewey KG, Cohen RJ, Brown KH, Rivera LL. Effects of exclusive breastfeeding for four versus six months on maternal nutritional status and infant motor development : results of two randomized trials in Honduras. *J Nutr* . 2001;131(2):262-267.
- Fewtrell M, Bronsky J, Campoy C, Domellöf M, Embleton N, Fidler Mis N, et al. Complementary feeding : a position paper by the ESPGHAN Committee on Nutrition . *J Pediatr Gastroenterol Nutr* . 2017;64(1):119-132. doi:10.1097/MPA.0000000000001454.
- Jones AD, Ickes SB, Smith LE, Mbuya MNN, Chasekwa B, Heidkamp RA, et al. World Health Organization infant and young child feeding indicators and their associations with child anthropometry : a synthesis of recent findings . *Matern Child Nutr* . 2014;10(1):1-17. doi:10.1111/mcn.12070.
- Lutter CK, Grummer-Strawn L, Rogers L. Complementary feeding of young children in developing countries : adapting the global recommendations to the local context . *Matern Child Nutr* . 2021;17 Suppl 1:e13148. doi:10.1111/mcn.13148.
- Marriott BP, White A, Hadden L, Davies JC, Wallingford JC. WorldHealth Organization infant and young child feeding indicators : associations with growth measures in 14 low-income countries . *Mother Child Nutr* . 2012;8(3):298-309. doi:10.1111/j.1740-8709.2011.00380.x.
- Pan American Health Organization , World Health Organization . Guiding principles for complementary feeding of the breastfed child . Washington DC: PAHO/WHO; 2003.
- Pannyiwi, R., Rahmat, RA, & Mainassy , MC (2026). Drug Aware Village : Community Empowerment in Realizing Safe Household Drug Management : Drug-Aware Village : Community Empowerment to Ensure a Safe Household Medication Management . *Social Friends: Journal of Community Service*, 4(4), 1846–1852. <https://doi.org/10.59585/sosisabdimas.v4i4.1652>
- Pannyiwi, R., Rahmat, RA, Cakrawati R, CR, Dasaryandi , KR, & Nasution, N. (2026). Empowering Diabetes Mellitus Patients in Prevention Diabetic Ulcers and the Risk of Recurrent Infection : Empowerment of Patients with Diabetes Mellitus in the Prevention of Diabetic Ulcers and the Risk of Recurrent Infection . *Barongko : Journal of Health Sciences* , 5(1), 985–991. <https://doi.org/10.59585/bajik.v5i1.1586>
- Pannyiwi, R. (2026). The Free Nutritional Meal Program (MBG) as a Government Intervention to Improve Children's Health and Learning Achievements . *Social Friends : Journal of Community Service*, 4(4), 1586–1599. Retrieved from <https://jurnal.agdosi.com/index.php/jpemas/article/view/1361>





- Pries AM, Huffman SL, Mengkheang K, Kroeun H, Champeny M, Roberts M, et al. High use of commercial food products among infants and young children and implications for infant and young child Feeding in Cambodia . *Mother Child Nutr* . 2016;12 Suppl 2:44-54. doi:10.1111/mcn.12270.
- Saha KK, Frongillo EA, Alam DS, Arifeen SE, Persson LA, Rasmussen KM. Appropriate infant feeding practices result in better growth of infants and young children in rural Bangladesh. *Am J Clin Nutr* . 2008;87(6):1852-1859. doi:10.1093/ajcn/87.6.1852.
- Smith ER, Hurt L, Chowdhury R, Sinha B, Fawzi W, Edmond KM, et al. Delayed breastfeeding initiation and infant survival : a systematic review and meta- analysis . *PLOS One*. 2017;12(7):e0180722. doi:10.1371/journal.pone.0180722.
- Stewart CP, Iannotti L, Dewey KG, Michaelsen KF, Onyango AW. Contextualising complementary feeding in a broader framework for stunting prevention . *Maternal Child Nutr* . 2013;9 Suppl 2:27-45. doi:10.1111/mcn.12088.
- UNICEF. Improving young children's diets during the complementary feeding period . New York : United Nations Children's Fund ; 2020.
- Victora CG, Bahl R, Barros AJD, França GVA, Horton S, Krasevec J, et al. Breastfeeding in the 21st century : epidemiology , mechanisms , and lifelong effect . *Lancet* . 2016;387(10017):475-490. doi:10.1016/S0140-6736(15)01044-2.
- Wahyuni, T., Achmad, VS, Pannyiwi, R., & Rahmat, RA (2025). The Relationship Between Nurse's Knowledge about Ventilators and Compliance in Preventing Ventilator - Associated Pneumonia (VAP) in the ICU. *International Journal of Health Sciences* , 3(4), 704–710. <https://doi.org/10.59585/ijhs.v3i4.892>
- World Health Organization . Complementary feeding of infants and young children 6–23 months of age . Geneva : World Health Organization ; 202
- World Health Organization . Infant and young child feeding . Geneva : World Health Organization ; 2026
- World Health Organization Guidelines for complementary feeding of infants and young children 6–23 months of age . Geneva : World Health Organization ; 2023. ISBN 978-92-4-008186-4.

