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Relationship Between Early Complementary Feeding and Nutritional Status of Infants Aged 6-12 Months

Nisrina Nur Fathiyah[1A-E], M. Rachmat Kasmad[2B-D], Muh.Said Hasan[3B-D*]

[1,2,3] Universitas Negeri Makassar, Sulawesi Selatan, Indonesia

nisrina.design@gmail.com[1], m.rachmat.k@unm.ac.id[2], said75hasan@unm.ac.id[3*]

ABSTRACT

Timely complementary feeding is one of the important factors supporting an infant's nutritional status in early life. Introducing complementary food too early may affect the adequacy of nutrient intake and increase the risk of nutritional problems in infants. This study aimed to determine the relationship between the timing of complementary feeding introduction and the infant's nutritional status. This study was a quantitative research with a cross-sectional design. The sample consisted of 58 respondents selected using a purposive sampling technique. Data on the timing of complementary feeding were collected through interviews using a questionnaire, while data on nutritional status were obtained through anthropometric measurements. Data were analyzed using the Spearman Rho Test. The result showed a significant relationship between the timing of complementary feeding introduction and the infant's nutritional status, with a correlation coefficient of -0,349 and a significant value of p = 0,007 (p < 0,05). The researcher concluded that the direction of the relationship indicates that the earlier complementary feeding is introduced, the lower the infant's nutritional status tends to be.

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INTRODUCTION

Infancy is a golden period that plays an important role in determining a child's growth and development in later stages of life. During this period, adequate nutritional intake becomes one of the main factors supporting optimal health and development. One of the essential efforts to fulfil infants' nutritional needs is exclusive breastfeeding during the first six months of life, followed by the introduction of complementary feeding (MP-ASI) after the infant reaches six months of age. The World Health Organisation (WHO) recommends that complementary feeding begin at six months because, at this age, the infant's digestive system is considered sufficiently mature to receive foods other than breast milk. However, the practice of early complementary feeding is still commonly found in the community and may negatively affect the nutritional status of infants.

Nisrina Nur Fathiyah[1A-E*], M. Rachmat Kasmad[2B-D], Muh.Said Hasan[3B-D]
said75hasan@unm.ac.id[3*]

The introduction of complementary feeding before six months of age may increase the risk of digestive disorders, diarrhoea, infections, malnutrition, and stunting because the infant's digestive system is not yet fully developed. In addition, early complementary feeding may reduce breast milk intake, resulting in inadequate nutritional fulfilment. According to the Indonesian Nutritional Status Survey (SSGI) 2024, the national prevalence of stunting remained 19.8%, underweight 16.8%, wasting 6.2%, and overweight 3.4%. In South Sulawesi Province, the prevalence of stunting was even higher than the national average, reaching 23.3%. These findings indicate that nutritional problems among infants remain a significant public health concern, particularly those associated with inappropriate complementary feeding practices.

Several previous studies have reported a relationship between early complementary feeding and infant nutritional status. Rosdiana et al. (2024) found that a history of early complementary feeding was significantly associated with stunting among infants under 24 months of age. Astuti (2023), in a study conducted at a community health post in East Jakarta, also reported a significant relationship between complementary feeding before six months of age and stunting incidence, with a p-value of 0.001. Furthermore, Cut Tasya Ismi et al. (2023) found that infants who received complementary feeding earlier than recommended tended to have poorer nutritional status compared to those who received complementary feeding at the appropriate age.

Similarly, Friska Sitorus et al. (2023) reported that the appropriateness of complementary feeding timing was significantly associated with the nutritional status of infants aged 6–12 months in Gedung Johor, Medan. Infants who received complementary feeding according to the recommended age were more likely to have a normal nutritional status than those who received inappropriate complementary feeding. Another study by Lutfian (2021) also demonstrated that early complementary feeding was associated with a higher risk of malnutrition among infants aged 6–12 months. These findings consistently suggest that the timing of complementary feeding is an important factor influencing infant nutritional status.

Although many studies have examined the relationship between early complementary feeding and nutritional status, research specifically focusing on infants aged 6–12 months in the working area of Tamalanrea Public Health Center is still limited. In addition, social and community characteristics in each region may influence complementary feeding practices and infant nutritional status differently. A preliminary study conducted at Tamalanrea Public Health Center found that approximately 12% of infants aged 6–12 months had received complementary feeding as early as two months of age, while cases of undernutrition and stunting were still identified among infants. These conditions indicate the need for further investigation regarding the relationship between early complementary feeding and infant nutritional status in this area.

Therefore, this study aimed to analyse the relationship between early complementary feeding and the nutritional status of infants aged 6–12 months at Tamalanrea Public Health Center. This study is expected to provide scientific evidence regarding early complementary feeding practices and their impact on infant nutritional

Nisrina Nur Fathiyah[1A-E*], M. Rachmat Kasmad[2B-D], Muh.Said Hasan[3B-D]
said75hasan@unm.ac.id[3*]

status. The novelty of this study lies in its focus on infants aged 6–12 months in the working area of Tamalanrea Public Health Centre using an observational analytic approach with nutritional status assessment based on weight-for-length anthropometric indicators. The findings of this study are expected to contribute to strengthening nutritional education and promoting appropriate complementary feeding practices in the community.

METHODS

This study employed a quantitative observational analytic approach using a cross-sectional design to examine the relationship between early complementary feeding (MP-ASI) and the nutritional status of infants aged 6–12 months. A cross-sectional design was considered appropriate because the independent and dependent variables were measured simultaneously at a single point in time without any experimental intervention. This design is widely used in public health and nutrition research to identify associations between feeding practices and nutritional outcomes in infants.

The study was conducted from 13–26 November 2025 at Tamalanrea Public Health Center, Makassar, South Sulawesi, Indonesia. The target population consisted of mothers who had infants aged 6–12 months registered in the working area of Tamalanrea Public Health Center, with a total population of 142 infants. A purposive sampling technique was used to recruit respondents who met the inclusion criteria. The minimum sample size was calculated using the Cochran formula for finite populations, resulting in 58 respondents. Inclusion criteria included mothers who had infants aged 6–12 months, were willing to participate in the study, and signed informed consent forms. Respondents who did not complete the questionnaire or anthropometric measurements were excluded from the study.

Two variables were examined in this study. Early complementary feeding (MP-ASI) was treated as the independent variable, while infant nutritional status was considered the dependent variable. Data regarding complementary feeding practices were collected using a structured questionnaire adapted from the Child Feeding Questionnaire developed by Cholishotun Nufus (2022). The questionnaire assessed the age of introduction, type and texture of food, amount of food, and feeding frequency. Nutritional status was assessed using anthropometric measurements based on the weight-for-length (WLZ) index according to WHO growth standards. Infant body weight was measured using a calibrated digital baby scale with 0.1 kg precision, while body length was measured using an infantometer with 0.1 cm precision. Nutritional status categories were determined using the WHO Anthro software and classified according to z-score standards.

Data collection was carried out in several stages. First, the researchers obtained ethical and administrative permission from the related institutions and coordinated with health staff and posyandu cadres in the working area of Tamalanrea Public Health Centre. During the implementation phase, respondents who agreed to participate signed

Nisrina Nur Fathiyah[1A-E*], M. Rachmat Kasmad[2B-D], Muh.Said Hasan[3B-D]
said75hasan@unm.ac.id[3*]

informed consent forms before completing the questionnaire. Anthropometric measurements were then performed directly by the researchers, assisted by health staff using standardised procedures. Data collected included infant characteristics, maternal characteristics, history of complementary feeding, and anthropometric measurements.

The collected data were processed through editing, coding, scoring, data entry, and data cleaning procedures before statistical analysis. Descriptive analysis was conducted to describe respondent characteristics, complementary feeding practices, and infant nutritional status. Inferential analysis was performed using the Spearman rho test to determine the relationship between early complementary feeding and infant nutritional status. Statistical analysis was conducted using IBM SPSS Statistics version 25 with a significance level of $p < 0.05$.

RESULTS AND DISCUSSION

Result

Table 1.
Characteristics of Infant Age 6-12 Months

Weight	N	Precentage
2 kg – 2,4 kg	3	5,2%
2,5 kg – 2,9 kg	22	37,9%
3 kg – 3,4 kg	29	50,0%
≥ 3,5 kg	4	6,9%
Gender	**N**	**Precentage**
Male	30	51,7%
Female	28	48,3%
Age	**N**	**Precentage**
6-8 Months	27	46,6%
9-12 Months	31	53,4%
Age Complementary	**N**	**Precentage**
6 Month	26	44,8%
< 6 Months	32	55,2%
Exclusive Breast Milk	**N**	**Precentage**
Yes	43	74,1%
No	15	25,9 %
Nutritional Status	**N**	**Precentage**
Severely Wasted	2	3,4%
Wasted	6	10,3 %
Normal	47	81,0%
Overwheight	3	5,2%
Total	**58**	**100%**

The characteristic of the respondents among the 58 infants, half of the respondents had a birth weight of 3.0–3.4 kg, accounting for 29 infants (50.0%), followed by birth weights of 2.5–2.9 kg in 22 infants (37.9%), ≥3.5 kg in 4 infants (6.9%), and 2.0–2.4 kg in 3 infants (5.2%). Regarding gender distribution, 30 infants (51.7%) were male, and 28 infants (48.3%) were female. Most of the infants were aged 9–12 months, totalling 31 infants (53.4%), while 27 infants (46.6%) were aged 6–8 months.

The majority of respondents received exclusive breastfeeding, with 43 infants (74.1%) receiving exclusive breastfeeding and 15 infants (25.9%) not receiving exclusive

Nisrina Nur Fathiyah[1A-E*], M. Rachmat Kasmad[2B-D], Muh.Said Hasan[3B-D]
said75hasan@unm.ac.id[3*]

breastfeeding. Regarding the timing of complementary feeding (MP-ASI), 32 infants (55.2%) received complementary feeding before the age of 6 months, while 26 infants (44.8%) received complementary feeding at the recommended age of 6 months. Based on nutritional status assessment, most infants had normal nutritional status, accounting for 47 infants (81.0%). Meanwhile, 6 infants (10.3%) were categorised as wasted, 3 infants (5.2%) were classified as overweight, and 2 infants (3.4%) were categorized as severely wasted. Overall, the findings indicate that although most infants had normal nutritional status and received exclusive breastfeeding, the prevalence of early complementary feeding before six months of age was still relatively high among respondents.

Table 2.
Characteristic of The Infant Mother

Age	**N**	**Precentage**
< 25 years old	11	19,0%
26 -30 years old	34	58,6%
31- 34 years old	2	3,4%
≥ 35 years old	11	19,0%
Education	**N**	**Precentage**
Elementary School	1	1,7%
Junior High School	2	3,4%
Senior High School	29	50,0
University	26	44,8
Job	**N**	**Precentage**
Housewife	46	79,3%
Privat Sector	4	6,9%
Government Employees	4	6,9%
Other	4	6,9 %
Family Income	**N**	**Precentage**
500,000 -1,500,000	47	81,0%
1,500.000 – 2.500.000	4	6,9%
>2,500,000	7	12,1%
Total	**58**	**100%**

Among the 58 respondents, most mothers were aged 26–30 years, accounting for 34 respondents (58.6%). Mothers aged below 25 years and those aged ≥35 years each accounted for 11 respondents (19.0%), while mothers aged 31–34 years accounted for 2 respondents (3.4%). Regarding educational background, most mothers had completed senior high school education, totalling 29 respondents (50.0%), followed by higher education graduates with 26 respondents (44.8%). Meanwhile, 2 mothers (3.4%) had completed junior high school education, and 1 mother (1.7%) had completed elementary school education. Based on occupation, the majority of mothers were housewives, accounting for 46 respondents (79.3%). Mothers working as private employees, civil servants, and in other occupations each accounted for 4 respondents (6.9%).

Regarding family income, most respondents had a monthly income ranging from IDR 500,000 to IDR 1,500,000, totalling 47 respondents (81.0%). Respondents with a monthly income of more than IDR 1,500,000 to IDR 2,500,000 accounted for 4 respondents (6.9%), while those with a monthly income above IDR 2,500,000 accounted for 7 respondents (12.1%). Overall, the findings indicate that most respondents were

Nisrina Nur Fathiyah[1A-E*], M. Rachmat Kasmad[2B-D], Muh.Said Hasan[3B-D]
said75hasan@unm.ac.id[3*]

mothers aged 26–30 years, had completed senior high school education, worked as housewives, and had relatively low monthly household income.

Table 3.
Correlation between Complementary Feeding and Nutritional Status

Indenpendent Variabel	Dependent Variabel	Column 2		
		N	r	P-Value
Early Complementary Feeding	Nutritional Status	58	-0,349	0,007

Based on the results of the Spearman's Rho test, a relationship or correlation is considered significant if the p-value is less than 0.05 ($p < 0.05$). The results showed a p-value of 0.007, indicating that there was a significant relationship between the timing of complementary feeding (MP-ASI) and the nutritional status of infants aged 6–12 months at Tamalanrea Public Health Centre. The correlation coefficient obtained was $r = -0.349$, which indicates a negative correlation with moderate strength. This finding suggests that the earlier or the more inappropriate the introduction of complementary feeding, the lower the nutritional status of the infants tends to be.

Discussion

Infants who receive complementary feeding before the age of 6 months have a lower nutritional status than infants who receive complementary feeding right at the age of 6 months. Of the 58 respondents, 55.2% of infants (n = 32) received complementary feeding before the age of 6 months, and from this group, all cases of Severely Wasted (n = 2) and Wasted (n = 6) were found in this study. In contrast, in the group that received complementary feeding right at the age of 6 months (44.8%; n = 26), the nutrition status is normal.

These findings align with the research of Prasetyo et al. (2023), who reported that infants receiving early complementary feeding (MP-ASI) had a 2.3-fold higher risk of underweight compared to infants receiving age-appropriate complementary feeding (MP-ASI). Similarly, Agustin (2021) concluded that there was a significant relationship between early complementary feeding and infant nutritional status, with a higher risk of malnutrition in the group receiving MP-ASI before 6 months of age. Hossain & Mihrshahi (2022) added that early complementary feeding increases infants' susceptibility to gastrointestinal disorders and reduces breast milk intake, which together contribute to decreased nutritional status. The results of this study reinforce this consensus in the context of the urban infant population in Makassar.

Biologically, the WHO (2023) recommends starting complementary feeding at 6 months of age because at that age, a baby's digestive system is considered sufficiently mature. Before 6 months of age, digestive enzymes such as pancreatic amylase are not yet sufficiently produced, so food cannot be digested optimally (Indrio et al., 2022). Biologically, the WHO (2023) recommends starting complementary feeding at 6 months of age because at that age, a baby's digestive system is considered sufficiently mature. Before 6 months of age, digestive enzymes such as pancreatic amylase are not yet sufficiently produced, so food cannot be digested optimally (Mardiana, 2019).

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said75hasan@unm.ac.id[3*]

Furthermore, introducing complementary feeding too early creates a displacement effect: babies who are full after consuming complementary foods tend to reduce the frequency of breastfeeding, thus reducing their intake of breast milk, which is rich in antibodies, iron, and essential micronutrients (Septiani, 2014). This combination of impaired absorption and reduced breast milk intake explains why babies who are fed complementary feeding too early are at risk of experiencing short- and long-term nutritional deficits, including wasting and stunting. In addition to the timing of complementary feeding, the quality and quantity of food provided also influenced the nutritional status of the infants in this study.

Infants with malnutrition generally received only 1–2 tablespoons per meal, with a frequency of 1–2 times a day, far below the WHO recommendation for infants aged 6–9 months, which should be 2–3 main meals accompanied by 1–2 snacks with gradually increasing portions. The texture is too liquid, which also reduces the energy density per serving, so that calorie needs are not met even though the volume seems sufficient. On the other hand, the three overweight infants in this study all received food in portions and frequency exceeding the recommendations, often accompanied by the provision of foods high in sugar and fat, indicating that inappropriate complementary feeding can lead to malnutrition in both directions.

Socioeconomic factors also play a role. 81% of respondents have a family income of Rp 500,000–Rp 1,500,000 per month, which limits access to nutritious food, so infant diets tend to be dominated by cheap carbohydrate sources and low in animal protein and micronutrients. Nasution (2024) emphasised that low family income correlates with low dietary diversity in infants, which in turn increases the risk of malnutrition. Although 79.3% of mothers are housewives, who theoretically have more time to care for their babies, economic constraints are a real barrier to providing nutritious and varied complementary foods.

CONCLUSION

The research results showed a significant correlation between the timing of complementary feeding and the nutritional status of infants aged six to 12 months at the Tamalanrea Community Health Centre. Infants receiving complementary feeding before six months of age had a lower nutritional status compared to infants receiving complementary feeding appropriate for their age. The practice of providing complementary feeding for some respondents was still not in accordance with the recommended recommendations in terms of age of administration, frequency of feeding, amount of food per meal, texture and variety of food. Some mothers provided complementary feeding too early, with amounts and frequencies that did not meet the infant's needs. It was concluded that the nutritional status of infants in this study included severely wasted, wasted, normal, and overnutrition. Infants with malnutrition and undernutrition tended to receive less food and meal frequencies than recommended for their age, so that their energy and nutrient needs were not optimally met. Conversely,

infants with good nutritional status generally received complementary feeding according to age recommendations, both in terms of quantity and frequency of feeding. Meanwhile, infants with higher nutritional status tended to receive food in quantities and frequencies that were excessive compared to their age requirements, increasing the risk of being overweight.

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