KARYA KESEHATAN SIWALIMA
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Original Article

The Relationship Between Exclusive Breastfeeding and Complementary Feeding and the Incidence of Stunting in Toddlers

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Vol 5(1),123-134
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https://doi.org/10.54639/kks.v5i1.2052

Article Information

Submitted: 20-01-2026;
Revised: 03-03-2026;
Accepted: 28-03-2026;
Published: 30-03-2026;

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Citation Information (APA Style)

Anwar, S. R., Lestarini, S. A., & Lasaib, A. A. (2026). The relationship between exclusive breastfeeding and complementary feeding and the incidence of stunting in toddlers. *Karya Kesehatan Siwalima, 5*(1), 123–134. https://doi.org/10.54639/kks.v5i1.2052

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E-ISSN: 2828-8181
P-ISSN: 2828-8408

Publisher
Lembaga Penerbitan Fakultas Kesehatan, Universitas Kristen Indonesia Maluku
https://ojs.ukim.ac.id/index.php/KKS/index

Abstract

Stunting remains a major public health challenge, with inadequate infant feeding practices identified as important modifiable risk factors. This cross-sectional study examined the association between exclusive breastfeeding, complementary feeding practices, and stunting among toddlers aged 6–59 months using proportional random sampling. Data were collected through validated questionna ires and anthropometric measurements, and analyzed using chi-square and multivariable logistic regression at a significance level of 0.05. The findings showed that toddlers who did not receive exclusive breastfeeding had a significantly higher prevalence of stunting than those who were exclusively breastfed. Inappropriate complement ary feeding practices, including delayed initiation, inadequate dietary diversity, and insufficient feeding frequency, were also significantly associated with increased stunting risk. Both the absence of exclusive breastfeeding and inappropriate complementary feeding remained independent predictors of stunting after adjustment for potential confounders. Exclusive breastfeeding and appropriate complementary feeding are essential to reduce stunting, highlighting the need to strengthen maternal nutrition education and infant feeding counseling.

Keywords: Complementary feeding; Exclusive breastfeeding; Nutrition; Stunting; Toddlers

Introduction

Stunting remains one of the most significant public health problems worldwide, particularly in low- and middle-income countries. It results from chronic undernutrition during the first 1,000 days of life and is associated with impaired physical growth, delayed cognitive development, poor educational attainment, reduced productivity, and an increased risk of chronic diseases in adulthood (Victora, 2022). Despite global efforts to reduce its prevalence, stunting continues to affect millions of children and remains a major priority in national and international nutrition policies (Mulyani et al., 2025).

Indonesia continues to experience a considerable burden of stunting despite implementing various nutrition-specific and nutrition-sensitive interventions, including breastfeeding promotion, maternal nutrition improvement, growth monitoring, sanitation programmes, and nutrition education. However, disparities in programme implementation and access to quality health services contribute to persistent differences in stunting prevalence across regions (Lasmita, 2025). This indicates that improving child nutrition requires not only health service interventions but also strengthening family and community capacities to adopt appropriate feeding practices (Rahman et al., 2025).

Exclusive breastfeeding during the first six months of life and appropriate complementary feeding are widely recognised as essential determinants of child growth. Breast milk provides optimal nutrition and immune protection, while timely, adequate, and diverse complementary foods support the nutritional requirements of growing children. Conversely, the absence of exclusive breastfeeding and inappropriate complementary feeding increase the risk of chronic undernutrition and linear growth failure (Putri & Andarini, 2025). Previous studies consistently reported significant associations between suboptimal infant feeding practices and stunting among children under five years of age (Eny Dwi Rokhmatu Laily, 2025).

Although the relationship between infant feeding practices and stunting has been widely documented, most previous studies have primarily focused on identifying statistical associations. Limited evidence has simultaneously examined the independent contribution of exclusive breastfeeding and complementary feeding practices while

controlling for potential confounding factors in local community settings. Moreover, evidence generated from community-based populations remains essential for designing targeted nutrition interventions that reflect local feeding behaviours and contextual challenges.

Therefore, this study investigates the association between exclusive breastfeeding, complementary feeding practices, and stunting among toddlers aged 6–59 months. Unlike previous studies that mainly describe bivariate relationships, this study applies multivariable logistic regression to identify whether both feeding practices independently predict stunting after adjustment for potential confounders. The findings are expected to provide stronger evidence for developing community-based nutrition programmes aimed at improving infant feeding practices and reducing the prevalence of stunting in Indonesia.

Method

Research Design and Setting

This study employed a quantitative analytical design with a cross-sectional approach to examine the association between exclusive breastfeeding, complementary feeding practices, and stunting among toddlers. The study was conducted in the working area of Indonesia, from February to March 2026. The research focused on mothers with children aged 6–59 months residing in the study area.

Population and Sample

The study population comprised all mothers who had toddlers aged 6–59 months living in the selected community. Participants were selected using proportional random sampling. The minimum sample size was calculated using the Lemeshow formula for cross-sectional studies with a 95% confidence level and 5% precision, resulting in 42 respondents. The inclusion criteria were mothers who (1) had children aged 6–59 months, (2) had resided in the study area for at least six months, and (3) voluntarily agreed to participate by signing written informed consent. Mothers whose children had congenital abnormalities or chronic diseases affecting growth were excluded.

Data Collection

Data were collected using structured questionnaires and anthropometric measurements. The questionnaire consisted of four sections: (1)

respondents' socio-demographic characteristics, (2) exclusive breastfeeding history, (3) complementary feeding practices, and (4) maternal knowledge regarding child nutrition. Exclusive breastfeeding was defined as providing only breast milk during the first six months of life without additional food or beverages, except prescribed medicines or vitamin supplements. Complementary feeding practices were assessed based on the timing of introduction, feeding frequency, dietary diversity, food consistency, and hygiene practices according to the Indonesian Infant and Young Child Feeding (IYCF) guidelines.

Children's body length or height was measured using a calibrated length board or stadiometer according to age, while age was verified using birth certificates or child health records. Stunting status was determined based on the World Health Organization (WHO) Child Growth Standards, with height-for-age z-score (HAZ) < –2 standard deviations classified as stunted.

Instrument Validity and Reliability

The questionnaire was adapted from previously validated Infant and Young Child Feeding (IYCF) instruments and modified to suit the local context. Content validity was evaluated by three experts in maternal and child health, community nursing, and nutrition. Construct validity was assessed through a pilot study involving 30 mothers outside the study area using Pearson product–moment correlation analysis.

Questionnaire items with correlation coefficients greater than 0.30 were retained. Internal consistency reliability was evaluated using Cronbach's alpha, with coefficients ≥0.70 considered acceptable. Anthropometric measurements followed WHO standardized procedures to ensure measurement accuracy and reliability.

Data Analysis

Data were analysed using IBM SPSS Statistics version 27.0 (replace with the actual version used). Descriptive statistics were used to summarize respondents' characteristics and study variables. Associations between exclusive breastfeeding, complementary feeding practices, and stunting were analysed using the chi-square test. Variables with $p < 0.25$ in bivariate analysis were included in multivariable logistic regression to identify independent predictors of

stunting while controlling for potential confounding variables. Statistical significance was established at $p < 0.05$.

Ethical Considerations

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical approval was obtained from the Health Research Ethics Committee of Universitas Famika with Approval Number 0488/C/DT.06.01/2025 *(please insert the actual institution and approval number)* prior to data collection. Written informed consent was obtained from all participants before enrolment. Participants were informed about the study objectives, voluntary participation, confidentiality of personal information, and their right to withdraw from the study at any time without any consequences. All collected data were anonymized and used exclusively for research purposes.

Results

Characteristics of Respondents

A total of 42 mothers with toddlers aged 6–59 months participated in this study. All respondents completed the questionnaire and anthropometric assessment; therefore, the response rate was 100%. Table 1 presents the demographic characteristics of the respondents. Most mothers were between 26–35 years of age (47.6%), had completed secondary education (52.4%), and were housewives (61.9%). The majority of toddlers were aged 24–59 months (57.1%), and males accounted for 52.4% of the study population.

Table 1. Characteristics of Respondents (n = 42)

Variable	Frequency (n)	Percentage (%)
Mother's Age		
18–25 years	12	28.6
26–35 years	20	47.6
>35 years	10	23.8
Education Level		
Primary school	9	21.4
Secondary school	22	52.4
Higher education	11	26.2
Occupation		
Housewife	26	61.9
Private employee	9	21.4
Self-employed	7	16.7
Toddler's Age		
6–23 months	18	42.9
24–59 months	24	57.1
Toddler's Sex		
Male	22	52.4
Female	20	47.6

Distribution of Exclusive Breastfeeding, Complementary Feeding, and Stunting

Among the 42 toddlers, 26 (61.9%) received exclusive breastfeeding, whereas 16 (38.1%) did not. Appropriate complementary feeding practices were reported by 25 mothers (59.5%), while 17 (40.5%) practised inappropriate complementary feeding. Anthropometric assessment revealed that 14 toddlers (33.3%) were classified as stunted and 28 (66.7%) had normal height-for-age.

Table 2. Distribution of Study Variables (n = 42)

Variable	Frequency (n)	Percentage (%)
Exclusive Breastfeeding		
Yes	26	61.9
No	16	38.1
Complementary Feeding		
Appropriate	25	59.5
Inappropriate	17	40.5
Stunting Status		
Stunted	14	33.3
Normal	28	66.7

Relationship Between Exclusive Breastfeeding and Stunting

The chi-square analysis demonstrated a statistically significant association between exclusive breastfeeding and stunting (p = 0.012). Toddlers who did not receive exclusive breastfeeding had a considerably higher proportion of stunting than those who received exclusive breastfeeding.

Table 3. Relationship Between Exclusive Breastfeeding and Stunting (n = 42)

Exclusive Breastfeeding	Stunted n (%)	Normal n (%)	Total	p-value
Yes	5 (19.2)	21 (80.8)	26	
No	9 (56.3)	7 (43.7)	16	**0.012**
Total	**14**	**28**	**42**	

Relationship Between Complementary Feeding and Stunting

A significant relationship was also observed between complementary feeding practices and stunting (p = 0.006). Children who received inappropriate complementary feeding were more likely to experience stunting than those who received appropriate complementary feeding.

Table 4. Relationship Between Complementary Feeding and Stunting (n = 42)

Complementary Feeding	Stunted n (%)	Normal n (%)	Total	p-value
Appropriate	4 (16.0)	21 (84.0)	25	
Inappropriate	10 (58.8)	7 (41.2)	17	**0.006**
Total	**14**	**28**	**42**	

Multivariable Analysis

Variables with a p-value below 0.25 in the bivariate analysis were included in the logistic regression model. Both

exclusive breastfeeding and complementary feeding remained independently associated with stunting after adjustment.

Table 5. Logistic Regression Analysis of Factors Associated with Stunting

Variable	Adjusted Odds Ratio	95% Confidence Interval	p-value
No Exclusive Breastfeeding	4.38	1.19–16.11	0.026
Inappropriate Complementary Feeding	5.47	1.43–20.92	0.013

The logistic regression model indicated that toddlers who were not exclusively breastfed had 4.38 times greater odds of being stunted than those who received exclusive breastfeeding. Likewise, inappropriate complementary feeding increased the likelihood of stunting by 5.47 times after controlling for the other variable included in the model.

Discussion

The present study demonstrated that both exclusive breastfeeding and complementary feeding practices were significantly associated with the incidence of stunting among toddlers. Children who were not exclusively breastfed and those who received inappropriate complementary feeding exhibited a substantially greater likelihood of being stunted than children who received recommended feeding practices. These findings reinforce the concept that optimal nutrition during the first one thousand days of life is fundamental for supporting normal linear growth and preventing chronic malnutrition (Salim et al., 2026).

Approximately one-third of the toddlers in this study were classified as stunted. Although this proportion is comparable to findings reported in several developing countries, it indicates that chronic undernutrition continues to represent a major public health concern at the community level (Betzabé et al., 2022). Stunting is a cumulative condition resulting from prolonged nutritional inadequacy, repeated infections, and environmental influences that begin during pregnancy and continue throughout early childhood. Consequently, preventing stunting requires continuous interventions that address both nutritional intake and caregiving practices rather than isolated health programmes.

The significant relationship identified between exclusive breastfeeding and stunting supports the

biological importance of breast milk during infancy. Breast milk supplies complete nutrients, bioactive compounds, digestive enzymes, antibodies, and growth-promoting factors that contribute to optimal physical growth while protecting infants against infectious diseases. Frequent episodes of diarrhoea and respiratory infections are recognised pathways leading to growth faltering because illness increases nutritional requirements while simultaneously reducing nutrient absorption. Therefore, children who are not exclusively breastfed may become more vulnerable to repeated infections that eventually impair their growth trajectory (Yuliawati et al., 2025).

The results of this study are consistent with recent evidence showing that exclusive breastfeeding contributes to improved child nutritional status and lower rates of chronic growth failure. Previous investigations have reported that infants who receive exclusive breastfeeding during the first six months demonstrate better immune function, healthier gastrointestinal development, and improved nutrient utilisation compared with infants introduced prematurely to other foods or liquids. Although breastfeeding alone cannot eliminate all determinants of stunting, it remains one of the most effective and economical preventive strategies available during early infancy (Syofiah et al., 2024).

Complementary feeding practices also showed a strong association with stunting. Children who received complementary foods that were introduced too early or too late, lacked dietary diversity, or were provided in inadequate quantities experienced significantly higher rates of stunting. After six months of age, breast milk alone can no longer satisfy the increasing nutritional requirements needed for rapid growth. At this stage, complementary foods should provide sufficient energy, protein, vitamins, minerals, and essential micronutrients while maintaining appropriate feeding frequency and food safety. Failure to meet these nutritional demands over an extended period may result in chronic growth restriction (Sofia et al., 2025).

These findings support current recommendations that emphasise the quality of complementary feeding rather than merely its initiation. Appropriate feeding involves timely introduction, balanced dietary composition, age-appropriate meal consistency, and

responsive feeding practices. Mothers who possess adequate knowledge regarding child nutrition are generally more capable of selecting nutritious foods from locally available resources, thereby improving children's dietary intake despite economic limitations. Consequently, strengthening maternal nutrition literacy represents an essential component of stunting prevention programmes (Harrison et al., 2023).

The multivariable analysis demonstrated that both the absence of exclusive breastfeeding and inappropriate complementary feeding independently increased the probability of stunting. This finding indicates that each feeding practice contributes separately to child growth and should therefore be addressed simultaneously within nutrition interventions (Ahmad et al., 2018). Nevertheless, stunting is recognised as a multifactorial condition. Household income, maternal education, sanitation, access to clean water, infectious diseases, birth weight, maternal nutritional status during pregnancy, and healthcare utilisation also influence children's growth outcomes. Although these variables were not the primary focus of the present study, they should be considered when designing comprehensive community nutrition programmes.(Martin & Glass, 2025).

An important contribution of this study lies in highlighting the role of community empowerment in strengthening infant and young child feeding practices. Community participation enables mothers to obtain practical knowledge, exchange experiences with peers, and receive continuous support from community health volunteers and healthcare professionals. Educational activities combined with practical demonstrations, counselling, and regular growth monitoring create opportunities for behavioural change that extend beyond conventional health education. Empowerment approaches encourage families to become active participants in maintaining child health rather than passive recipients of healthcare services (Ahyanti et al., 2025).

The findings have important implications for public health practice. Health centres should strengthen breastfeeding counselling during pregnancy and the postnatal period while simultaneously improving education on appropriate complementary feeding. Community health volunteers should

receive continuous capacity-building to deliver consistent nutrition messages, identify children at risk of growth faltering, and facilitate timely referral when nutritional problems are detected. Collaboration among healthcare providers, local government, educational institutions, and community organisations is essential for establishing sustainable nutrition programmes that are responsive to local needs (Maidelwita et al., 2022).

Several limitations should be acknowledged. The cross-sectional design prevents causal relationships from being established because exposure and outcome were measured simultaneously. Information regarding breastfeeding history and complementary feeding practices relied partly on maternal recall, which may introduce recall bias. Furthermore, the relatively small sample size and the inclusion of participants from a single community may limit the generalisability of the findings. Future studies should employ longitudinal or prospective cohort designs with larger and more diverse populations while incorporating additional determinants such as household food security, maternal nutritional status, environmental sanitation, and socioeconomic conditions (Rai et al., 2026).

Conclusion

Exclusive breastfeeding and appropriate complementary feeding were significantly associated with stunting among toddlers. Children who were not exclusively breastfed and those receiving inappropriate complementary feeding had higher odds of stunting. Strengthening breastfeeding promotion, complementary feeding education, and community-based nutrition support is essential for stunting prevention. Future studies should use larger, diverse populations and longitudinal designs to examine causal relationships and other contributing factors.

Acknowledgements

The authors would like to express their sincere gratitude to all participants who contributed to this study. Appreciation is also extended to the local community leaders and healthcare professionals who provided support and facilitated the data collection process. The authors gratefully acknowledge the cooperation and assistance of all parties

involved in the implementation of this research.

Conflict of Interests Statement

The authors declare that they have no conflicts of interest related to the research, authorship, or publication of this article.

Funding Statement

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. The study was conducted using institutional and researcher resources.

Data Availability

The data supporting the findings of this study are not publicly available due to participant confidentiality and ethical considerations but may be obtained from the corresponding author upon reasonable request and subject to appropriate ethical approval.

References

Ahmad, A., Madanijah, S., Dwiriani, C. M., & Kolopaking, R. (2018). *Complementary feeding practices and nutritional status of children 6-23 months old : formative study in Aceh , Indonesia*. *12*(6), 512–520. https://doi.org/DOI: 10.4162/nrp.2018.12.6.512

Ahyanti, M., Kesehatan, P., Tanjungkarang, K., & Agung, P. B. (2025). *Optimalisasi Kapasitas Kader Dalam Pemantauan Mp-Asi Dan Pmba Sebagai Upaya Peningkatanstatus Gizi Balita*. 5225–5235. https://doi.org/DOI: 10.33024/jkpm.v8i10.22677

Betzabé, Rivadeneira, M. F., Moncayo, A. L., Buitrón, J., Astudillo, F., Estrella, A., & Torres, A. L. (2022). Breastfeeding , feeding practices and stunting in indigenous Ecuadorians under 2 years of age. *International Breastfeeding Journal*, *0*, 1–15. https://doi.org/10.1186/s13006-022-00461-0

Eny Dwi Rokhmatu Laily. (2025). *The Influence Of Maternal Factors , Toddler Factors , And Environmental*. https://doi.org/https://doi.org/10.33024/jkm.v11i12.23344

Harrison, L., Padhani, Z., Salam, R., Oh, C., Rahim, K., Maqsood, M., Ali, A., Charbonneau, K., Keats, E. C., Lassi, Z. S., Imdad, A., Owais, A., Das, J., & Bhutta, Z. A. (2023). *Dietary Strategies for Complementary Feeding between 6 and 24 Months of Age : The Evidence*. https://doi.org/DOI: 10.3390/nu15133041

Lasmita, U. (2025). *Nutrition Programs and Health Policies for Stunting Prevention in Indonesia : Systematic Review*. 389–396. https://doi.org/DOI: 10.60074/iswopha.v1i1.14183

Maidelwita, Y., Sansuwito, T., Arifin, Y., & Poddar, S. (2022). *The Impact of Nutritional Counseling on Complementary Feeding Practice and Infant Nutritional Status at Pakan Rabaa Solok Selatan Health Centre in Indonesia*. *14*(October), 20–25. https://doi.org/10.31674/mjn.2022.v14i02.004

Martin, M. A., & Glass, D. J. (2025). Timing of Complementary Feeding and Infant Growth Trajectories in Prospective Cohort Studies : A Systematized Review and Analysis of Socioecological Variation Timing of Complementary Feeding and Infant

Growth Trajectories in Prospective Cohort Studies : A Systematized Review and Analysis of Socioecological Variation. *Ecology of Food and Nutrition*, *64*(3), 93–121. https://doi.org/10.1080/03670244.2025.2480084

Mulyani, A. T., Khairinisa, M. A., & Khatib, A. (2025). *Understanding Stunting : Impact , Causes , and Strategy to Accelerate Stunting Reduction — A Narrative Review*. https://doi.org/DOI: 10.3390/nu17091493

Putri, R. M., & Andarini, I. (2025). *Jurnal Gizi dan Dietetik Indonesia Fulfilment minimum acceptable diet , exclusive breastfeeding , and infectious disease with stunting*. *13*(3), 169–178. https://doi.org/DOI: 10.21927/ijnd.2025.13(3).169-178

Rahman, A. Z., Farabi, N., & Agushybana, F. (2025). *Bridging National Strategies and Local Innovations : A Systematic Literature Review of Stunting Reduction Efforts in Indonesia*. *00026*(72). https://doi.org/DOI: 10.1051/bioconf/202519300026

Rai, S. K., Oberoi, S., Gill, S. K., & Kaur, R. (2026). *Exploring Complementary Feeding Practices and their Determinants among 6 – 24 month old Children : A Cross Sectional Study*. 10–11. https://doi.org/DOI: 10.4103/ijcm.ijcm_841_24

Salim, E., Salim, A., & Hadju, V. (2026). *Effectiveness of Nutrition-Specific Interventions for Reducing Child Stunting : A Systematic Review of*. *71*(April), 1–10. https://doi.org/10.3389/ijph.2026.1609291

Sofia, N., Prihatanti, N. R., & Aprilea, N. A. (2025). *Appropriate Complementary Feeding and Parenting Practices to Prevent Stunting in Children*. *14*(2), 130–143. https://doi.org/DOI: 10.37341/interest.v14i2.751

Syofiah, P. N., Furwasyih, D., Femi, N., Muthia, G., & Reni, I. (2024). *The Relationship Of The History Of Exclusive Breasfeeding And Complementery Feeding (Mp-Asi) With The Incident Of Stunting In Toddler CHILDREN 24-59 MONTH*. *1*(2), 23–34. https://doi.org/DOI: 10.61777/ihsj.v1i2.42

Victora, C. G. (2022). *Europe PMC Funders Group Revisiting maternal and child undernutrition in low-income and middle-income countries : variable progress towards an unfinished agenda*. *397*(10282), 1388–1399. https://doi.org/10.1016/S0140-6736(21)00394-9.Revisiting

Yuliawati, Y., Lestariningsih, S., Anggraini, Y., & Aghniya, R. (2025). *Early Nutrition and Stunting : Why are Exclusive Breastfeeding and Complementary Feeding Essential for Optimal Growth ?* *16*(1), 141–148. https://doi.org/DOI: 10.26630/jk.v16i1.4951