

THE RELATIONSHIP BETWEEN FEEDING PATTERNS AND THE INCIDENCE OF STUNTING AMONG CHILDREN AGED 6–24 MONTHS IN THE WORKING AREA OF UPTD PUSKESMAS SIKUMANA KUPANG CITY

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Abstract

Background: The alarmingly high stunting prevalence of 26.6% in the Sikumana Health Centre area, which significantly exceeds the Kupang City average, creates an urgent need to investigate suboptimal feeding practices encompassing early initiation of breastfeeding (EIBF), exclusive breastfeeding, and complementary feeding (MP-ASI) as the primary suspected drivers of this local nutritional crisis. This study aims to determine the relationship between feeding patterns and the incidence of stunting among children aged 6–24 months in the working area of UPTD Puskesmas Sikumana, Kupang City. **Methods:** This was a quantitative observational analytic study with a cross-sectional design. A total of 88 children aged 6–24 months were selected using purposive sampling. Data were collected through structured interviews and anthropometric measurements, then analyzed using the chi-square test. **Results:** Of 88 children, 30 (34.1%) were stunted. No significant relationship was found between EIBF and stunting ($p=0.71$). Significant relationships were found between exclusive breastfeeding ($p=0.01$), complementary-feeding texture ($p=0.03$), frequency ($p < 0.001$), and amount ($p=0.001$) and stunting. **Conclusion:** Feeding patterns, particularly exclusive breastfeeding and the appropriateness of complementary-feeding texture, frequency, and amount, are significantly associated with the incidence of stunting among children in the Sikumana Health Centre working area. Nutrition education for mothers of young children regarding appropriate feeding practices should be strengthened as a stunting prevention effort.



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Introduction

The WHO Child Growth Standards are international standards developed from data of healthy, exclusively breastfed children who grew up in environments that support optimal growth. These standards utilize advanced statistical modeling to generate accurate and bias-free growth curves, making them universally applicable across different countries and

socioeconomic conditions to assess child growth status (1). Regarding stunting assessment, the length/height-for-age z-score parameters are categorized into normal (z-score ≥ -2 SD), stunted (z-score < -2 SD), and severely stunted (z-score < -3 SD). Children classified within these stunting thresholds present a shorter stature relative to their peers raised in optimal environments, underscoring a state of prolonged growth impairment due to chronic malnutrition that concurrently restricts both physical stature and cognitive development.

UNICEF data from 2025 indicates that approximately 150.2 million under-five children worldwide suffer from stunting, with a global prevalence of 23.2%, which is well above the public health threshold established by the WHO at 20%. The 2023 Indonesian Health Survey (SKI) recorded a national stunting prevalence of 20.1%, whereas East Nusa Tenggara (NTT) Province registered a substantially higher rate of 30.5%. At the municipal level, the Kupang City Health Office reported a stunting prevalence of 17.2%; however, the working area of the Sikumana Community Health Center paradoxically recorded a higher prevalence at 26.6%, positioning it as the highest contributor to stunting cases in the Maulafa District (8,9).

Stunting frequently co-occurs with other forms of malnutrition, such as wasting, which is characterized by acute episodes of onset and recovery over time. This co-existence significantly exacerbates the risk of developmental impairment and mortality in children (2). Stunting affects not only physical growth but also cognitive and behavioral development. Evidence from a systematic review demonstrates that childhood malnutrition is associated with neurodevelopmental impairment, reduced academic performance, and cognitive deficits (5). The risk of stunting emerging as early as infancy also contributes to increased susceptibility to non-communicable diseases later in life (6,7).

The causes of stunting in children are multidimensional, involving direct factors such as infectious diseases and the quality of nutritional intake, as well as indirect factors including parenting practices, environmental sanitation, access to healthcare services, and food availability. Among these factors, feeding patterns constitute a critical determinant as they directly dictate the adequacy of a child's nutrient intake, particularly during the critical period of the First 1,000 Days of Life (10). Inappropriate feeding practices ranging from early initiation of breastfeeding (IMD), exclusive breastfeeding, to mismatches in the texture, frequency, and portion size of complementary feeding (MP-ASI) can cause a child's nutritional needs to be suboptimally met. From a physiological and nutritional perspective, providing a complementary food texture that is not age-appropriate can cause children to refuse food or experience digestive issues, leading to sub-optimal nutrient absorption. Furthermore, inadequate feeding frequency leads to a continuous deficit in energy and nutrients that directly hinders a child's linear growth, while inappropriate portion sizes contribute to chronic energy and protein deficits (10).

Based on preliminary data, the number of stunted toddlers within the working area of the Sikumana Community Health Center was recorded at 829 children. out of a total population of 3,714 toddlers in the area. This high figure and substantial proportion highlight the critical urgency of this public health issue. Beyond geographic location, addressing this problem in Sikumana requires particular attention due to specific local phenomena, such as unique cultural feeding practices, distinct challenges in local food accessibility, and prevailing socioeconomic trends among parents in Kupang City that differentiate it from other regions in Indonesia. This research aims to determine the relationship between feeding patterns encompassing the early initiation of breastfeeding (IMD), exclusive breastfeeding, as well as the texture, frequency, and portion size of complementary feeding (MP-ASI) and stunting incidence among toddlers aged 6–24 months within the working area of the UPTD Puskesmas Sikumana, Kupang City, so that the findings can serve as a basis for formulating more targeted nutritional interventions.

Materials and Methods

This quantitative study utilized an analytical observational design and a cross-sectional approach, assessing both the independent variable (feeding practices) and the dependent variable (stunting incidence) concurrently. The research was carried out within the operational area of the Sikumana Public Health Center, Maulafa Subdistrict, Kupang City, East Nusa Tenggara Province, between March and April 2026. The study target population encompassed all children aged 6–24 months registered and domiciled in the Sikumana Public Health Center service area in February 2026, totaling 3,714 individuals. Utilizing the Slovin formula with a 10% margin of error, the minimum required sample size was determined to be 97 toddlers; however, post-data collection, the final analyzed cohort comprised 88 toddlers. Purposive sampling was deployed based on inclusion criteria (children aged 6–24 months, residing in the Sikumana Public Health Center area, and mothers consenting to be respondents) and exclusion criteria (children with severe or chronic illness during the study, uncompleted questionnaires or un-interviewable mothers, and children absent during data collection).

Utilizing the Slovin formula with a 10% margin of error chosen due to logistical and resource constraints during the specific data collection period the minimum required sample size was determined to be 97 toddlers. Although a probability (random) sampling scheme is typically preferred given the well-defined sampling frame of 3,714 toddlers, a purposive sampling method was ultimately implemented. This non-probability approach was necessary to ensure that selected participants strictly met the inclusion criteria (especially mothers' availability and willingness for in-depth interviews) and to accommodate field logistical challenges. Out of the 97 targeted participants, 9 were excluded due to specific exclusion criteria (4 mothers were unable to complete the questionnaire, 3 children were

absent during data collection, and 2 children experienced severe illness), resulting in a final analyzed cohort of 88 toddlers. The inclusion criteria comprised children aged 6–24 months, residing in the Sikumana Public Health Center area, and mothers consenting to be respondents

The independent variable in this study was feeding patterns, which encompassed the early initiation of breastfeeding (IMD), exclusive breastfeeding, as well as the appropriateness of texture, frequency, and portion size of complementary feeding (MP-ASI). The complementary feeding variables were categorized into 'compliant' and 'non-compliant' strictly based on the operationalized Infant and Young Child Feeding (IYCF) guidelines for specific age groups. For infants aged 6–8 months, compliance was defined as providing mashed or pureed foods, 2–3 times a day, with a portion of 2–3 tablespoons per meal. For children aged 9–11 months, it required finely chopped or minced foods, 3–4 times a day, at half a cup (125 ml) per meal. For children aged 12–24 months, compliance meant providing family foods, 3–4 times a day, at three-quarters to a full cup (250 ml) per meal

The dependent variable was stunting incidence, determined by length-for-age or height-for-age z-scores (stunted if the z-score is < -2 SD). Primary data were collected through structured interviews using questionnaires and direct anthropometric measurements. To ensure data reliability, the measurements were conducted by trained researchers utilizing a standardized and calibrated infantometer for measuring the recumbent length of children under 24 months, or a calibrated microtoise for standing height. Secondary data were obtained from the reports and profiles of the health center's working area. The collected data underwent stages of editing, coding, entry, cleaning, and tabulation, followed by univariate analysis to describe respondent characteristics and research variables, as well as bivariate analysis using the chi-square test to examine the relationship between feeding patterns and stunting incidence, with a significance level of $p < 0.05$.

Results

Respondent Characteristics The study involved 88 respondents consisting of mothers of toddlers within the working area of the UPT Puskesmas Sikumana. The majority of the toddlers were female (56.8%). Most mothers had a high school education (78.4%) and worked as housewives (88.6%), while the fathers were predominantly employed as laborers (30.7%) with the highest income range falling between IDR 1,000,000 and IDR 2,000,000 (43.2%). The majority of the mothers' income was in the range of IDR 500,000 to IDR 1,000,000 (53.4%). Detailed respondent characteristics are presented in Table 1.

Table 1. Respondent Characteristics

Characteristics	Category	n	%
Toddler's Gender	Male	38	43,2
	Female	50	56,8
Maternal Education	No school	7	8
	Senior High School	69	78,4
	Junior High School	8	9,1
	D1 – D3	3	3,4
	D4/S1 – S3	1	1,1
Mother's Job	Civil Servants/TNI/Polri	1	1,1
	Private employees	4	4,5
	Businessman	4	4,5
	Homemaker	78	88,6
	Laborer	1	1,1
Father's Job	Civil Servants/TNI/Polri	4	4,5
	Private employees	16	18,2
	Businessman	16	18,2
	Farmers	7	8,0
	Fishermen	2	2,3
	Laborer	27	30,7
	Other	16	18,2
Mother's income	<500.000	22	25.0
	Rp 500.000 – 1.000.000	47	53.4
	Rp 1.000.000 – 2.000.000	12	13.6
	Rp 2.000.000 – 3.000.000	5	5.7
	>Rp 3.000.000	2	2.2
Father's income	<500.000	2	2.3
	Rp 500.000 – 1.000.000	8	9.1
	Rp 1.000.000 – 2.000.000	38	43.2
	Rp 2.000.000 – 3.000.000	32	36.4
	>Rp 3.000.000	8	9.1

Table 1 presents the socio-demographic characteristics of the respondents, comprising 88 pairs of mothers and children aged 6–24 months in the working area of UPTD Puskesmas Sikumana, Kupang City. Based on the toddler's gender, more than half of the children were female (n = 50; 56.8%), while males accounted for 43.2% (n = 38). In terms of maternal education, the vast majority of mothers had completed senior high school education (n = 69; 78.4%), whereas only a small fraction held higher education degrees ranging from D1 to S3 (n = 4; 4.5%), and 8% of mothers (n = 7) had no formal schooling. The occupational distribution of the parents revealed distinct patterns. The overwhelming majority of the mothers were homemakers (n = 78; 88.6%), with only a minor percentage working as

private employees (4.5%), businesswomen (4.5%), civil servants/TNI/Polri (1.1%), or laborers (1.1%). In contrast, the fathers' occupations were more diversified; the largest proportion of fathers worked as laborers (n = 27; 30.7%), followed equally by private employees (n = 16; 18.2%), businessmen (n = 16; 18.2%), and other categories (n = 16; 18.2%). The remaining fathers were engaged in farming (8.0%), civil service/TNI/Polri (4.5%), and fishing (2.3%).

Table 2. Distribution of Stunting Incidence and Feeding Patterns

Variable	Category	n	%
Incidence of Stunting	Stunted	30	34,1
	No stunted	58	65,9
IMD	Yes	79	89,8
	No	9	10,2
Exclusive Breastfeeding	Yes	82	93,2
	No	6	6,8
Texture of complementary foods	Compliant	68	77,3
	Non-compliant	20	22,7
Frequency of complementary feeding	Compliant	44	50,0
	Non-compliant	44	50,0
Amount of complementary food	Compliant	75	85,2
	Non-compliant	13	14,8

The distribution of the main variables is detailed in Table 2. Regarding the nutritional status, approximately one-third of the children aged 6–24 months in the study area were classified as stunted. In terms of feeding practices, a substantial majority of the children successfully received early initiation of breastfeeding (IMD) and were exclusively breastfed. Evaluation of complementary feeding (MP-ASI) practices showed that the majority of respondents were compliant with age-appropriate recommendations for texture and amount. Interestingly, the frequency of complementary feeding showed an equal distribution, where exactly half of the sample achieved compliance while the other half fell into the non-compliant category.

Table 3. The Relationship Between Feeding Patterns and Stunting Incidence

Variable	Category	Stunted		No Stunted		p-value	OR (95% CI)
		n	%	n	%		
IMD	Yes	28	31,8	51	58,0	0,71	1.92 ((0,37 – 9,81)
	No	2	2,3	7	8,0		
Exclusive Breastfeeding	Yes	25	28,4	57	64,8	0,01*	11.4 (1.27 – 102.1)
	No	5	5,7	1	1,1		
Texture	compliant	19	21,6	49	55,7	0,03*	3.15 (1.12 – 8.90)
	Non-compliant	11	12,5	9	10,2		

Frequency	compliant	6	6,8	38	43,2	0,001*	7.60 (2.73 – 21.1)
	Non-compliant	24	27,3	20	22,7		
Quantity	compliant	20	22,7	55	62,5	0,001*	9.16 (2.25 – 37.2)
	Non-compliant	10	11,4	3	3,4		

Note: statistically significant ($p < 0.05$), chi-square test. Odds Ratio (OR) value

Table 3 presents the bivariate analysis using the chi-square test to determine the relationship between feeding patterns and the incidence of stunting among children aged 6–24 months. The statistical analysis revealed that early initiation of breastfeeding (IMD) did not have a significant correlation with stunting incidence ($p = 0.71$). Among children who received IMD, 31.8% ($n = 28$) were stunted, which was proportionally similar to the stunted rate in the non-IMD group (2.3% out of the total sample). Conversely, exclusive breastfeeding and all three components of complementary feeding practices demonstrated statistically significant relationships with the incidence of stunting ($p < 0.05$). Furthermore, based on the Odds Ratio (OR) analysis, children who did not receive exclusive breastfeeding had a substantially higher risk of stunting. Regarding complementary feeding (MP-ASI) practices, non-compliance with age-appropriate texture increased the likelihood of stunting. More prominently, the frequency of complementary feeding emerged as a highly significant factor ($p < 0.001$), with non-compliant children having a 7.6 fold higher risk of stunting compared to compliant children. Furthermore, providing a non-compliant quantity of complementary food was also strongly associated with an increased risk of stunting ($p = 0.001$)

DISCUSSION

The results of the study showed no significant relationship between the early initiation of breastfeeding (IMD) and the incidence of stunting ($p = 0.71$). This finding aligns with a study by Paramesti et al. (2024) at the Giligan Health Center, which also found no significant correlation between IMD and stunting. This lack of significance suggests that successful stunting prevention is more heavily determined by the continuity of exclusive breastfeeding practices and subsequent child feeding patterns, rather than by IMD alone. Conversely, this result differs from the findings of Kusumaningsih *et al* (2023), who identified a significant relationship. This discrepancy is highly likely due to variations in regional characteristics and socio-economic backgrounds. Furthermore, the high coverage of IMD in the working area of the UPTD Puskesmas Sikumana (89.8%) means that only 9 children did not receive IMD. This extremely low sample size in the comparison group resulted in insufficient statistical power to detect meaningful differences. Despite the lack of association with initial breastfeeding, the subsequent continuity of exclusive breastfeeding demonstrated a contrasting and significant impact on stunting.

This study found a significant relationship between exclusive breastfeeding and the incidence of stunting ($p = 0.01$). This finding is consistent with research by Gulo and Subuh (2024) in West Nias Regency, as well as a systematic review by Rifai *et al* (2022), which confirms that exclusive breastfeeding serves as a vital protective factor against stunting. This protection occurs because breast milk contains complete nutrients and immunological factors that support optimal growth and reduce the risk of infection. Nevertheless, the study also identified 25 children who still experienced stunting despite receiving exclusive breastfeeding. This empirical evidence strongly supports the premise that exclusive breastfeeding alone is insufficient and must be supported by the quality of complementary feeding (MP-ASI), environmental sanitation, and maternal nutritional status during pregnancy. Therefore, the protective role of exclusive breastfeeding must be sustained by adequate complementary feeding practices, as explored below.

All three components of complementary feeding texture ($p = 0.03$), frequency ($p = 0.00$), and quantity ($p = 0.001$) were proven to have a significant relationship with the incidence of stunting. Providing a texture that is not age-appropriate can cause children to refuse food or experience digestive issues, leading to sub-optimal nutrient absorption. This finding aligns with Sari and Winarta (2022), who highlighted the importance of compliance across all comprehensive aspects of complementary feeding. Furthermore, inadequate feeding frequency leads to a continuous deficit in energy and nutrients that hinders a child's linear growth, as emphasized by Sugiyanto and Sumarlan (2021) as well as Erliwati *et al.* (2022). Similarly, an inappropriate quantity of complementary food portions contributes to chronic energy and protein deficits. This result is consistent with the findings of Kasatu *et al.* (2023), who reported that the portion sizes and nutritional adequacy of complementary feeding among stunted toddlers tend to be lower than the recommendations of the Indonesian Pediatric Society (IDAI).

Crucially, the non-compliant complementary feeding frequency and portion sizes among the respondents can be directly linked to their socio-economic constraints. As detailed in Table 1, a significant proportion of the father work as laborers with a primary income ranging only from IDR 1,000,000 to IDR 2,000,000. Bridging this nutritional theory with the local socioeconomic reality in Kupang reveals that these inadequate feeding practices are not merely a result of maternal unawareness. Rather, they are significantly constrained by the household's limited purchasing power to consistently provide frequent, appropriately sized, and nutritionally adequate meals. Finally, it is important to acknowledge a potential limitation of this study. The exceptionally high rate of exclusive breastfeeding (93.2%) reported by the respondents might be subject to recall bias or social desirability bias, given that the data were collected through self-reported maternal interviews.

Conclusion

The prevalence of stunting among toddlers aged 6–24 months in the working area of UPT Puskesmas Sikumana was recorded at 34.1%. This study concludes that there is no significant association between the early initiation of breastfeeding (IMD) and the incidence of stunting; however, exclusive breastfeeding, as well as the appropriateness of complementary feeding (MP-ASI) texture, frequency, and quantity, are significantly associated with the incidence of stunting. These findings indicate that the sustainability of feeding practices beyond the neonatal period, particularly exclusive breastfeeding and the appropriateness of complementary feeding, plays a more significant role in a toddler's nutritional status than IMD alone. Instead of relying solely on general nutrition education, it is recommended that Puskesmas Sikumana implement specific and actionable interventions. Given the prominent non-compliance in feeding frequency and portion sizes, the health center should provide targeted counseling on feeding schedules and portion sizes, as well as conduct hands-on cooking demonstration classes using nutrient-dense local foods. Furthermore, future research is advised to utilize cohort or case-control designs with larger sample sizes to better establish causality, and to consider other confounding factors such as infection history, environmental sanitation, and maternal nutritional status during pregnancy.

Reference

1. Group WMGRS, de Onis M. WHO Child Growth Standards based on length/height, weight and age. *Acta Paediatrica*. 2006;95(S450):76–85. doi:10.1111/j.1651-2227.2006.tb02378.x
2. Kemenkes. Laporan SKI 2023 dalam Angka. Kementerian Kesehatan; 2023.
3. Ledo J, Litik SKA, Nur ML, Berek NC. Description of Maternal Parenting Patterns for Stunted Toddlers in Bello Sub-District, Maulafa District, Kupang City. *Timorese Journal of Public Health*. 2025 Mar 31;7(1):31–6. doi:10.35508/tjph.v7i1.22982
4. Mulyaningsih T, Mohanty I, Widyaningsih V, Gebremedhin TA, Miranti R, Wiyono VH. Beyond personal factors: Multilevel determinants of childhood stunting in Indonesia. *PLOS ONE*. 2021 Nov 19;16(11):e0260265. doi:10.1371/journal.pone.0260265
5. Paramesti KF, Balgis B, Putri AAKEN. Hubungan Inisiasi Menyusui Dini, ASI Eksklusif, dan Pengetahuan Ibu terkait Nutrisi dengan Kejadian Stunting. *Jurnal Kesehatan Masyarakat Indonesia*. 2024 Mar 31;19(1):21–7. doi:10.26714/jkmi.19.1.2024.21-27
6. Kusumaningsih N, Muharramah A, Khairani MD, Abdullah. Hubungan Inisiasi Menyusui Dini (IMD) dengan Kejadian Stunting di Kampung Astra Ksetra Kecamatan Menggala Kabupaten Tulang Bawang Tahun 2022. *Jurnal Gizi Aisyah*. 2023 Feb 9;6(1):27–34. doi:10.30604/jnf.v6i1.790

7. Gulo SD, Subuh M. Hubungan Pemberian Asi Eksklusif Dengan Kejadian Stunting pada Balita di Kabupaten Nias Barat Tahun 2024. PREPOTIF *Jurnal Kesehatan Masyarakat*. 2024 Aug 30;8(2):4473–84. doi:10.31004/prepotif.v8i2.28529
8. Rifai A, Setyawati T, Sumarni. Hubungan Asi Eksklusif dengan Kejadian Stunting : Tinjauan Sistematis. *Jurnal Medical Profession*. 2022;4(2):111–8.
9. Sugiyanto S, Sumarlan S. Analisa Faktor Yang Berhubungan Dengan Stunting Pada Balita Usia 25-60 Bulan. In: *Jurnal Kesehatan Perintis*. 2021. p. 9–20. doi:10.33653/jkp.v7i2.485
10. Erliwati E, Evawaty E, Masniati M, Page M, Rahmania R. Hubungan Pemberian MP-ASI Dengan Kejadian Stunting Pada Anak Usia 6-24 Bulan Di Desa Bonde Utara Wilayah Kerja Puskesmas Pamboang Kabupaten Majene. *J-HEST J Health Educ Econ Sci Technol*. 2022 Dec 31;5. doi:10.36339/jhest.v5i1.83
11. Kasatu BD, Anggraheny HD, Noviasari NA. Hubungan Faktor Riwayat Mpasi Dengan Kejadian Stunting di Wilayah Kerja Puskesmas Karanganyar I Kabupaten Demak. *Jurnal Ilmu Kedokteran dan Kesehatan*. 2023;10(12):3541–7. doi:10.33024/jikk.v10i12.10599