

THE RELATIONSHIP BETWEEN EXCLUSIVE BREASTFEEDING HISTORY AND COMPLETE FOOD PROVISION PRACTICES WITH THE INCIDENCE OF STUNTING IN TODDLERS AGED 6-24 MONTHS

PEBRIANTI¹, Andi Fatwa Tenri Awaru^{1*}, Ummu Kalsum¹

¹Nutrition Study Program, Faculty of Health Sciences, University of West Sulawesi, Indonesia

*Corresponding author email address: andifatwa.tenriawaru@unsulbar.ac.id

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Abstract

Background: Stunting is a manifestation of growth failure caused by chronic malnutrition that remains a serious public health problem in Indonesia, particularly in the West Sulawesi region.

Objective: This study aims to analyze the relationship between the history of exclusive breastfeeding and complementary feeding (MP-ASI) practices toward the incidence of stunting among toddlers aged 6–24 months in Buntubuda Village, Mamasa Regency.

Methods: This analytical observational study with a cross-sectional design involved 56 toddlers selected using a total sampling technique. Data were collected through structured questionnaires and Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ) forms. Data analysis was performed using the Chi-Square test ($\alpha=0.05$). **Results:** The prevalence of stunting at the study site was found to be 33.9%. Statistical test results showed a significant relationship between stunting incidence and a history of exclusive breastfeeding ($p=0.008$; $OR=7.00$), timing of complementary feeding ($p=0.002$; $OR=7.85$), frequency of complementary feeding ($p=0.001$; $OR=12.47$), and dietary diversity ($p=0.004$; $OR=5.74$). Furthermore, the intake of energy, protein, and carbohydrates was also significantly associated with stunting ($p = 0.002$), whereas fat intake showed no significant relationship ($p=0.715$). **Conclusion:** Inadequate feeding practices are the primary determinants of stunting. Intensive education for mothers regarding nutritional parenting and the importance of food variety is required to prevent growth failure in toddlers.



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Introduction

Stunting, defined as growth failure in infants due to chronic malnutrition and repeated infections during the first 1,000 days of life, indeed remains a critical global public health challenge with profound long-term effects. Stunting not only impairs physical growth but also significantly compromises cognitive development and neurodevelopmental

outcomes. Neuroimaging studies reveal that stunted infants show impaired visual working memory and attentional functions, which are crucial for early cognitive development, leading to poorer problem-solving skills later in infancy (1). Additionally, stunting is associated with deficits in academic achievement and cognitive function in childhood, with effects potentially differing by sex (2). Beyond cognitive impacts, stunting elevates the risk of non-communicable diseases during adulthood, possibly through enduring physiological disruptions including endocrine and immune system dysregulation caused by early-life malnutrition and infections (3).

Economically, stunting poses a significant burden; it is estimated to reduce a country's Gross Domestic Product (GDP) by 2-3% annually due to decreased productivity, higher healthcare costs, and impaired human capital development. Stunted individuals face reduced educational attainment and economic potential, which collectively translates into a substantial loss of economic growth on the national scale (1,3). Global data shows that the prevalence of stunting reached 22.3% in 2022. In Indonesia, although there was a significant decline from 30.8% (2018) to 21.5% (2023), this figure remains above the WHO threshold of 20% for public health problems. West Sulawesi Province is recorded as one of the regions with the second highest prevalence in Indonesia, with Mamasa Regency ranking first at the provincial level with a prevalence of 37.6%. Specifically, Buntubuda Village in Mamasa District recorded a relatively high prevalence rate of 33.55%, indicating the urgency of local-level interventions

Infant and young child feeding (IYCF) practices are critical determinants in preventing stunting, a multifactorial condition. Exclusive breastfeeding for the first six months of life is widely recognized as the ideal nutritional foundation. Breast milk provides essential macronutrients, micronutrients, and antibodies that cannot be replicated by infant formulas, ensuring optimal infant growth, immune protection, and development (4,5). Studies in diverse contexts, including South Africa and Ghana, indicate that poor exclusive breastfeeding rates, early introduction of complementary foods, and suboptimal dietary diversity significantly increase the risk of stunting in young children (4,6). Lack of exclusive breastfeeding is a significant predictor of stunting as breast milk contains antibodies and nutrients essential for early immune development and growth that formula feeding cannot replace. Mothers who delay initiation or discontinue exclusive breastfeeding prematurely often expose infants to infections and inadequate nutrition, contributing to growth faltering (4,7).

After six months, infants' nutritional needs exceed what breast milk alone can provide; therefore, timely introduction of adequate, safe, and nutrient-dense complementary foods—referred to as MP-ASI—is vital to meet their evolving energy and micronutrient requirements (5,8). Appropriate complementary feeding practices promote healthy growth and reduce stunting risk, while poor complementary feeding, such as early introduction or

low dietary diversity, is linked with chronic undernutrition and inadequate growth (4,9). Interventions targeting optimized IYCF practices, including promoting exclusive breastfeeding, supporting continued breastfeeding up to 24 months, and improving complementary feeding quality and timing, have been shown to be essential in poverty-stricken settings and areas with high stunting prevalence (4,9). Additionally, social support systems for mothers and culturally tailored healthcare messaging improve adherence to evidence-based feeding recommendations to effectively prevent stunting (8,10).

Although theories regarding the importance of breastfeeding and complementary feeding (MP-ASI) are well-established, their implementation in the field is often hindered by maternal knowledge, socioeconomic status, and local cultural influences. In Buntubuda Village, preliminary observations indicate a low exclusive breastfeeding coverage of only 10%, alongside the practice of early complementary feeding triggered by maternal perceptions that infants are not satiated by breast milk alone. Furthermore, cultural factors, such as the administration of honey or coffee to newborns, are still prevalent, potentially compromising the infants' digestive health. Preliminary observations suggest that these feeding decisions are often influenced by intergenerational advice from grandmothers and traditional healers who encourage early feeding practices. This study aims to conduct an in-depth analysis of the relationship between a history of exclusive breastfeeding and complementary feeding practices—encompassing timeliness, frequency, type, and macronutrient intake—on the incidence of stunting among toddlers aged 6–24 months in Buntubuda Village, Mamasa Regency. The results of this research are expected to provide empirical evidence for local policymakers in designing more effective and targeted nutritional intervention strategies in regions with high stunting prevalence.

Materials and Methods

This research is an analytical observational study with a cross-sectional design aimed at analyzing the relationship between the history of exclusive breastfeeding and complementary feeding (MP-ASI) practices on the incidence of stunting in toddlers. The study was conducted in Buntubuda Village, Mamasa District, Mamasa Regency, West Sulawesi Province, from May 5 to 28, 2025. The research population included all toddlers aged 6–24 months in the village, totaling 56 individuals. Sampling was carried out using a total sampling technique, whereby all members of the population (56 toddlers) were included as respondents in this study. Data collection consisted of primary data obtained directly through questionnaires and anthropometric measurements, as well as secondary data sourced from reports by the Health Office and the Mamasa Community Health Center (Puskesmas). The dependent variable in this study is the incidence of stunting, assessed based on the anthropometric standards of the Ministry of Health of the Republic of Indonesia (2020), where toddlers are categorized as stunted if the length-for-age or height-for-age Z-

score < -2.0 SD. Height measurements were conducted using a microtoise. Meanwhile, the independent variables include the history of exclusive breastfeeding and MP-ASI practices, measured using structured questionnaires and a Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ). The SQ-FFQ was selected as it is a standard instrument in nutritional epidemiology for assessing long-term intake patterns and has been documented in recent studies involving Indonesian children aged 6–24 months. To minimize maternal recall bias inherent in the SQ-FFQ method, trained enumerators used food models and standard household portion sizes as visual aids during interviews. This method converts portion size frequency into energy intake based on food composition data (11). MP-ASI practices were evaluated through four main indicators: timeliness of first introduction (appropriate if ≥ 6 months), daily feeding frequency, dietary diversity (diverse if consuming > 5 out of 8 food groups), and the amount of macronutrient intake (energy, protein, fat, and carbohydrates), which is categorized as appropriate if it reaches 80–120% of the requirements based on the 2019 Nutritional Adequacy Ratio (AKG).

The collected data were processed through stages of editing, coding, entry, and cleaning. Univariate analysis was used to describe the frequency distribution of respondent characteristics and research variables. Subsequently, bivariate analysis was performed using the Chi-Square statistical test to determine the relationship between the independent variables and the incidence of stunting, with the level of significance set at a p -value < 0.05. The entire research process was conducted in accordance with research ethics, including providing information regarding the study's objectives, the signing of informed consent forms by respondents, and the guarantee of data confidentiality."

Results

Table 1. Demographic Characteristics of Mothers and Toddlers

| Characteristics | Category | n | % |
|--------------------------|--------------------|----|------|
| Maternal Characteristics | | | |
| Age | 16 – 25 years | 6 | 10.7 |
| | 26 – 35 years | 32 | 57.1 |
| | 36 – 45 years | 16 | 28.5 |
| | 46 – 55 years | 2 | 3.5 |
| Education Level | Elementary School | 1 | 1.8 |
| | Junior High School | 7 | 12.5 |
| | Senior High School | 36 | 64.3 |
| | College | 12 | 21.4 |
| Occupation | Houswife | 45 | 80.4 |
| | Work | 11 | 19.6 |

| Toddler Characteristics | | | |
|-------------------------|----------------|----|------|
| Age | 0 – 11 months | 19 | 33.9 |
| | 12 – 24 months | 37 | 66.1 |
| baby's weight | <2500 g | 1 | 1.8 |
| | 2500 – 3999 g | 55 | 98.2 |
| baby's body length | <48 cm | 9 | 16 |
| | >48 cm | 47 | 84 |
| Total | | 56 | 100 |

Source: Processed Primary Data (2025)

The characteristics of the respondents in this study indicate that the majority of mothers fall within the age range of 26–35 years (57.1%), with the highest level of education being Senior High School (64.3%). A total of 80.4% of respondents work as housewives, and 59% have between 1 and 2 children. Regarding the characteristics of the toddler sample, the majority are within the age range of 12–24 months (66.1%). Most toddlers were born with a normal birth weight between 2,500 and 3,999 grams (98.2%) and a normal birth length of over 48 cm (84%). Based on nutritional status, it was found that the prevalence of stunting among toddlers aged 6–24 months in Buntubuda Village is 33.9% (19 toddlers), while the remaining 66.1% have a normal nutritional status.

Table 2. Relationship between Risk Factors and the Incidence of Stunting

| Variable | Normal | | Stunting | | N | p-value |
|------------------------------------|--------|------|----------|------|----|---------|
| | n | % | n | % | | |
| History of Exclusive Breastfeeding | | | | | | |
| Yes | 21 | 87.5 | 3 | 12.5 | 24 | 0.008* |
| No | 16 | 50 | 16 | 50 | 32 | |
| First MP-ASI Time | | | | | | |
| > 6 bln | 29 | 82.9 | 6 | 17.1 | 35 | 0.002* |
| < 6 bulan | 8 | 38.1 | 13 | 61.9 | 21 | |
| MP-ASI frequency | | | | | | |
| Accordance | 22 | 91.7 | 2 | 8.3 | 24 | 0.001* |
| Not accordance | 15 | 46.9 | 17 | 53.1 | 32 | |
| Types of complementary foods | | | | | | |
| Diverse | 31 | 77.5 | 9 | 22.5 | 40 | 0.004* |
| Not diverse | 6 | 37.5 | 10 | 62.5 | 16 | |

Note: Significance level $p < 0.05$.

Based on the bivariate analysis results of this study, all feeding practice variables showed a statistically significant relationship with the incidence of stunting among toddlers aged 6–24 months. A history of exclusive breastfeeding was proven to be a strong protective factor, where toddlers who were exclusively breastfed had a significantly lower prevalence of stunting (12.5%) compared to those who were not (50.0%), with a p-value of 0.008. The timeliness of complementary feeding (MP-ASI) introduction also showed a significant influence ($p = 0.002$), where early introduction of complementary foods before 6 months of age resulted in 61.9% of toddlers experiencing stunting due to an immature digestive system. This high percentage suggests that the local perception of 'feeding faster for better growth' is scientifically proven to increase stunting risk in this village due to immature digestive systems. Furthermore, the quality of feeding, assessed through frequency and dietary diversity, had a very strong correlation with the linear growth of toddlers. Toddlers fed at a frequency that did not meet age-appropriate standards had a stunting risk of 53.1% ($p = 0.001$), while low dietary diversity contributed to stunting in 62.5% of respondents ($p = 0.004$).

Table 3. The relationship between food intake and the incidence of stunting

| Variable | Normal | | Stunting | | N | p-value |
|----------------------------|--------|------|----------|------|----|---------|
| | n | % | n | % | | |
| Energy Intake | | | | | | |
| Accordance | 27 | 84.4 | 5 | 15.6 | 32 | 0.002* |
| Not accordance | 10 | 41.7 | 14 | 58.3 | 24 | |
| Protein Intake | | | | | | |
| Accordance | 25 | 89.3 | 3 | 10.7 | 28 | 0.002* |
| Not accordance | 12 | 42.9 | 16 | 57.1 | 28 | |
| Fat Intake | | | | | | |
| Accordance | 13 | 72.2 | 5 | 27.8 | 18 | 0.715 |
| Not accordance | 24 | 63.2 | 14 | 36.8 | 38 | |
| Carbohydrate Intake | | | | | | |
| Accordance | 27 | 87.1 | 4 | 12.9 | 31 | 0.001* |
| Not accordance | 10 | 40 | 15 | 60 | 25 | |

Note: Significance level $p < 0.05$.

Based on the bivariate analysis in this study, it was found that a history of exclusive breastfeeding, complementary feeding (MP-ASI) practices, and the adequacy of macronutrient intake are crucial determinants of stunting incidence in toddlers aged 6–24 months. Toddlers who did not receive exclusive breastfeeding showed a stunting prevalence of 50.0%, significantly higher than those who were exclusively breastfed (12.5%), with a p-

value of 0.008. The timeliness of the first complementary food introduction also showed a significant relationship ($p = 0.002$), where early introduction (before 6 months of age) contributed to a 61.9% stunting rate.

Furthermore, inappropriate feeding frequency ($p = 0.001$) and lack of dietary diversity ($p = 0.004$) significantly increased stunting rates to 53.1% and 62.5%, respectively. From the perspective of nutritional intake, inadequate consumption of energy ($p = 0.002$), protein ($p = 0.002$), and carbohydrates ($p = 0.001$) was significantly associated with stunting, with prevalence in these inadequate intake groups ranging from 57.1% to 60.0%. However, fat intake was the only variable that did not show a statistically significant relationship with the incidence of stunting in this study location, with a p -value of 0.715. When fat intake is adequate but protein intake is low, the risk of stunting remains high because protein provides essential structural materials, particularly through essential amino acids, necessary for linear growth and height development. Protein deficiency limits the availability of these key building blocks for bone and tissue growth, thereby directly affecting height increment. Animal-sourced foods, which are rich in high-quality protein and essential amino acids, have been shown to be statistically significant predictors of future linear growth, underscoring the importance of adequate protein intake for preventing stunting (12).

Conversely, fat deficiency can often be compensated for by increased carbohydrate intake to fulfill basal energy requirements. While this energy compensation may prevent severe energy deficiency, it does not provide the building blocks required for linear growth. The impact of inadequate fat intake is thus more pronounced on weight-related outcomes, such as wasting or weight faltering, rather than on height. Wasting reflects body mass loss due to energy deficit, where insufficient fat (as a dense energy source) exacerbates weight loss but is less critical to linear growth compared to protein deficiency (13,14).

DISCUSSION

The results of the study showed a significant relationship between a history of exclusive breastfeeding and the incidence of stunting ($p = 0.008$). Toddlers who did not receive exclusive breastfeeding had a significantly higher prevalence of stunting (50.0%) compared to toddlers who did (12.5%). This is in line with the findings of Syahrir (2024) who stated that parenting is a crucial factor significantly related to the incidence of stunting. Poor parenting practices, including failure to provide exclusive breastfeeding, increase the risk of impaired physical growth and impact the decline in cognitive function in toddlers in the future. Poor parenting practices, including the failure to provide exclusive breastfeeding, significantly increase the risk of impaired physical growth and have detrimental effects on cognitive development in toddlers. Exclusive breastfeeding, recommended by the World

Health Organization for the first six months, is critical for providing essential nutrients necessary for healthy growth and brain development (16). Breastfeeding contributes to neurodevelopment by supplying key nutrients such as sialic acid and docosahexaenoic acid, which are essential for brain growth and cognitive functions, and promotes language and memory development, particularly in preterm toddlers (16,17). Nutritional support from breast milk is the primary foundation, but nutritional status is also inextricably linked to the mother's past health. As explained by Napisa et al. (2025), a mother's nutritional history during pregnancy, such as anemia and Chronic Energy Deficiency, contributes to the risk of persistent child growth disorders.

The practice of providing complementary feeding (MP-ASI), including the timeliness, frequency, and variety of types, has been shown to be significantly associated with stunting ($p < 0.05$). The finding that 61.9% of toddlers who received early MP-ASI experienced stunting indicates the vulnerability of the infant's digestive system to premature non-breast milk intake. According to Syahrir (2024), maternal knowledge about nutrition plays a vital role in determining the quality of a child's food intake; mothers with low knowledge tend to have a higher risk of stunting in their children. In addition to stunting, inappropriate MP-ASI practices also trigger weight faltering (inadequate weight gain). Auliyah et al. (2025) emphasized that poor MP-ASI practices, if accompanied by a history of infectious diseases, will accelerate the decline in nutritional status of toddlers, which if left untreated will progress to chronic stunting.

Nutritional intake analysis shows that insufficient energy, protein, and carbohydrate intake significantly contribute to stunting ($p = 0.002$). Animal protein is crucial for supporting growth hormone production as it provides essential amino acids necessary for the synthesis and regulation of growth hormone and other vital proteins in the body. Adequate intake of animal protein stimulates the hypothalamic-pituitary axis, which controls growth hormone synthesis and secretion, thereby promoting proper growth, tissue repair, and overall development (20,21). This lack of macronutrient intake is often exacerbated by infection cycles. Auliyah et al. (2025) explained that toddlers who experience repeated infectious diseases tend to lose their appetite and experience impaired nutrient absorption, making the already low intake even less effective in supporting linear growth. Sociologically, Syahrir (2024) also emphasized that economic and educational factors often limit family access to diverse foods, as reflected in the results of this study where low food diversity ($p = 0.004$) was one of the main triggers of stunting in Buntubuda Village.

This study acknowledges several limitations. The small sample size ($n=56$) increases the risk of Type II error, potentially explaining why fat intake did not show a statistically significant relationship ($p=0.715$) despite its biological importance. Additionally, as this study is specific to the rural context of Mamasa, the results may differ in urban settings due to varying socio-economic and cultural factors.

Conclusion

Based on the results of this study, it can be concluded that the prevalence of stunting among toddlers aged 6–24 months in Buntubuda Village, Mamasa Regency, reached 33.9%. Data analysis indicates a significant relationship between the incidence of stunting and the history of exclusive breastfeeding ($p=0.00$). Notably, early introduction of complementary foods ($p=0.002$) was significantly associated with higher stunting rates, confirming that premature feeding practices negatively impact growth. Furthermore, inadequate intake of energy, protein, and carbohydrates was clearly associated with stunting. Although fat intake did not show a statistically significant relationship ($p=0.715$) in this study, likely due to sample size limitations, adequate fat consumption remains biologically essential. Overall, inadequate feeding practices and inappropriate nutritional parenting are the primary determinants contributing to the high stunting rates in the region.

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