

THE EFFECT OF NURTURING CARE ON THE INCIDENCE OF STUNTING AMONG TODDLERS IN THE SERVICE AREA OF THE MAIWA COMMUNITY HEALTH CENTER ENREKANG REGENCY

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ABSTRACT

Stunting refers to a condition of chronic undernutrition in which a child's height-for-age (HAZ) falls more than two standard deviations below the WHO reference median. In 2024, Enrekang Regency reported a stunting prevalence of 34.3%, the second-highest figure in South Sulawesi Province. This research set out to examine how three dimensions of maternal caregiving—exclusive breastfeeding, complementary feeding, and household sanitation—relate to stunting among toddlers within the coverage area of Puskesmas Maiwa, Enrekang Regency. A cross-sectional quantitative design was applied, drawing 93 respondents through simple random sampling, with binary logistic regression used for data analysis. Findings indicated that exclusive breastfeeding was significantly related to stunting status ($p=0.002$; $OR=11.058$), while inappropriate complementary feeding emerged as the strongest predictor ($p=0.000$; $OR=37.414$); sanitation, by contrast, showed no significant association ($p=0.675$). Together, the three variables accounted for 68.7% of the variance in stunting occurrence (Nagelkerke $R^2 = 0.687$). Based on these results, efforts to prevent stunting in the area should give priority to maternal education on proper breastfeeding and complementary feeding practices.

Keywords: *Exclusive breastfeeding, complementary feeding, nurturing care, sanitation, stunting.*

INTRODUCTION

Stunting represents a form of chronic malnutrition with lasting consequences for a child's physical growth and developmental trajectory. The WHO defines a child as stunted when their height falls two or more standard deviations below the reference growth curve for their age group. This condition typically arises from a combination of long-term inadequate nutrient intake, repeated illness, and insufficient early stimulation. WHO data for 2024 place the global burden at 150.2 million stunted children under five, or 23.2% of all toddlers worldwide (Ramlan et al., 2024).

The consequences of stunting cut across multiple domains and can be severe. In the near term it heightens vulnerability to illness and mortality, and over the longer run it can leave lasting deficits in brain development that show up as weaker cognitive, motor, and language skills. Because stunted children often score lower on IQ measures, their schooling outcomes and later economic productivity tend to suffer as well.

Stunting should therefore be understood not simply as a health concern but as a matter of long-term human capital investment that shapes a nation's future (Febrianti et al., 2025).

Despite measurable progress, Indonesia continues to grapple with the task of lowering stunting rates. Figures from the Indonesian Nutrition Status Survey (SSGI) show a decline from 21.5% in 2023 to 19.8% in 2024, equivalent to roughly 357,000 fewer new stunting cases. Even so, this remains well short of the 14.2% target set for 2029 under the National Medium-Term Development Plan (RPJMN), leaving an additional reduction of about 7.3 percentage points to be achieved within five years (Hermawati et al., 2025).

South Sulawesi continues to rank among the provinces with comparatively high stunting burdens. Provincial prevalence dropped from 27.2% in 2022 to 23.3% in 2024, placing the province somewhere between 8th and 10th nationally, yet still above the 19.8% national figure. Gaps between districts within the province are wide: Jeneponto sits at the top with 37.0%, Enrekang follows in second place at 34.3%, and Gowa records the lowest prevalence at 17% (Kurniati et al., 2025).

Enrekang Regency's stunting situation is particularly concerning. SSGI figures over the last three years reveal a worrying pattern: prevalence stood at 26.4% in 2022, jumped by 8.5 percentage points to 34.9% in 2023, then eased slightly to 34.3% in 2024. That 34.3% figure keeps Enrekang in second place among South Sulawesi's districts, well above both the 23.3% provincial average and the 14% national target (Aswi & Sukarna, 2022).

Puskesmas Maiwa, located in Maiwa Subdistrict, Enrekang Regency, functions as the frontline provider for stunting-prevention services across 21 villages and one kelurahan. Its 2025 monitoring data cover 1,431 toddlers, of whom 200 (14.1%) were classified as stunted and 1,231 (85.9%) as having adequate nutritional status. While this puts Maiwa Subdistrict at 12th of 14 subdistricts in Enrekang and just under the 14.2% national benchmark, prevalence varies sharply from one village to another—from a high of 22.5% in Ongko Village to a low of 4.8% in Limbuang Village (Riyadh et al., 2023).

The significant increase in prevalence from 2022 to 2023 underscores the urgent need to identify the underlying causes and design effective, evidence-based interventions. Specifically, maternal care practices in the field still reveal a number of gaps, such as suboptimal exclusive breastfeeding due to challenges with milk production and mothers' limited understanding, as well as the introduction of complementary foods that often does not align with the recommended timing, frequency, and texture for the child's age. This situation is exacerbated by geographic factors, variations in the economic status of a population that is predominantly made up of farmers, and mothers' educational backgrounds, which shape their understanding of the importance of nutrition and optimal child-rearing practices. Low socioeconomic status is often associated with a high risk of stunting, due to limited access to health information and nutritious food sources. However, in the context of a region with complex challenges such as Enrekang, a deep understanding of maternal child-rearing

practices that influence stunting rates is highly relevant and strategic to examine as a basis for developing effective and replicable interventions (Wisnuwardani et al., 2026).

This study aims to examine the effect of maternal caregiving practices—including exclusive breastfeeding, complementary-food introduction, and sanitation—on stunting incidence among toddlers in the service area of the Maiwa Community Health Center (Aghniyaa, 2026).

The Nurturing Care Framework (NCF) developed by the WHO, UNICEF, and the World Bank identifies maternal caregiving practices as a key factor in preventing stunting through five main components. This study focuses on the three most relevant components of the NCF: (1) exclusive breastfeeding as optimal nutrition and protection against infection, (2) appropriate complementary feeding to meet energy and micronutrient needs, and (3) sanitation to prevent recurrent infections. The novelty of this study lies in the use of the Nurturing Care Framework to simultaneously examine three components of maternal care—exclusive breastfeeding, complementary feeding, and sanitation—within a single binary logistic regression model, an approach that, to the best of the researchers' knowledge, has not been widely applied in stunting studies in mountainous geographic areas such as the Maiwa Community Health Center in Enrekang Regency. This study provides empirical evidence regarding the parenting variables that most significantly influence stunting in this context, serving as a basis for prioritizing interventions by the local Community Health Center and Posyandu volunteers (Dian Amilia, 2025).

RESEARCH METHOD

A quantitative, descriptive-analytical approach with a cross-sectional design was used in this research. This design suited the goal of examining the relationship between maternal caregiving practices (exclusive breastfeeding, complementary feeding, and sanitation) and stunting prevalence at one point in time, without the need for repeated follow-up. It was also a practical choice in terms of time and cost, matching the study's intent to capture how these variables relate to one another under actual field conditions. Data collection took place in the Puskesmas Maiwa service area, Enrekang Regency, over a two-month period once the research proposal had received approval (Ida et al., 2023).

The study population comprised every toddler aged 6 months to 5 years registered and monitored within the Puskesmas Maiwa coverage area—1,231 with adequate nutritional status and 200 classified as stunted, for a combined total of 1,431 children (Parellangi et al., 2023). Sampling followed a probability-based, simple random approach, chosen so that every toddler in the population had an equal chance of selection. This yielded a sample of 93 toddlers (Eldrian et al., 2022).

The inclusion criteria covered mothers of toddlers aged 6 months to 5 years within either nutritional category, provided the child was registered in the Puskesmas Maiwa area and the mother resided there permanently. Toddlers were excluded if the mother was unavailable during data collection, declined to cooperate or withdrew partway

through, or if the child had a chronic illness or congenital condition affecting nutritional status (Elmina Tampubolon, 2023).

Primary data were gathered by the research team directly from respondents through structured interviews. Prior to fieldwork, the 26-item questionnaire was piloted on 32 respondents and checked for validity using Pearson's product-moment correlation; every item returned an r value between 0.415 and 0.909, all exceeding the critical value of 0.3494 ($df=30$, $\alpha=0.05$), confirming the instrument's suitability for measuring the study variables (Nuryani, 2019).

Secondary data came from existing records, including the toddler cohort registry maintained by Puskesmas Maiwa to track children's growth over time (Maineny et al., 2022). Binary logistic regression was chosen to test the effect of the three independent variables—exclusive breastfeeding, complementary feeding, and sanitation—on stunting status, a choice justified by the dichotomous, categorical nature of these variables (Ningsih et al., 2024).

RESULTS AND DISCUSSION

Results of the Univariate Analysis of the Variables Exclusive Breastfeeding, Complementary Feeding, and Environmental Sanitation

A univariate analysis was carried out first, to map out the frequency and percentage distribution of each study variable—stunting status, exclusive breastfeeding, complementary feeding, and environmental sanitation. The resulting distribution is set out below.

Table 1. Frequency Distribution of Stunting, Exclusive Breastfeeding, Complementary Feeding, and Environmental Sanitation

Variable	Category	n	%
Incidence of Stunting	Non-Stunting	42	45.2
	Stunting	51	54.8
	Total	93	100
Exclusive Breastfeeding	Breast Milk	57	61.3
	No Breastfeeding	36	38.7
	Total	93	100
Complementary Feeding	Compliant	52	55.9
	Non-Compliant	41	44.1
	Total	93	100
Environmental Sanitation	Good	83	89.2
	Poor	10	10.8
Incidence of Stunting	Total	93	100

As shown in Table 1, 51 of the 93 sampled toddlers (54.8%) were classified as stunted against 42 (45.2%) who were not. For exclusive breastfeeding, 57 children

(61.3%) met the criterion while 36 (38.7%) did not; for complementary feeding, 52 respondents (55.9%) were categorized as compliant against 41 (44.1%) non-compliant; and for sanitation, 83 households (89.2%) were rated good and 10 (10.8%) poor. WHO classifies any prevalence above 30% as high to very high, so the 54.8% figure recorded here sits well within that range—signaling that linear growth failure is a widespread problem in this population, one carrying the potential for lasting effects on cognitive development as well as elevated risk of noncommunicable disease later in life.

Results of the Bivariate Analysis of Exclusive Breastfeeding, Complementary Feeding, and Environmental Sanitation

A bivariate analysis followed, testing each independent variable against stunting status individually through simple logistic regression, with the p-value and odds ratio (OR) serving as indicators of statistical significance and relative risk respectively. Results appear below (Suwarni & Selviana, 2026).

Table 2. Table of the Effects of Exclusive Breastfeeding, Complementary Feeding, and Environmental Sanitation on the Incidence of Stunting

Variables	B	p-value	OR (Exp(B))	95% CI
Exclusive Breastfeeding	3.171	<0.001	23,833	6,449–88,085
Complementary Feeding	4,147	<0.001	65,000	13,651–309,501
Environmental Sanitation	-1,314	0.109	0.269	0.054–1.342

Table 2 shows that, at the bivariate level, both exclusive breastfeeding ($p < 0.001$; $OR = 23.833$; 95% CI 6.449–88.085) and complementary feeding ($p < 0.001$; $OR = 65.000$; 95% CI 13.651–309.501) were significantly associated with stunting, whereas sanitation was not ($p = 0.109$; $OR = 0.269$; 95% CI 0.054–1.342). Judging from the OR magnitudes alone, complementary feeding carried the strongest bivariate association ($OR = 65.000$), ahead of exclusive breastfeeding ($OR = 23.833$).

Results of the Bivariate Analysis of Exclusive Breastfeeding, Complementary Feeding, and Environmental Sanitation

Most mothers in the sample—51 of them (54.8%)—fell into the 21–30 year age bracket, a pattern that echoes other studies showing mothers of toddlers typically cluster within the 20–35 year range regarded as the most reproductively favorable window for pregnancy, delivery, and child-rearing. At the same time, a large share of the toddlers were aged 6–11 months, meaning most children in the sample were passing through the transition from exclusive breastfeeding into complementary feeding—a stage widely regarded as pivotal for meeting nutritional needs.

Parity—the number of children a mother has had—can shape how she cares for a toddler, since it reflects her accumulated child-rearing experience. Here, 78.5% of the toddlers were first- or second-born, suggesting most mothers were still relatively early in that learning curve; limited prior experience of this kind may partly explain shortfalls in exclusive breastfeeding and complementary feeding practice.

Sex is a basic variable worth accounting for in nutritional-status research, since growth patterns and nutrient needs can diverge somewhat between boys and girls at particular ages. The sample here was close to evenly split, with 47 girls (50.5%) against 46 boys (49.5%), so sex distribution was not skewed toward either group.

Educational attainment varied across the sample, though on balance most mothers appear reasonably well-positioned to absorb health information—68.8% had completed at least senior secondary school, up through diploma or bachelor's-level education.

Most respondents—70, or 75.3%—identified as homemakers. Being at home more often gives these mothers a practical advantage in time available for direct childcare compared with mothers working outside the home, yet more contact time does not automatically translate into better-quality care unless it is paired with adequate nutritional knowledge.

Table 3. Results of the Logistic Regression Model Validity Test

Statistical Tests	Value	df	p-value
Omnibus Test (Chi-square)	67.042	3	0.000
Hosmer and Lemeshow Test	3.769	4	0.438
-2 Log Likelihood	61.011	—	—
Cox & Snell R-squared	0.514	—	—
Nagelkerke R-Square	0.687	—	—

Table 4. Results of Binary Logistic Regression Analysis on the Effect of Maternal Child-Rearing Practices on Stunting Incidence Among Toddlers in the Maiwa Community Health Center Service Area, Enrekang Regency

Variable	B	S.E.	Wald	df	p-value	OR (Exp B)	Lower 95% CI	Upper 95% CI
Exclusive Breastfeeding	2.403	0.786	9,351	1	0.002	11,058	2,370	51,599
Complementary Feeding	3,622	0.836	18,761	1	0.000	37,414	7,265	192,679
Environmental Sanitation	0.514	1,227	0.176	1	0.675	1.673	0.151	18.538
Constant	1.755	0.420	17.463	1	0.000	0.173	—	—

Results of the Binary Logistic Regression Model Validity Test

Table 3's Omnibus Test of Model Coefficients returned a chi-square of 67.042 (df=3, p=0.000), confirming that the model as a whole holds statistical significance and is fit for use. The Hosmer-Lemeshow test, meanwhile, produced a chi-square of 3.769 (df=4, p=0.438), and because this exceeds 0.05 it indicates no meaningful gap between predicted and observed outcomes—in other words, the model fits the data adequately. Its Nagelkerke R² of 0.687 means the three independent variables jointly account for 68.7% of the variation seen in toddler stunting.

Results of the Binary Logistic Regression Test

As shown in Table 4, the binary logistic regression results indicate that of the three variables tested, two—exclusive breastfeeding and complementary feeding—are statistically significant in relation to stunting incidence, while environmental sanitation shows no statistically significant relationship.

The exclusive breastfeeding variable produced a Wald value of 9.351 with a p-value of 0.002 (p < 0.05), an OR of 11.058, and a 95% CI of 2.370–51.599. This means toddlers not exclusively breastfed face an 11.058 times greater risk of stunting than those who are, after controlling for the other variables.

The complementary feeding variable stood out as the most dominant factor associated with stunting, posting the largest Wald value at 18.761 with a p-value of 0.000 (p < 0.05). Its OR reached 37.414 with a 95% CI of 7.265–192.679, meaning toddlers given inappropriate complementary feeding faced a 37.414 times greater stunting risk than those given appropriate complementary feeding, after controlling for the other variables.

The environmental sanitation variable produced a Wald value of 0.176 with a p-value of 0.675 (p > 0.05), an OR of 1.673, and a 95% CI of 0.151–18.538. These figures show that environmental sanitation was not a statistically significant factor associated with stunting once the other variables in the model were controlled for.

The logistic regression equation obtained is therefore as follows:

$$Y = -1.755 + 2.403 (X1) + 3.622 (X2) + 0.514 (X3)$$

From these multivariate results, it can be concluded that complementary feeding is the most dominant variable associated with stunting incidence among toddlers in the Maiwa Community Health Center's service area in Enrekang Regency, followed by exclusive breastfeeding.

The Effect of Exclusive Breastfeeding on the Incidence of Stunting in Toddlers

Based on the findings from the researchers' study on the influence of exclusive breastfeeding on stunting incidence among toddlers in the working area of Maiwa Community Health Center, Enrekang Regency, the binary logistic regression analysis

yielded a Wald statistic of 9.351 with a p-value of 0.002 ($p < 0.05$), an OR of 11.058, and a 95% CI ranging from 2.370 to 51.599. These findings demonstrate a significant relationship between exclusive breastfeeding and stunting occurrence among toddlers at Maiwa Community Health Center, and thus the alternative hypothesis (H_{a1}) proposed in this study is supported. Toddlers who did not receive exclusive breastfeeding faced a stunting risk 11.058 times higher than those who were exclusively breastfed, even after accounting for other variables.

During the first 1,000 days of life, adequate nutrition delivered through exclusive breastfeeding appears to shield infants from stunting, a pattern clearly reflected in the data from Puskesmas Maiwa's working area. A plausible explanation lies in the vulnerability of non-exclusively breastfed infants to recurrent infections, which in turn compromise nutrient absorption and impede linear growth — a mechanism also highlighted by Mahartama, (2022), systematic review. Supporting evidence comes from two recent studies: in Kelurahan Kemang Agung reported a comparable protective effect ($p=0.003$), while at Puskesmas Cekar, and Asprika (2023) at found an even stronger association (OR = 12.00). Taken together, these parallel findings across distinct settings point to exclusive breastfeeding's protective effect as a genuinely robust phenomenon; at the same time, the differing effect sizes between locations serve as a reminder that stunting remains multifactorial, shaped by local conditions and confounders beyond breastfeeding status alone.

Strengthening support systems for exclusive breastfeeding — encompassing Early Initiation of Breastfeeding (IMD), proper technique education, and consistent backing from both family members and health workers — emerges as a critical priority in light of this study's results. Without such support, toddlers in the working area of Puskesmas Maiwa, Enrekang Regency, remain at considerably heightened risk of stunting, as the failure to sustain exclusive breastfeeding practices was shown to be a major contributing factor.

The Effect of Exclusive Complementary Feeding on the Incidence of Stunting in Toddlers

An analysis using binary logistic regression, applied to examine the relationship between complementary feeding practices and stunting incidence among toddlers within the working area of Puskesmas Maiwa, Enrekang Regency, yielded a Wald value of 18.761 alongside a p-value of 0.000 ($p < 0.05$); the odds ratio reached 37.414, with a 95% confidence interval spanning 7.265 to 192.679. Given that the p-value fell well below the 0.05 threshold, complementary feeding was confirmed to bear a significant relationship with stunting occurrence at Puskesmas Maiwa, lending support to the second alternative hypothesis (H_{a2}) advanced in this research. Among all variables examined in the study, complementary feeding emerged as the single most dominant factor linked to stunting, with toddlers receiving inappropriate complementary feeding facing a risk of stunting roughly 37 times greater — specifically 37.414 times — than their counterparts who received appropriate complementary feeding, even after other

variables were statistically controlled for.

Emerging as the most dominant variable linked to stunting in this study, complementary feeding carries an odds ratio (OR) so high — 37.414 — that it points to the 6-to-23-month window as a particularly critical and vulnerable stage for growth impairment. When complementary feeding is initiated at the wrong time, whether prematurely before the child reaches 6 months or belatedly afterward, the resulting imbalance in energy intake and essential micronutrients like iron and zinc can directly undermine both physical growth and brain development in children. Compounding this risk are additional factors: complementary feeding of poor nutritional quality, insufficient dietary diversity as measured against the Minimum Dietary Diversity (MDD) standard, and unresponsive feeding behaviors — such as mothers forcing food on children or disregarding their natural hunger and satiety signals — all of which can substantially deteriorate toddlers' overall nutritional status.

Special attention to enhancing the quality of complementary feeding — encompassing its timing, texture, frequency, menu variety, and the application of responsive feeding practices — stands out as a priority that stunting prevention efforts in the working area of Puskesmas Maiwa must address, a conclusion firmly supported by this study's findings. This emphasis is warranted precisely because, among the three variables examined in the study, complementary feeding exerted the strongest influence on stunting incidence relative to the other two.

The Effect of Exclusive Environmental Sanitation on Stunting Incidence in Toddlers

An examination of the relationship between sanitation and stunting incidence among toddlers within the working area of Puskesmas Maiwa, Enrekang Regency, conducted through binary logistic regression analysis, produced a Wald value of 0.176 accompanied by a p-value of 0.675 ($p > 0.05$); the odds ratio stood at 1.673, with a 95% confidence interval extending from 0.151 to 18.538. Since the p-value exceeded the 0.05 threshold, no statistically significant association was found between sanitation and stunting occurrence at Puskesmas Maiwa after accounting for other variables, leading to acceptance of the null hypothesis (H_0-3) formulated in this study.

The researchers position this study's contribution as its integrated application of the Nurturing Care Framework to examine exclusive breastfeeding, complementary feeding, and sanitation simultaneously, an approach rarely applied together in prior Indonesian studies and one that remains underrepresented in South Sulawesi, including Enrekang Regency, where existing Nurturing Care Framework research has concentrated mainly in Sumatra and Java. By identifying the most dominant predictor through binary logistic regression, this study offers empirical evidence from a locus that has rarely been examined, providing a basis for more targeted stunting prevention interventions at the Puskesmas level in the region. Furthermore, respondents' compliance in answering the questionnaire regarding sanitation may be influenced by perceptual bias, whereby respondents tend to report their household sanitation conditions as better than they actually are. Nevertheless, sanitation must still be a

priority in comprehensive stunting prevention programs, given that it plays a role in preventing recurrent infections that can exacerbate the effects of suboptimal feeding practices (Said et al., 2023).

Implications for practical health service delivery emerge from these findings, most notably the need to position breastfeeding and nutrition counseling as a priority intervention at the Puskesmas level. Corroborating this direction is the work of Athifah, (2023) who examined the implementation of stunting prevention programs in the working area of Puskesmas Lapadde, Parepare City; that study found that initiatives taken at the discretion of frontline health workers — including routine home visits, iron supplementation, and ongoing breastfeeding and nutrition counseling — played a key role in sustaining the success of stunting prevention efforts. A parallel line of support appears at the policy level, drawn from the study by Zainal et al., (2021) in the working area of Puskesmas Antang, Makassar City, where breastfeeding counseling was shown to have a significant direct effect in lowering stunting incidence, notwithstanding the fact that the broader specific nutrition intervention package for breastfeeding mothers — spanning early initiation, exclusive breastfeeding, and appropriate timing of complementary feeding — failed to produce an overall reduction in stunting within that particular setting. Taken together, these two studies point toward a noteworthy possibility: it may be counseling itself, rather than the intervention package in its entirety, that functions as the most consistently effective component across comparable Puskesmas settings. Looking ahead, future research would benefit from longitudinal designs capable of establishing the causal pathway linking feeding practices to stunting, while also probing how regional context moderates the strength of these associations across diverse settings in Indonesia.

CONCLUSION

Emerging from this study as the primary determinants of stunting in the working area of Puskesmas Maiwa are infant feeding practices — namely exclusive breastfeeding and the timely introduction of complementary foods — with the latter exerting a markedly stronger influence than the former, whereas environmental sanitation does not appear, on its own, to drive stunting risk within this setting. Viewed through the lens of nurturing care, this pattern suggests that feeding-related caregiving behaviors carry substantially more weight than environmental conditions in shaping early childhood growth outcomes in this locality, a disparity that likely reflects the sanitation infrastructure already present at an adequate level in the study area. Accordingly, the researchers argue that stunting prevention efforts in this region ought to place feeding practices — strengthened through breastfeeding support and complementary feeding education — at the center of intervention priorities, while relegating environmental sanitation to a supporting rather than primary role.

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