

Original Article**The effect of health education on mothers' knowledge about choosing good complementary feeding for babies aged 6 to 24 months****Merince Yosefina Mailoa¹, Rifzul Maulina²**¹Coordinator Midwifery at Sagea Community Health Center, Indonesia²Department of Midwifery, Institute of Technology, Science, and Health RS dr Soepraoen, Indonesia**Abstract:**

Adequate nutrition during infancy and early childhood is essential for optimal growth and development. Appropriate complementary feeding is therefore important for meeting the nutritional needs of infants aged 6–24 months after exclusive breastfeeding. This study aimed to determine the effect of health education on mothers' knowledge regarding the selection of appropriate complementary foods for infants aged 6–24 months. A pre-experimental study using a one-group pretest–posttest design was conducted at Saga Health Center, Central Maluku. The study included 35 mothers of infants aged 6–24 months who were selected using total population sampling. Data were collected using a structured questionnaire assessing mothers' knowledge of complementary feeding. Knowledge scores before and after the intervention were compared using the Wilcoxon signed-rank test. The results showed a significant improvement in mothers' knowledge following the health education intervention. The analysis demonstrated a significant difference between pretest and posttest knowledge scores ($p < 0.001$), indicating that health education effectively improved mothers' understanding of appropriate complementary feeding practices. Health education can improve mothers' knowledge regarding appropriate complementary feeding for infants aged 6–24 months. Strengthening nutrition education through primary healthcare services may support appropriate feeding practices and contribute to optimal child growth and development.

Keywords:

complementary feeding, complementary foods, health education, infant nutrition, maternal knowledge

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**INTRODUCTION**

The first 1,000 days of life, spanning from conception to a child's second birthday, represent a critical window for growth, neurodevelopment, and long-term health outcomes. During this period, adequate nutrition is essential to support rapid physical growth, brain development, immune function, and metabolic programming (Black et al., 2013; Victora et al., 2021). Nutritional deficiencies occurring during early life can have irreversible consequences, including impaired cognitive development, reduced educational attainment, lower economic productivity, and increased

susceptibility to chronic diseases later in life (Dewey & Begum, 2011; Grantham-McGregor et al., 2007). Consequently, improving infant and young child feeding practices remains a global public health priority.

Breastfeeding is widely recognized as the optimal source of nutrition for infants during the first six months of life. The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) recommend exclusive breastfeeding for the first six months, followed by the introduction of nutritionally adequate and safe complementary foods while continuing breastfeeding up to two years of age or beyond (WHO & UNICEF, 2021). Although breast milk provides most of the nutrients required during early infancy, by approximately six months of age, an infant's nutritional requirements, particularly for energy, iron, zinc, and certain micronutrients, exceed what breast milk alone can supply (WHO, 2023). Therefore, the timely initiation of appropriate complementary feeding is essential to meet the growing nutritional demands of infants and young children.

Complementary feeding refers to the process of introducing solid, semi-solid, or soft foods in addition to breast milk when breast milk alone is no longer sufficient to meet nutritional requirements (WHO, 2023). Appropriate complementary feeding encompasses not only the timing of food introduction but also dietary diversity, meal frequency, food texture, nutrient density, food safety, and responsive feeding practices (Pan American Health Organization & WHO, 2003). Evidence suggests that optimal complementary feeding practices contribute significantly to preventing malnutrition, promoting healthy growth, and supporting cognitive development during early childhood (Dewey, 2013).

Despite global recommendations, inappropriate complementary feeding practices remain prevalent in many low- and middle-income countries, including Indonesia. Common problems include the premature introduction of complementary foods before six months of age, delayed initiation beyond six months, insufficient dietary diversity, inadequate meal frequency, and the provision of foods with poor nutritional quality (UNICEF, 2023). These practices may contribute to undernutrition, micronutrient deficiencies, growth faltering, and increased vulnerability to infectious diseases (Bhutta et al., 2013). Introducing complementary foods before six months of age may also interfere with exclusive breastfeeding and expose infants to foodborne pathogens due to immature gastrointestinal and immune systems (Victora et al., 2016).

Conversely, delayed or inadequate complementary feeding can result in insufficient nutrient intake during a period of rapid growth. Infants who do not receive age-appropriate complementary foods are at increased risk of iron deficiency, growth retardation, underweight status, wasting, and stunting (Dewey & Brown, 2003). Stunting, defined as low height-for-age, reflects chronic undernutrition and remains one of the most significant child health challenges worldwide. According to UNICEF, WHO, and the World Bank Group (2023), approximately 148 million children under five years of age were stunted globally in 2022. Stunting not only affects physical growth but is also associated with impaired cognitive development, reduced school performance, and diminished economic productivity in adulthood (Victora et al., 2008).

Indonesia continues to face substantial nutritional challenges among children under five years of age. Although improvements have been observed over the past decade, the prevalence of stunting, underweight, and wasting remains a major public health concern. According to the Indonesian Nutritional Status Survey (Survei Status Gizi Indonesia/SSGI), the national prevalence

of stunting among children under five was 21.6% in 2022, while underweight and wasting remain significant nutritional problems requiring continuous intervention (Ministry of Health of the Republic of Indonesia, 2023). These findings indicate that many Indonesian children continue to experience nutritional deprivation during critical periods of growth and development.

The burden of child malnutrition varies substantially across regions within Indonesia. Several provinces continue to report nutritional indicators above national targets, reflecting disparities in socioeconomic conditions, healthcare access, food security, sanitation, and caregiver knowledge. In many rural and remote communities, inappropriate infant and young child feeding practices remain prevalent and contribute to poor nutritional outcomes. Studies conducted in Indonesia have consistently identified maternal knowledge, educational level, household income, and access to nutrition information as important determinants of complementary feeding practices (Sari et al., 2022; Wulandari et al., 2021).

Among the various factors influencing complementary feeding practices, maternal knowledge plays a particularly important role. Mothers are generally the primary caregivers responsible for selecting, preparing, and providing food to infants and young children. Adequate maternal knowledge regarding the timing, composition, texture, frequency, and hygiene of complementary foods can positively influence feeding behavior and nutritional outcomes (Martin et al., 2014). Conversely, limited knowledge may result in inappropriate feeding practices, including reliance on nutritionally inadequate foods, incorrect food textures, and feeding schedules that do not meet children's developmental needs (Mukuria et al., 2016).

Previous studies have demonstrated a significant association between maternal knowledge and child nutritional status. Mothers with greater nutrition knowledge tend to provide more diverse diets, initiate complementary feeding at appropriate ages, and adhere more closely to recommended infant feeding guidelines (Beyene et al., 2015; Nguyen et al., 2014). Furthermore, maternal nutrition education has been identified as an effective intervention for improving infant and young child feeding practices and reducing the risk of malnutrition (Imdad et al., 2011). These findings highlight the importance of educational strategies aimed at increasing mothers' understanding of appropriate complementary feeding practices.

Health education is one of the most widely implemented approaches to improving maternal knowledge and promoting healthy feeding behaviors. Health education interventions can provide mothers with evidence-based information regarding infant nutritional requirements, age-appropriate food textures, dietary diversity, food preparation methods, feeding frequency, and hygiene practices. Such interventions may also address misconceptions and cultural beliefs that contribute to inappropriate feeding practices (Bhutta et al., 2008). Systematic reviews have shown that nutrition education interventions significantly improve complementary feeding behaviors and contribute to better child growth outcomes, particularly in resource-limited settings (Lassi et al., 2020; Imdad et al., 2011).

In Indonesia, health education regarding complementary feeding is routinely delivered through primary healthcare facilities, integrated health service posts (Posyandu), and maternal-child health programs. However, evidence suggests that knowledge gaps persist among mothers, particularly in rural areas where access to nutrition information may be limited (Ministry of Health of the Republic of Indonesia, 2023). Many mothers continue to provide complementary foods that lack dietary

diversity or do not match the developmental stage of the child. These practices may negatively affect children's appetite, nutritional intake, and growth outcomes.

A preliminary assessment conducted at Sagea Community Health Center identified several challenges related to complementary feeding practices among mothers of children aged 6–24 months. Interviews revealed that some mothers provided foods with inappropriate textures for the child's age, while others introduced foods that were difficult for young infants to chew and digest. Such practices indicate potential gaps in maternal knowledge regarding age-appropriate complementary feeding recommendations. Given the critical importance of the complementary feeding period and the influential role of maternal knowledge in shaping feeding practices, targeted health education interventions may offer an effective strategy for improving mothers' understanding and decision-making regarding infant nutrition.

Although numerous studies have examined complementary feeding practices in Indonesia, evidence regarding the effectiveness of health education interventions among mothers in remote areas of Eastern Indonesia remains limited. Understanding whether educational interventions can improve maternal knowledge is essential for developing effective community-based nutrition programs and supporting national efforts to reduce malnutrition among children under two years of age.

Therefore, this study aimed to determine the effect of health education on mothers' knowledge regarding the selection of appropriate complementary foods for infants aged 6–24 months at Sagea Community Health Center. The findings are expected to contribute to the evidence base supporting nutrition education interventions and provide practical recommendations for strengthening maternal and child health services in primary healthcare settings.

METHOD

This study employed a quantitative pre-experimental design using a one-group pretest–posttest approach. This design was selected to evaluate the effect of a health education intervention on mothers' knowledge regarding appropriate complementary feeding practices for infants aged 6–24 months. Participants' knowledge was assessed before the intervention (pretest) and reassessed after the intervention (posttest), allowing measurement of changes in knowledge scores attributable to the educational program. Although this design does not include a control group, it is widely used to assess the preliminary effectiveness of educational interventions in community health settings (Polit & Beck, 2021).

The study was conducted at Sagea Community Health Center (Puskesmas Sagea), Central Halmahera Regency, North Maluku Province, Indonesia. Data collection and implementation of the health education intervention were carried out in December 2023. The health center serves as the primary healthcare facility for the local community and provides maternal and child health services, including nutrition counseling and growth monitoring programs.

The target population consisted of all mothers with infants aged 6–24 months who were registered at Sagea Community Health Center during the study period. According to health center records, a total of 35 eligible mothers met the inclusion criteria. Because the study population was

relatively small, a total population sampling technique was employed, whereby all eligible mothers were recruited as study participants. Consequently, the final sample comprised 35 mothers of infants aged 6–24 months.

The inclusion criteria were: (1) mothers who had infants aged 6–24 months, (2) mothers registered at Sagea Community Health Center, (3) mothers who were willing to participate and provided informed consent, and (4) mothers who attended both the pretest and posttest sessions. Participants were excluded if they were unable to complete the study procedures or were absent during the health education intervention.

The intervention consisted of a structured health education session focusing on appropriate complementary feeding (MP-ASI) practices for infants aged 6–24 months. Educational content included the recommended age for introducing complementary foods, appropriate food texture according to developmental stage, meal frequency, dietary diversity, nutritional adequacy, food hygiene and safety, and common misconceptions regarding infant feeding. The educational session was delivered by trained health personnel using lecture-based presentations, discussions, and educational materials. Participants were encouraged to ask questions and actively engage in discussions to enhance understanding of the information provided.

Data were collected using a structured questionnaire developed to assess mothers' knowledge regarding complementary feeding practices. The questionnaire consisted of items covering the timing of complementary feeding initiation, appropriate food selection, food texture, feeding frequency, nutritional content, and food safety practices. Participants completed the questionnaire before the educational intervention (pretest) and immediately after the intervention (posttest). Higher scores indicated a greater level of knowledge regarding appropriate complementary feeding practices.

Data collection was conducted in three stages. First, participants were informed about the study objectives and procedures, and informed consent was obtained. Second, participants completed the pretest questionnaire to assess baseline knowledge regarding complementary feeding. Third, the health education intervention was administered, followed by completion of the posttest questionnaire to evaluate changes in knowledge after receiving the educational intervention.

Data were analyzed using descriptive and inferential statistical methods. Descriptive statistics were used to summarize participants' demographic characteristics and knowledge scores. The normality of the data distribution was assessed prior to inferential analysis. Because the knowledge score data were not normally distributed, the Wilcoxon Signed-Rank Test was used to compare pretest and posttest knowledge scores. Statistical significance was determined at a p-value of less than 0.05 ($p < 0.05$).

Participation in the study was voluntary, and all participants provided informed consent before enrollment. Participants were assured that all information collected would be kept confidential and used solely for research purposes. Personal identifiers were removed from the dataset to maintain participant anonymity throughout the study.

RESULT

Table 1. Distribution of Mothers' Knowledge Before and After Health Education (n = 35)

Knowledge level	Before education, n (%)	After education, n (%)
Good	10 (28.6)	29 (82.9)
Moderate	8 (22.9)	6 (17.1)
Poor	17 (48.6)	0 (0.0)
Total	35 (100.0)	35 (100.0)

Table 1 shows an improvement in mothers' knowledge following health education. Before the intervention, 10 (28.6%) mothers had good knowledge, 8 (22.9%) had moderate knowledge, and 17 (48.6%) had poor knowledge. After the intervention, the proportion with good knowledge increased to 29 (82.9%), while no participants remained in the poor-knowledge category.

Table 2. Wilcoxon Signed-Rank Test of Changes in Mothers' Knowledge Following Health Education (n = 35)

Comparison	Rank	n	Mean rank	Sum of ranks	Z	p-value
Posttest vs. pretest	Negative ranks	0	0.00	0.00	-5.409	<0.001
	Positive ranks	33	17.00	561.00		
	Ties	2	—	—		
Total		35				

The Wilcoxon signed-rank test (Table 2) showed that 33 participants had higher posttest knowledge scores, while none experienced a decrease, and two had unchanged scores. The difference between pretest and posttest knowledge scores was statistically significant ($Z = -5.409$, $p < 0.001$). These findings indicate that health education was associated with a significant improvement in mothers' knowledge regarding appropriate complementary feeding for infants aged 6–24 months.

DISCUSSION

The present study examined the effect of health education on mothers' knowledge of selecting appropriate complementary foods for infants aged 6–24 months at the Sagea Community Health Center. The findings demonstrated a statistically significant improvement in maternal knowledge following the educational intervention. The Wilcoxon Signed-Rank Test revealed a significant difference between pretest and posttest knowledge scores ($p < .001$), indicating that health education effectively enhanced mothers' understanding of appropriate complementary feeding practices. Furthermore, the positive rank results indicated that most participants experienced an increase in knowledge after receiving the intervention, and no participants showed a decline. These findings suggest that structured health education can be an effective strategy to improve maternal knowledge of infant and young child feeding practices.

The improvement in maternal knowledge observed in this study is consistent with the theoretical understanding that knowledge acquisition is a primary outcome of educational interventions. Health education provides individuals with opportunities to receive, process, and understand information that can subsequently influence attitudes and behaviors. In the context of infant nutrition, education equips mothers with essential knowledge about the timing of complementary feeding initiation, appropriate food textures for each developmental stage, dietary diversity, meal frequency, nutritional adequacy, and food safety practices. Enhanced knowledge enables mothers to make more informed decisions regarding infant feeding and nutritional care (WHO & UNICEF, 2021).

The findings of this study are consistent with previous evidence indicating that nutrition education interventions significantly improve maternal knowledge and infant feeding practices. Imdad et al. (2011), in a systematic review examining the effects of maternal education on complementary feeding, reported that educational interventions improved feeding practices and contributed to better nutritional outcomes among children. Similarly, Lassi et al. (2020) found that infant and young child feeding interventions, particularly those involving caregiver education, were associated with significant improvements in feeding behaviors and child nutrition indicators. These findings support the notion that knowledge-based interventions remain an important component of public health strategies aimed at reducing childhood malnutrition.

Maternal knowledge is recognized as one of the most influential determinants of complementary feeding practices. During the first two years of life, mothers are generally responsible for selecting, preparing, and providing food to their children. Consequently, their understanding of nutritional requirements directly influences feeding decisions and dietary quality. Research has consistently demonstrated that mothers with greater nutritional knowledge are more likely to introduce complementary foods at the recommended age, provide diverse, nutrient-dense foods, and follow recommended feeding guidelines (Martin et al., 2014; Nguyen et al., 2014). Therefore, increasing maternal knowledge through health education may contribute not only to improved understanding but also to positive behavioral changes that support optimal child growth and development.

The significant increase in knowledge observed among participants may be attributed to the educational approach employed during the intervention. The health education sessions provided clear, structured information on appropriate complementary feeding practices and encouraged active participation through discussion and question-and-answer activities. Educational theory suggests that active engagement enhances learning outcomes because participants are more likely to retain information when they interact with educational content rather than passively receive it (Polit & Beck, 2021). The opportunity to discuss feeding challenges and clarify misconceptions may have strengthened participants' understanding of the material presented.

Another possible explanation for the observed improvement is the limited access to nutrition information among participants prior to the intervention. In many rural and remote communities, mothers may have limited opportunities to receive evidence-based information regarding infant and young child feeding. Health education interventions can therefore address critical information gaps by providing accurate and practical guidance tailored to local needs. The preliminary observations conducted at Sagea Community Health Center indicated that some mothers provided complementary foods with inappropriate textures or introduced foods that were not suitable for their

children's developmental stage. Such practices may reflect inadequate exposure to nutrition education and highlight the need for continuous educational support at the community level.

The findings also support the growing body of literature emphasizing the importance of maternal education in improving child nutritional outcomes. According to Black et al. (2013), inadequate infant feeding practices are among the primary underlying causes of child undernutrition worldwide. Appropriate complementary feeding during the period from 6 to 24 months is particularly important because nutritional requirements increase rapidly while breast milk alone is no longer sufficient to meet energy and micronutrient needs (Dewey, 2013). Consequently, caregivers must possess adequate knowledge regarding food selection and feeding practices to ensure that children receive sufficient nutrients for healthy growth and development.

The period between 6 and 24 months represents a critical stage in child development because growth velocity remains high and dietary transitions occur rapidly. During this period, inappropriate complementary feeding may result in nutrient deficiencies, growth faltering, increased susceptibility to infection, and long-term developmental consequences (Dewey & Brown, 2003). Conversely, the timely introduction of nutritionally adequate complementary foods improves nutritional status and developmental outcomes. Therefore, interventions that improve maternal knowledge during this critical period have the potential to generate substantial public health benefits.

The findings of this study may also be interpreted within the broader framework of child malnutrition prevention. Child undernutrition remains a major public health challenge globally and in Indonesia. According to UNICEF, WHO, and the World Bank Group (2023), millions of children continue to experience stunting, wasting, and underweight conditions resulting from inadequate dietary intake and suboptimal feeding practices. In Indonesia, despite recent improvements, the prevalence of stunting remains above national and international targets (Ministry of Health of the Republic of Indonesia, 2023). Improving complementary feeding practices through maternal education may therefore represent an important strategy for addressing these persistent nutritional challenges.

The positive impact of health education observed in this study is consistent with behavioral change theories, suggesting that knowledge is a prerequisite for behavior modification. Although knowledge alone may not guarantee behavioral change, it provides the foundation upon which attitudes, intentions, and practices are developed. Mothers who understand their children's nutritional needs are more likely to recognize the importance of age-appropriate feeding practices and adopt healthier feeding behaviors. Previous studies have demonstrated that nutrition education interventions can improve dietary diversity, meal frequency, and feeding responsiveness among caregivers, thereby contributing to improved child nutrition outcomes (Bhutta et al., 2013; Lassi et al., 2020).

An important finding of the present study is that no respondents demonstrated a decrease in knowledge following the intervention. This result suggests that the educational content was understandable and well-received by participants. Additionally, the fact that only two participants maintained their baseline knowledge levels, while the majority improved, indicates that the intervention was broadly effective across participants with varying levels of prior knowledge. This outcome highlights the potential applicability of health education programs within primary healthcare settings serving diverse populations.

From a practical perspective, the study findings underscore the important role of community health centers in promoting appropriate infant and young child feeding practices. Primary healthcare facilities such as Puskesmas are strategic platforms for delivering nutrition education because they maintain regular contact with mothers and children through maternal and child health services, immunization programs, growth monitoring, and community outreach initiatives. Integrating structured complementary feeding education into routine maternal and child health services may enhance caregivers' knowledge and improve child nutrition outcomes.

Despite the positive findings, several limitations should be acknowledged. First, the study employed a one-group pretest–posttest design without a control group, limiting the ability to establish causal relationships with certainty. Second, the relatively small sample size and single-site setting may limit the generalizability of the findings to other populations. Third, the study evaluated knowledge outcomes only and did not assess whether increased knowledge translated into long-term behavioral changes or improvements in children's nutritional status. Future studies should consider using randomized controlled or quasi-experimental designs with larger sample sizes and longer follow-up periods to evaluate the sustainability of educational effects and their impact on child health outcomes.

Overall, the findings provide evidence that health education is an effective intervention for improving mothers' knowledge of selecting appropriate complementary foods for infants aged 6–24 months. Given the critical role of maternal knowledge in shaping feeding practices and child nutrition outcomes, strengthening nutrition education programs within primary healthcare services may help prevent malnutrition and promote optimal growth and development during the first 1,000 days of life.

CONCLUSION

This study demonstrated that health education significantly improved mothers' knowledge of selecting appropriate complementary foods for infants aged 6–24 months at Sagea Community Health Center. The significant increase in post-intervention knowledge scores indicates that educational interventions effectively enhance mothers' understanding of age-appropriate complementary feeding practices, including the timing of introduction, food selection, texture, nutritional adequacy, and feeding frequency. These findings highlight the importance of integrating regular nutrition education into maternal and child health services at primary healthcare facilities. Strengthening educational programs delivered by healthcare professionals, particularly midwives and nutrition personnel, may improve mothers' knowledge and support appropriate complementary feeding practices. Future studies should examine whether improvements in maternal knowledge led to sustained behavioral changes and better nutritional outcomes among infants and young children.

CONFLICT OF INTEREST

There is no conflict of interest.

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