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Factors associated with the practice of early complementary feeding and its impact on the nutritional status of infants aged 7 to 23 months

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Abstract

Background: Proper complementary feeding plays a crucial role in influencing an infant's nutritional status. Key factors to consider when introducing complementary foods include the starting age, the consistency and texture of the food, the portion size, and the frequency of feeding.
Purpose: To identify factors related to the practice of early complementary feeding and their impact on the nutritional status of infants aged 7 to 23 months.
Method: A quantitative analytical research with a cross sectional design. Respondent were selected using purposive sampling and the Slovin formula, resulting in 51 respondent from Sipayung Village. Univariate statistical analysis was conducted, including chi square test.
Results: The chi-square test revealed a significant relationship between nutritional status and factors such as the age of feeding onset (p=0.015), consistency of delivery (p=0.006), portion size (p=0.000), and feeding frequency (p=0.000). In the "good nutrition" category, the majority were in alignment with the recommended feeding guidelines: 41 (87.2%) for age of onset, 40 (88.9%) for consistency of delivery, 40 (90.0%) for portion size, and 41 (91.1%) for feeding frequency. On the other hand, malnutrition was more common in those not following the appropriate guidelines: 3 (75.0%) for age of onset, 4 (66.7%) for consistency of delivery, 5 (71.4%) for portion size, and 5 (83.3%) for feeding frequency.
Conclusion: A significant relationship exists between the practice of providing complementary breastfeeding and factors such as the age of onset of feeding, consistency of delivery, quantity of food, and feeding frequency.

Keywords: **Age of Onset; Consistency of Delivery; Feeding Frequency; Nutritional Status; Portion Size.**

INTRODUCTION

The first thousand days of a child's life span from pregnancy to the age of two. This period is crucial for a child's growth, development, and overall health, requiring proper nutrition. At six months old, babies begin receiving supplementary nutrition in the form of complementary breastfeeding or solid foods to meet their nutritional needs (Rotua, Novayelinda, & Utomo, 2018).

Providing the right complementary foods alongside breast milk plays a crucial role in a child's growth, development, and cognitive abilities. Improper feeding practices can lead to nutritional problems, such as malnutrition. The World Health Organization (WHO) has highlighted malnutrition as a major threat to global health. It is believed to be the leading cause of death for 3.1 million children annually. According to a report from the United Nations International Children's Emergency Fund (UNICEF), the number of children under five suffering from malnutrition worldwide reached 767.9 million in 2021, marking a 6.4% increase from 721.7 million in 2020 (Megasari, & Mariyani, 2024).

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UNICEF estimates that among the 767.9 million children, 45.4 million children under five worldwide suffer from acute malnutrition. The majority of these children live in conflict zones, impoverished conditions, and areas with limited access to nutritional health services. Regionally, the highest percentage of children under five experiencing acute malnutrition is in South Asia, with 14.7%. This is followed by West and Central Africa at 7.2%, the Middle East and North Africa at 6.3%, and East and Southern Africa at 5.3%. In East Asia and the Pacific, 3.7% of children under five are affected by acute malnutrition (Mufida, Widyaningsih, & Malligan, 2015).

Indonesia is recorded as having the highest number of people suffering from malnutrition in the Southeast Asia region. According to the Indonesian Ministry of Health's Nutritional Status report, the prevalence of malnutrition among children under five was 17.1% in 2022, marking an increase of 0.1 percentage points from 17% in 2020 (Annur, 2023). In 2021, Banten Province was ranked among the top five regions in Indonesia with the highest stunting rates, with 294,862 children under five (24.50%) affected. The districts with the highest rates include Pandeglang Regency at 37.8%, followed by Lebak Regency at 27.3% (Ongko, Willyana, Liman, & Atzmardina, 2023).

Providing inappropriate or age-inappropriate complementary foods can interfere with meeting a baby's nutritional needs and may also lead to digestive issues. Babies under six months old are not yet ready for semi-solid foods, and introducing them too early can result in digestive problems such as diarrhea and bloody stools. This is because their digestive systems are still developing and are not fully capable of functioning properly. Improper complementary feeding can lead to unmet nutritional needs, while overfeeding can result in overweight and obesity. Children who experience malnutrition, undernutrition, or overnutrition will likely face stunted growth and development, preventing optimal growth and development (Fransiska & Sugiatini, 2024).

Complementary foods are introduced at six months to meet the baby's nutritional needs beyond breast milk. At this age, breast milk can only fulfill about two-thirds of the baby's nutritional needs. By 9-12 months, it meets about half, and by 12-24 months, it provides only one-third of the required nutrition. The World Health Organization (WHO) recommends several factors to consider when providing complementary foods, including the right time to start, the texture and type of food, the number of servings, and the frequency of feeding. The texture of the food should match the baby's developmental stage, ensuring it is easy to digest and preventing malnutrition (Pibriyanti & Atmojo, 2017).

RESEARCH METHOD

A quantitative analytical research with a cross sectional design. The research was conducted in May-June 2023 in Sipayung Village, Cipanas District, Lebak Regency. The independent variables in this research were the practice of complementary breastfeeding, including the age of initial administration, consistency, amount, and frequency of feeding. The dependent variable was the nutritional status of infants aged 7 to 23 months.

Purposive sampling and the Slovin formula were used to select 51 respondents who met specific inclusion and exclusion criteria. The inclusion criteria were infants aged 7-23 months, babies weighed at the integrated health post, and mothers willing to participate as respondents. The exclusion criteria included infants born prematurely and those suffering from infections or chronic conditions during the study, such as diarrhea, chickenpox, cough, seizures, or tuberculosis.

The researcher used a questionnaire as the instrument. The nutritional status of the infants was assessed using infant cohort data based on weight-for-age from March 2023. Nutritional status was categorized as good nutrition if the Z-score was > +2 SD and malnutrition if the Z-score was <-3 SD. The complementary feeding practices were assessed through 12 questions, divided into four indicators: age of feeding initiation, consistency, amount, and frequency of complementary feeding. These questions included both positive and negative statements.

The data were analyzed using univariate frequency distribution analysis and bivariate chi-square analysis. Ethical approval for this research was obtained from the Health Research Ethics Committee of the Nursing School of PPNI, West Java, under number No. 27/KEPK/STIKEP/PPNI/JABAR/II/2023, dated February 17, 2023.

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RESEARCH RESULTS

Table 1. Nutritional Status and Complementary Feeding (N=51)

Variables	Results
Nutritional Status of Infants Age 7 to 23 Months (n/%)	
Well-nourished	42/82.4
Undernourishment	9/17.6
The Practice of Early Complementary Feeding in Infants Aged 7 to 23 Months (n/%)	
Appropriate	37/72.5
Inappropriate	14/27.5

Table 1 displays the characteristics of the respondents, indicating that the majority of infants aged 7 to 23 months had good nutritional status, with 42 (82.4%) classified as well-nourished. In terms of complementary feeding practices, the majority were found to be inappropriate, with 37 (72.5%) of the cases.

Table 2. The Practice of Early Complementary Feeding in Infants (N=51)

Characteristics	Results
Age of Onset of Feeding (n/%)	
Appropriate	47/92.2
Inappropriate	4/7.8
Consistency of Supply (n/%)	
Appropriate	45/88.2
Inappropriate	6/11.8
Portion Size (n/%)	
Appropriate	44/86.3
Inappropriate	7/13.7
Frequency of Feeding (n/%)	
Appropriate	45/88.2
Inappropriate	6/11.8

Table 2 shows the majority of respondents adhered to the appropriate age for starting complementary feeding, with 47 (92.2%) following the correct timing. Most respondents also provided the correct consistency of feeding, with 45 (88.2%) doing so. Additionally, 44 (86.3%) respondents gave the appropriate quantity of complementary foods, while 45 (88.2%) maintained the proper frequency of feeding.

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Table 3. The relationship between the practice of early complementary feeding and the nutritional status of infants aged 7 to 23 months (N=51)

Variable	Nutritional Status		*p-value*	OR
	Well-nourished	Undernourishment		
Age Onset of Feeding (n/%)				
Appropriate	41/87.2	1/25.0	0.015	20.500
Inappropriate	6/12.8	3/75.0		
Consistency of Delivery (n/%)				
Appropriate	40/88.9	2/33.3	0.006	16.000
Inappropriate	5/11.1	4/66.7		
Quantity of gift (n/%)				
Appropriate	40/90.0	2/28.6	0.000	25.000
Inappropriate	4/9.1	5/71.4		
Frequency of Feeding (n/%)				
Appropriate	41/91.1	1/16.7	0.000	51.250
Inappropriate	4/8.9	5/83.3		

The results of the chi-square test indicated a significant relationship between nutritional status and several factors: age of onset of feeding (p=0.015), consistency of delivery (p=0.006), quantity of feeding (p=0.000), and frequency of feeding (p=0.000). In the well-nourished category, the majority were aligned with the appropriate practices for the age of onset of feeding (41 or 87.2%), consistency of delivery (40 or 88.9%), quantity of feeding (40 or 90.0%), and frequency of feeding (41 or 91.1%). In contrast, those with undernourishment were more likely to be in the categories with inappropriate practices: age of onset of feeding (3 or 75.0%), consistency of delivery (4 or 66.7%), quantity of feeding (5 or 71.4%), and frequency of feeding (5 or 83.3%).

The odds ratios (OR) showed that infants with appropriate age of onset of feeding had an OR of 20.500, indicating they were 20.5 times more likely to have good nutritional status compared to those with inappropriate feeding onset. For consistency of feeding, the OR was 16.000, meaning infants with appropriate consistency had a 16 times higher chance of having good nutritional status compared to those with inappropriate consistency. The appropriate quantity of feeding had an OR of 25.000, indicating a 25 times greater chance of good nutritional status. Lastly, the appropriate frequency of feeding had the highest OR of 51.250, meaning infants who were fed at the correct frequency were 51.25 times more likely to have good nutritional status.

DISCUSSION

Children need a balanced intake of nutrients to maintain good nutritional health and ensure proper growth. This is especially important because children are the most vulnerable group to the negative effects of nutritional deficiencies. Nutritional status is influenced by the full range of nutrients required by the body, as well as factors that determine the quantity of these nutrients, along with their absorption and utilization (Mariyati & Rezania, 2021). Malnutrition can result from direct causes such as poor diet and infectious diseases that affect the child. Indirect factors include family food security, child-rearing practices, access to clean water and healthcare services, parental knowledge about nutrition, and the introduction of complementary foods alongside breastfeeding (Megasari & Mariyani, 2024).

Research has shown a 25.6% prevalence of malnutrition (<-2SD), while 84.1% of children had good nutritional status. Similarly, studies indicate that

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most infants showed weight gain (82.5%) (Kopa, Togubu, & Syahruddin, 2021).

It is assumed that most children with good nutritional status have growth, particularly in terms of weight, that aligns with their age. This condition arises because the nutrients their bodies need are being met. Factors contributing to malnutrition in infants aged 7 to 23 months include infectious diseases, improper parenting practices, lack of parental knowledge about proper nutrition, and inappropriate complementary food practices in terms of age of introduction, consistency, quantity, and frequency. Therefore, it is essential to improve mothers' knowledge about appropriate complementary feeding for children aged 7 to 23 months. This will help optimize their children's growth, prevent susceptibility to infections, and improve their nutritional status.

In children aged 6-24 months, the term "complementary foods" refers to the food given alongside breast milk. Good complementary foods must meet key requirements, such as being healthy, easy to digest, and containing adequate nutrients, especially energy and protein. Babies generally show readiness for complementary foods when they begin putting their hands in their mouths and chewing, reach double their birth weight, respond and open their mouths when offered food, lose their tongue-thrust reflex, show more interest in food than in a bottle, can sit upright, and display curiosity about others' food. The practice of complementary feeding is influenced by the initial age of introduction, consistency, quantity, and frequency (Nadeak, Siagian, Sormin, & Juwita, 2023).

It was found that 71.7% of complementary foods were provided on time, with 68.3% of children receiving the appropriate complementary food, and 61.1% receiving the correct type of complementary foods. (Yaneli, FIkawati, Syafiq, & Geminy, 2021).

The researchers believe that most children aged 7 to 23 months who receive appropriate breastfeeding practices are being given proper complementary foods. These foods are introduced after 6 months, with the correct consistency, quantity, and frequency suitable for the child's age. This is because mothers are aware of the right time to start complementary feeding, which occurs when the child reaches 6 months, begins putting their hands in their mouth, shows interest in food over bottles, and can sit up steadily, indicating their digestive system is ready for foods beyond breast milk.

There are three types of complementary foods: pureed foods, soft foods, and family meals or solid foods. When first introduced, babies need time to adapt to new foods, as they were previously only fed breast milk (Prabantini, 2010). Consequently, complementary foods should be introduced gradually, starting with slightly liquid consistency and thickening over time to suit the development of the baby's digestive system. The thickness of the complementary foods can affect whether the baby's nutritional needs are met, with thicker foods providing more energy than thinner porridge (Azzahroh, Sari, & Lubis, 2021).

According to the study results, 61.1% of the respondents administered complementary foods at the appropriate time. The majority (65%) of respondents correctly provided complementary foods in the right form (Widyawati, Febry, & Destriania, 2016). Researchers assume that most mothers give complementary foods according to the right consistency, indicating they understand the gradual process of transitioning from crushed foods to soft foods, and eventually to family meals, which is necessary for the baby's digestive system development.

The quantity refers to as the amount (in terms of numbers or things grouped together), in this context referring to the portion of complementary foods given according to the baby's age. Frequency refers to how often complementary foods are given based on the baby's age. It is essential that complementary foods are given appropriately and according to the baby's needs, considering their small stomach capacity. The amount of food provided should be adjusted based on the baby's response, with the mother gradually increasing the portion as the child grows (Lestiarini & Sulistyorini, 2020).

The research findings indicate that 61.1% of children received the correct amount of complementary foods. Additionally, the majority (70%) of doses were appropriate, with 69.8% of children being given the proper quantity of complementary

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foods. (Anggarini, Yunita, Yuneta, Kartikasari, & Ropitasari, 2020).

Researchers believe that most mothers provide the appropriate amount of food because they are knowledgeable about the correct portion sizes based on the baby's age. This knowledge is often gained from sources such as the Maternal and Child Handbook and advice from healthcare providers. For instance, for babies aged 6-8 months, the recommended amount is 2 full tablespoons per meal, for babies aged 9-11 months, it's about half a 250 ml bowl per meal, and for babies aged 12-24 months, it's approximately 3/4 of a 250 ml bowl per meal.

For babies aged 6-8 months, the recommended frequency of complementary feeding is 2-3 main meals and 1-2 snacks per day. For babies aged 9-23 months, the frequency should be 3-4 main meals and 1-2 snacks daily. Inadequate frequency of complementary feeding increases the risk of advanced malnutrition and contributes to high rates of malnutrition among toddlers. Since a baby's stomach capacity is limited (around 30 grams per kg of body weight, or about 200 ml), it's better to distribute meals into main meals (morning, afternoon, and evening) and snacks between meals, along with 2-3 breast or formula milk feeds daily (Mirania, & Louis, 2021).

The study found that 61.1% of children received complementary foods at the appropriate frequency. Additionally, 72.2% of feeding frequencies were deemed appropriate, and 69.8% of children received complementary foods in line with the recommended frequency (Hasanah, Mastuti, & Ulfah, 2019).

Researchers suggest that most babies aged 7 to 23 months receive complementary foods at the correct frequency, indicating that most mothers understand the importance of providing 2 to 3 main meals and 1 to 2 snacks per day. This practice is based on the understanding that it takes about 2 to 3 hours for food to pass through the baby's digestive system. Mothers divide the food into main meals and snacks to prevent boredom, ensuring that the child is not solely reliant on main meals.

Many behaviors, often stemming from a lack of knowledge about proper feeding practices and harmful habits, contribute directly and indirectly to malnutrition in children. Energy for the body primarily comes from carbohydrates, fats, and proteins. Proteins, in the form of essential amino acids, are crucial for growth and repairing damaged cells. Fats provide calories, essential fatty acids, and aid in the absorption of vitamins A, D, E, and K. The recommended carbohydrate intake is 60-70% of total energy (Almatsier, 2018).

The research also found a significant relationship between infant nutritional status and breastfeeding complementary foods ($p = 0.001$), the relationship between giving complementary foods ($p = 0.02$) and body weight, and the relationship between breastfeeding ($p = 0.000$) and the nutritional status of children aged 6-24 months. (Soedibyo, & Winda, 2007).

Researchers assume a relationship between the practice of giving complementary foods with the nutritional status of infants aged 7 to 23 months, this is because at the time of feeding mothers pay attention to when the start of the time of giving complementary foods is after the age of 6 months; consistency of complementary foods starting from crushed food, soft food and family food; The amount given to infants starts from small police stations to large portions with a frequency of 2 to 3 times a day main meals and 1 to 2 times interlude meals. The regularity based on the time of administration, accuracy in the consistency of complementary foods, the amount and frequency given makes the digestive process in the baby's body run optimally so that the absorption process of nutrient levels in the baby's body is also absorbed perfectly so that it has an impact on the baby's nutritional status to be good or normal.

Based on the results of the Chi-Square test, it was found that the value of $p = 0.015 < 0.05$, which means there is a significant relationship between the practice of giving complementary foods based on the initial age of administration and the nutritional status of babies aged 7 to 23 months. The OR value is 20.500, so it can be stated that babies with the practice of giving complementary foods based on the appropriate initial age of giving are 20.500 times more likely to have good nutritional status compared to babies with the practice of giving complementary foods based on the inappropriate starting age of giving.

The appropriate age to receive complementary foods is between 6-23 months, at which age the child

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has reached a general stage of development (chewing, swallowing, digestion and secretion) that allows the child to be given foods other than breast milk. An increase in the incidence of malnutrition is manifested if complementary foods is given too early and late in giving complementary foods. This is because exclusive breastfeeding does not meet energy and protein needs after six months of age; lack of iron, zinc, and anemia due to late introduction of foods such as meat and foods with mineral sources; and eating disorders in infants, such as refusal of solid food, vomiting, or choking. Exclusive breastfeeding without food during 6 months of age can reduce the incidence of diarrhea and respiratory diseases when compared to exclusive breastfeeding for 3 or 4 months. While late breastfeeding will cause growth disorders, micronutrient deficiencies, and infectious diseases (Ministry of Health of the Republic of Indonesia, 2017).

Researchers believe there is a connection between the timing of introducing complementary foods and the nutritional status of infants aged 7 to 23 months. When mothers introduce complementary foods at the right time, typically after 6 months, the child has reached a developmental stage (including chewing, swallowing, digestion, and secretion) that allows the introduction of foods beyond breast milk. This indicates that the baby's digestive system is ready to process solid foods, enabling effective nutrient absorption and proper fulfillment of the baby's nutritional needs, which positively impacts the infant's nutritional status.

In contrast, introducing complementary foods too early, before the baby's digestive system is ready, can lead to growth problems. This is because the infant is more susceptible to infections that can affect growth, ultimately impacting the nutritional status. Complementary foods are introduced when breast milk alone can no longer meet the infant's growing nutritional needs. However, premature introduction may cause issues like diarrhea or constipation, due to the infant's immature digestive system.

Research findings show that the Chi-Square test yielded a p-value of 0.006 < 0.05, indicating a significant relationship between the practice of providing complementary foods with the appropriate consistency and the nutritional status of infants aged 7 to 23 months. The OR value of 16.000 suggests that babies receiving complementary foods with the correct consistency are 16 times more likely to have good nutritional status compared to babies receiving inappropriate consistency.

Introducing complementary foods in line with the baby's developmental stages helps develop chewing skills, particularly in the critical 6-9 month phase. Initially, babies aged 6-8 months are given crushed foods, followed by mashed or chopped foods for those aged 9-11 months, and finally, family foods suitable for babies aged 12-23 months. If complementary foods are introduced with inappropriate textures, such as rough foods, they may cause stomach discomfort due to underdeveloped stomach muscles. On the other hand, overly thin foods may lack sufficient energy content (Supartini, 2004)..

Researchers believe there is a link between the consistency of complementary foods and the nutritional status of infants aged 7 to 23 months. When mothers provide complementary foods that match the appropriate consistency for the baby's age, the digestive process works optimally, and the development of gastric muscles progresses as needed. For example, foods should start as thin or crushed for infants aged 6-8 months, then progress to soft foods for babies aged 9-11 months, and finally to family-style foods for infants aged 12-23 months. This gradual change prevents digestive issues. If the texture of the complementary foods is too dense or hard, it can overwork the baby's digestive system, especially if not introduced at the right developmental stage. Complementary feeding also serves to help babies learn how to chew, swallow, and explore different foods, not just gain weight.

The period of complementary feeding is a critical stage of growth, during which children are vulnerable to malnutrition. This vulnerability often arises when complementary foods lack sufficient quantity and nutritional quality. The energy content of complementary foods varies from 0.6 to 1.0 kcal per gram. If the food has higher energy content, smaller portions can meet the infant's energy needs, while diluted foods may require larger volumes to provide adequate energy (Nasar, 2005).

Researchers also observe a relationship between the quantity of complementary foods and the

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nutritional status of infants aged 7 to 23 months. Adequate portions of complementary foods provide sufficient nutrients, leading to improved nutritional status. However, if too little food is given, the baby may not receive enough nutrients. The amount of food should be tailored to the baby's readiness and ability to handle it.

Providing complementary foods with the correct frequency significantly increases the chances of maintaining good nutritional status. Infants fed appropriately based on frequency are 51.250 times more likely to have good nutritional status compared to those given complementary foods too infrequently. For babies aged 6-8 months, the recommended frequency is 2-3 main meals per day and 1-2 snacks, while for infants aged 9-23 months, it is 3-4 main meals and 1-2 snacks per day. Giving complementary foods with improper frequency increases the risk of malnutrition and contributes to its high prevalence. Since babies' stomachs have limited capacity, around 30 grams per kilogram of body weight or about 200 ml, food should be distributed throughout the day in main meals and snacks, with breast milk or formula given 2-3 times a day (Hidayati, 2014).

There is a clear link between the frequency of complementary feeding and the nutritional status of infants aged 7 to 23 months. When the frequency of main meals and snacks is appropriate, it prevents babies from getting bored with food and ensures smooth digestion. Proper frequency of food intake helps the digestive system process food continuously, improving nutrient absorption and promoting healthy growth. If feeding frequency is inadequate, it can lead to malnutrition or over nutrition.

CONCLUSION

There is a significant association between the practice of providing complementary breastfeeding and factors such as the age of onset of feeding, consistency of delivery, quantity of feeding, and frequency of feeding.

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