



Analysis of Risk Factors for Stunting in Toddlers

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<p>Track Record Article</p> <p>Revised: 10 January 2026 Accepted: 13 February 2026 Published: 31 March 2026</p> <p>How to cite : Nababan, D., & Putri, H. K. (2026). Analysis of Risk Factors for Stunting in Toddlers. <i>Contagion : Scientific Periodical of Public Health and Coastal Health</i>, 8(1), 604–619.</p>	<p style="text-align: center;">Abstract</p> <p><i>Stunting has been a significant public health burden in Indonesia, reflecting chronic malnutrition during the critical first 1,000 days of life. Despite a national decline, local prevalence in rural areas, such as in Langkat District, remains a challenge. This study aims to analyze interrelated risk factors: maternal knowledge, antenatal care (ANC) visits, iron supplementation, exclusive breastfeeding, and complementary feeding, that contribute to stunting in toddlers. A cross-sectional study was conducted in the working area of the Secanggang Community Health Center, Langkat. A total of 162 toddlers participated in this study. Data were collected through interviews with mothers and anthropometric measurements. Bivariate analysis was performed using the Chi-square test to determine the relationship between variables. The prevalence of stunting was 40.7% (n=66). Statistical analysis showed that all factors studied were significantly associated with stunting (p < 0.05). Mothers' knowledge about stunting was generally low (70.4%). The highest risk was found in infants who did not receive exclusive breastfeeding, where 25.9% experienced stunting compared to those who received exclusive breastfeeding. Inadequate ANC visits (p < 0.05) and poor adherence to iron (Fe) tablets (p < 0.05) also significantly increased the risk of growth failure. Stunting in this population is triggered by the interaction between low maternal literacy and suboptimal antenatal and postnatal care. These findings indicate an urgent need for maternal education programs and breastfeeding support integrated into the primary health care (Puskesmas) framework to reduce long-term growth disorders.</i></p> <p>Keywords: <i>Maternal Knowledge, Antenatal Care, Exclusive Breastfeeding, Stunting, Toddlers</i></p>
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INTRODUCTION

Stunting is a condition when children fail to develop adequately, resulting in a height that is below the normative standard for their age (Scheffler et al., 2020). Stunting is a public health concern particularly in impoverished and emerging nations (Soliman et al., 2024). In 2020, according to the World Health Organization (WHO), around 149.2 million children under the age of five globally experienced stunting (Gabain et al., 2023). In Southeast Asia, Indonesia ranks third with an average prevalence of 36.4%. Besides height, stunting can affect a child's physical health, mental well-being, brain development, and even future achievement (Ministry of Health of Indonesia, 2020). Although governments and organizations have worked hard to tackle this issue over the past two decades, it continues to be a tough challenge (Aswi et al., 2024). In Indonesia, the cases of stunting have dropped to 19.8% in 2024, according to the 2024 SSGI released in May 2025. This figure is even better than Bappenas' projection of 20.1% for the same year (Ministry of Health of Indonesia, 2024).

The progress of preventing stunting cases has been seen, but the effect of stunting is not only about a child's physical growth alone (Montenegro et al., 2022). Stunting can be triggered by chronic malnutrition during the 'First 1,000 Days of Life', which triggers irreversible structural changes in brain architecture and inhibits cognitive neural development (Ali, 2023). This condition can be a main factor of lower IQ scores, reduced learning capacity, and decreased economic productivity in adulthood, ultimately creating a cycle of intergenerational poverty (Saavedra & Prentice, 2022). Furthermore, the current study points to metabolic 'programming' effects, whereby children who experience stunting are at greater risk of developing non-communicable diseases such as obesity and cardiovascular disorders later in life (Cerf, 2023). The complexity of these impacts suggests that stunting is not merely a growth disorder, but rather a systemic failure in nutritional and environmental support during the critical growth.

Lack of nutrition during a child's growth and development are interacting with other unidentified factors at the local level (Renn et al., 2022). The main problem faced at the local level is the multidimensional risk clusters, such as low diversity of animal protein intake during the complementary feeding period and poor sanitation infrastructure, that triggers a cycle of repeated infections (Beal et al., 2018; Joe et al., 2025). Additionally, a significant gap exists between national nutrition intervention policies and the realities of maternal health literacy and limited household economic access, which hinders the implementation of optimal parenting practices (Anyanwu et al., 2022). Limitations in finding the main causes of stunting in a specific population suggest that the measures to prevent stunting are often carried out generally without targeting the unique causes in a certain region. Without the identification of appropriate and locally-based risk factors, efforts to break the chain of stunting will continue to face structural barriers that hinder the sustainable achievement of national health targets.

Recent literature reviews emphasize that stunting is the result of complex interactions between specific and sensitive factors. Inadequate animal protein intake and low dietary diversity are some major predictors of linear growth failure in the critical period of early childhood (Limardi et al., 2022; Muslimatun et al., 2016). Beyond nutritional aspects, environmental health can trigger stunting too; it was proven that limited access to adequate sanitation and clean water has been shown to mediate the risk of chronic intestinal infections that systematically inhibit micronutrient absorption (Clara et al., 2025). Furthermore, maternal education level, age at pregnancy, and nutritional literacy, have been identified as fundamental factors that determine the quality of infant and child feeding practices (PMBA) and overall parenting patterns (Siregar et al., 2024). The consistency of findings from various

international and national literature provides a strong theoretical basis for the multidimensionality of stunting causes, but at the same time highlights the urgent need to verify which variables are most decisive in specific demographic and geographic contexts to optimize the effectiveness of interventions.

This study was carried out in the Secanggang Community Health Center is located within the Langkat Regency Health Office. The WHO states that a national nutritional problem is considered if the prevalence of stunting is above 20%. Secanggang Village is one of the local areas with highest prevalence cases of stunting in Langkat regency. Through brief interviews at the integrated health post (Posyandu) in Secanggang Village, it was found that several mothers of toddlers did not understand stunting, its impact, and the factors associated with stunting. Based on this initial survey, the researcher was interested in researching the relationship between knowledge, maternal parenting patterns, socioeconomic status, and access to sanitation, as well as exclusive breastfeeding, with the incidence of stunting in toddlers in the Secanggang Community Health Center.

METHODS

This study employed an analytical observational design with a cross-sectional approach to assess the relationship between maternal knowledge, ANC, Iron, and exclusive breastfeeding with the incidence of stunting in toddlers. While this design allows for the identification of significant associations, it is important to note that it cannot establish definitive causality between the variables. This research was conducted at the Secanggang Community Health Center (Puskesmas), Langkat Regency, from August 2024 to February 2025. Prior to data collection, all participants were provided with information regarding the study's objectives, and written informed consent was obtained from each respondent.

The study population consisted of all mothers with toddlers residing in the Secanggang Health Center work area. A total sampling technique was utilized, involving 162 mothers. The sampling frame was derived from the 2024 Integrated Service Post (Posyandu) records and the Community-Based Nutrition Recording and Reporting System (EPPGBM). All eligible mothers who met the inclusion criteria, having a toddler aged 0-59 months and being permanent residents, were recruited for the study. The data obtained included the mother's name, age, education, knowledge, socioeconomic status, parenting patterns, access to sanitation, and exclusive breastfeeding. Secondary data included the toddler's name, age, gender, address, and nutritional status, which was measured using the Community-Based Nutrition Recording and Reporting System (EPPGBM) in 2024. The child's nutritional status

was measured to determine the relationship between the dependent and independent variables. Interviews were conducted to determine the toddler's name, age, and address. Anthropometric kits were used to determine whether infants were stunted.

Length was measured in a supine position for children aged 0-24 months. If measured in a standing position, it was corrected by adding 0.7 cm. Height was measured in a standing position for children aged 24-59 months. If measured in a lying position, it was corrected by subtracting 0.7 cm. Stunting was defined as a Z score (Height/Age): <-2 Standard Deviation. Normal was defined as a Z score (Height/Age): -2 to <2 Standard Deviation. Maternal knowledge is measured through interviews using a questionnaire that has been tested for validity and reliability, consisting of 15 questions about the definition, causes, effects, and prevention of stunting.

Correct answers were given a score of 1, and incorrect answers were given a score of 0. The results were categorized as follows: 1. Good: if the respondent's score was 24-30 (76-100%) 2. Poor: if the respondent's score was <24 ($<76\%$), Exclusive breastfeeding was measured through interviews using a questionnaire. The categorization was based on Exclusive breastfeeding, and not exclusive breastfeeding. The analysis was conducted in stages, including univariate and bivariate analysis. Univariate analysis was conducted to obtain an overview/description of each independent and dependent variable. Bivariate analysis aims to determine the relationship between independent variables (X1-X5) and dependent variables (Y1). To prove the existence of this relationship, a Chi-Square test was performed with a 95% confidence level ($\alpha=0.05$). In this study, data processing was performed using statistical data processing software, which then produced a p-value.

RESULT

Table 1 presents the research population in the Secanggang Community Health Center where the prevalence of stunting in toddlers reached 40.7% (66 respondents), while the other 59.3% (96 respondents) were in the normal growth category. This Indicates that there is a mismatch between mothers' health literacy levels and clinical practices, where, although most mothers (70.4%) had poor knowledge about stunting, they showed high compliance with health procedures during pregnancy, as reflected in optimal *Ante Natal Care* (ANC) visits (69.0%) and consistent iron tablet consumption (60.5%). Child feeding behavior indicators also showed a positive trend, with most toddlers receiving exclusive breastfeeding (66%) and complementary feeding (70.4%) categorized as good. Overall, these data represent a complex risk profile, where, despite adherence to basic parenting practices and access to maternal

health services, limited maternal knowledge remains a fundamental problem contributing to the high incidence of stunting in the region.

Table 1. Descriptive analysis of the research population in the Secanggang Community Health Center

Variable	n	%
Stunting Incidents in Toddlers		
Stunting	66	40.7
Normal	96	59.3
Mother's knowledge		
Poor	48	29.6
Good	114	70.4
Antenatal Care Visit		
Poor	52	32.1
Good	110	67.9
History of iron tablet administration		
Poor	64	39.5
Good	98	60.5
Exclusive Breastfeeding		
Poor	55	34.0
Good	107	66.0
Providing complementary foods		
Poor	48	29.6
Good	114	70.4
Total	162	100

Table 2. Factors associated with stunting in toddlers in the Secanggang Community Health Center

Variable	Stunting incidents				Total		p-value
	Stunting		Normal		N	%	
	n	%	n	%			
Mother's knowledge							
Poor	35	21.6	13	8.0	48	29.6	0.000
Good	31	19.1	83	51.2	114	70.4	
Antenatal Care Visit							
Poor	36	22.2	16	9.9	52	30.8	0.000
Good	30	18.5	80	49.4	110	67.9	
History of iron tablet administration							
Poor	38	23.5	26	16.0	64	39.5	0.000
Good	28	17.3	70	43.2	98	60.5	
Exclusive Breastfeeding							
Poor	42	25.9	13	8.0	55	34.0	0.000
Good	24	14.8	83	51.2	107	66.0	
Provision of Complementary Feeding							
..Poor	31	19.1	17	10.5	48	29.6	0.000
Good	35	21.6	79	48.8	114	70.4	
Total	66	44.2	96	55.8	162	100	

In Table 2, the bivariate test results show that all independent variables studied have a statistically significant relationship with stunting in toddlers in the Secanggang Community Health Center working area ($p < 0.05$). Data analysis showed that linear growth failure was more common among mothers with limited health literacy, with a stunting rate of 21.6% among mothers with low knowledge. In terms of antenatal care, the risk of stunting was

found to be higher among mothers with poor ANC attendance (22.2%) and poor iron tablet (Fe) compliance (23.5%). This condition was exacerbated by postnatal care practices, where lack of exclusive breastfeeding was a risk factor with the highest proportion of stunting cases at 25.9%, followed by inappropriate complementary feeding (19.1%). Based on these findings, we can conclude that maternal knowledge gaps, low-quality health interventions during pregnancy, and inadequate infant and child feeding practices (PMBA) are factors contributing to the increase the case of stunting in children.

DISCUSSION

The Relationship Between Mother's Knowledge and Stunting Incidence

The statistical test results indicate that there is a significant relationship between maternal knowledge and the incidence of stunting in toddlers ($p < 0.05$). Stunting in toddlers is a complex and multifactorial public health problem. One factor contributing to stunting is knowledge, including maternal knowledge about nutrition, healthy eating patterns, and proper child care. Although access to information may be available, the internalization of risks and prevention of chronic growth failure is still not optimal. This lack of knowledge becomes a structural barrier for mothers in identifying the early symptoms of growth disorders, which increases children's vulnerability to stunting due to feeding and care practices that are not based on proper health principles.

The relationship between maternal knowledge and stunting in this study is in line with the current literature consensus that places maternal health literacy as an upstream determinant of child nutritional status. This finding is strongly supported by research by Abri, (2022) in Enrekang and Ramadhan et al. (2024) in Aceh, which reported that mothers' limited understanding of the concept of stunting and nutritional parenting was directly related to linear growth failure in toddlers. Aprilina et al., (2021), through a case-control study, found that mothers with low nutritional knowledge had a four times higher risk of having stunted toddlers compared to mothers with good knowledge ($p=0.015$). Appropriate feeding practices (Aisyah et al., 2024) and the ability to manage family food diversity (Wahyuni et al., 2023) are also other factors contributing to stunting cases in toddlers. The consistency of these findings is also in line with studies carried out by Fatmah et al., (2023); Marita et al., (2023); and Qomah et al., (2024), which collectively affirm that although economic and environmental factors play a role, mothers' cognitive capacity to internalize the importance of nutrition during the first 1000 days of life (HPK) is the most crucial factor in mitigating the risk of stunting in Indonesia.

To reduce the cases of stunting in toddlers, efforts have been made to improve mothers' knowledge and practices related to nutrition, growth, and child development. One of them is by educating pregnant and breastfeeding mothers about the importance of balanced nutrition and proper nutritional intake during pregnancy and breastfeeding as an effort to prevent stunting cases. Mothers were invited to attend regular nutrition counseling sessions through Posyandu, health clinics, or other community activities. This counseling can include information about nutritious foods, balanced diets, and the importance of nutrition for child growth and development. Another effort is ensuring mothers have adequate access to health information through health guidebooks, brochures, pamphlets, or digital media such as health applications. In addition, training on nutritious cooking skills using local and affordable ingredients was also done so that mothers can prepare healthy meals for their families. Moreover, providing individual counseling to mothers who have toddlers at risk of stunting or other nutritional problems is expected to help mothers understand their children's health problems more deeply and receive specific advice tailored to their children's needs. Finally, involving various stakeholders, such as health workers, local governments, non-governmental organizations, and communities, in stunting prevention efforts is a collaboration which can ensure comprehensive support in addressing stunting.

The Relationship between ANC Visits During Pregnancy and the Incidence of Stunting

Bivariate analysis revealed a significant relationship between ANC visits and stunting ($p < 0.05$). Mothers of toddlers who receive ANC services in accordance with the Ministry of Health program during pregnancy, whether from doctors or midwives at health care facilities such as community health centers (Puskesmas) and hospitals, can monitor the condition of their pregnancy and fetus and obtain information on how to prevent stunting. This indicates that irregularity in pregnancy check-ups contributes to the risk of stunting. However, fragmented maternal health monitoring reduces the effectiveness of prevention.

The findings of this study, which show a significant relationship between antenatal care (ANC) history and the incidence of stunting, are consistently supported by various recent studies that emphasize the crucial role of antenatal monitoring. Research by Harumi et al. (2025) in Sidoarjo confirms that improving the quality of antenatal services directly contributes to reducing the risk of stunting through the mechanism of early detection of fetal growth disorders. This is reinforced by the findings of Suryani (2025) in North Sumatra, which identified the frequency of ANC visits as the main modifiable variable that determines the quality of delivery outcomes and postnatal growth patterns of toddlers. More specifically, Santoso and Sodik (2025) highlight that interventions through 'Integrated ANC' combined

with participation in Pregnant Women's Classes have a very strong correlation with stunting prevention because they facilitate deeper internalization of nutrition education. At the macro level, an analysis by Simbolon et al. (2021) using national data proves that the coverage of maternal and child health (MCH) services, of which ANC is a core component, is negatively correlated with the prevalence of stunting in various provinces in Indonesia. Although Astuti et al., (2020) noted varying dynamics in the risk factors for anemia during pregnancy, the literature consensus indicates that adherence to the ANC examination schedule enables specific nutrition interventions to be carried out in a timely manner to prevent intrauterine growth retardation, which is a prerequisite for stunting.

The integration of maternal and child health programs, including ANC, immunization, postpartum care, and nutrition education, is essential to ensure a holistic approach to stunting prevention. A routine monitoring and evaluation system is needed to measure the effectiveness of ANC programs and assess their impact on reducing stunting in toddlers. This data can help improve future programs and policies. Collaboration between government agencies, non-governmental organizations, health workers, and local communities is essential to create a comprehensive and sustainable approach to addressing stunting. The implementation of a comprehensive and sustainable follow-up plan is expected to reduce the prevalence of stunting in toddlers and improve the health and quality of life of children in the future.

The Relationship Between Iron Tablet Administration During Pregnancy

Bivariate analysis showed a significant relationship between iron tablet administration and stunting ($p < 0.05$). This is likely because iron tablets given to pregnant women, at a dose of one tablet per day for 90 days, can prevent anemia. This indirectly affects the fetus, as anemia can cause various consequences, such as bleeding and low birth weight (LBW). Iron deficiency anemia, which often occurs in pregnant women, causes a decrease in the number of healthy red blood cells. Non-compliance with supplementation triggers pregnancy anemia, which systematically inhibits the supply of nutrients to the fetus, manifesting in the risk of low birth weight and linear growth disorders in early life. Therefore, the relationship found in this study reinforces the proposition that adequate micronutrient intake during pregnancy is a major biological determinant of future child growth resilience.

The significance of the relationship between iron (Fe) tablet consumption during pregnancy and the incidence of stunting in this study reinforces global scientific evidence regarding the crucial role of prenatal micronutrients in the linear growth of toddlers. These findings are consistent with a study by Sari and Sartika, (2023) in Indonesia, which showed

that infants whose mothers did not receive iron supplements during pregnancy had a four times higher risk of stunting compared to those who received adequate supplements (aOR: 4.34; $p=0.030$). This consistency was also found on an international scale, where Traore et al., (2023) through a study in Sub-Saharan Africa and Nisar et al., (2020) Data analysis in seven South Asian countries proved that iron-folate supplementation (IFA) significantly reduces the risk of stunting and supports the achievement of better nutritional status in children under two years of age. This relationship is further explained in systematic reviews by Adilah et al., (2023) and Oktarina et al., (2024), which emphasizes that iron deficiency during pregnancy triggers maternal anemia, which inhibits the transport of oxygen and nutrients to the fetus through the placenta. This failure to supply nutrients causes intrauterine growth restriction (IUGR), which is a major systemic predisposing factor for stunting in early life.

Based on the findings of this study, we suggest that it is important to raise awareness among pregnant women about the importance of iron supplementation during pregnancy to prevent anemia and optimize fetal growth. Regular education programs involving health workers and local communities should be implemented. In addition, efforts should be made to ensure adequate iron supplementation for pregnant women. This may include the distribution of iron supplements free of charge or with subsidies, as well as ensuring their availability in health facilities and pharmacies. Finally, an effective monitoring system is needed to ensure that pregnant women consume iron supplements as recommended by health workers.

The Relationship Between Exclusive Breastfeeding and Stunting

The results of the bivariate analysis showed a significant relationship between breastfeeding and stunting ($p < 0.05$). Exclusive breastfeeding is the main source of nutrition for children aged 0-6 months. Exclusive breastfeeding provides complete nutrition, carbohydrates, protein, vitamins, and minerals that are easily absorbed and do not interfere with the functioning of the child's organs. The inability to implement exclusive breastfeeding can expose infants to the risk of contamination from external nutritional sources that can trigger a cycle of repeated infections and malnutrition. These findings suggest that nutritional intervention in early life through breastfeeding is an irreplaceable pillar in breaking the chain of stunting.

The relationship between exclusive breastfeeding and stunting incidence is consistent with various recent empirical evidence. These results are in line with qualitative and quantitative studies by Setyowati et al., (2022) and a systematic review by (M. Hadi, 2023),

which confirms that exclusive breastfeeding during the first six months is the most effective specific nutritional intervention in mitigating the risk of growth failure in toddlers. Studies carried out by H. Hadi et al., (2021) in Eastern Indonesia and Malonda et al., (2020) in coastal areas, consistently reports that infants who do not receive exclusive breastfeeding have a much higher vulnerability to stunting ($p=0.000$). A similar phenomenon was also reported by Triana et al., (2020) in Banyumas ($p=0.004$) and N. Sari et al., (2021) in Lampung, which showed that exclusive breastfeeding functions as an immunological 'shield' and primary nutrition. In addition, studies carried out by Hasni et al., (2023) and Umiyah & Hamidiyah (2020) emphasizes that failure to practice exclusive breastfeeding not only causes micronutrient deficiencies but also increase the risk of recurrent gastrointestinal infections, which are the main triggers of nutrient absorption disorders and growth faltering.

Support for policies that promote exclusive breastfeeding, such as regulations on formula milk advertising and the right of mothers to breastfeed in public places, needs to be strengthened. Policies that support breastfeeding in the workplace and health facilities are also very important to encourage exclusive breastfeeding practices. Public education on the importance of exclusive breastfeeding must be carried out continuously and consistently through various communication channels, including mass media, social campaigns, and community activities. The implementation of a comprehensive and coordinated follow-up plan is expected to increase exclusive breastfeeding practices. Exclusive breastfeeding reduces the incidence of stunting in toddlers and improves children's health and quality of life in the future.

The Relationship Between Complementary Feeding and Stunting

Bivariate analysis revealed a significant relationship between complementary feeding and stunting ($p < 0.05$). To ensure optimal growth and development in infants, exclusive breastfeeding and appropriate complementary feeding (MPASI) are essential. Malnutrition that leads to stunting is the result of inadequate nutrition in early life. This study shows that inaccuracies in complementary feeding, particularly related to inadequate animal protein intake and insufficient feeding frequency, are major factors contributing to stunting. This problem reflects challenges in infant and child feeding practices (PMBA) at the household level, where the quality of complementary foods often does not meet the cognitive nutritional standards necessary to support rapid physical growth and brain development in toddlers.

Previous studies have discussed the importance of the nutritional transition period after six months of age. These results are supported by research conducted by Virginia et al., (2020) in Semarang, which found that inaccuracy in the frequency and timing of the first

introduction of complementary foods increased the risk of stunting by 4.5 times ($p=0.002$). Similar findings were also reported by Sudarianti et al., (2022) and Hidayati & Pratiwi (2022), who proved that feeding patterns that do not meet nutritional standards have a strong correlation with linear growth failure ($p=0.000$). A qualitative study by Soesanti et al., (2020) in East Java revealed that the dominance of carbohydrate intake and low introduction of animal protein in complementary feeding are the main triggers of stunting in coastal communities. This phenomenon is not only found in Indonesia, but also confirmed by Masuke et al., (2021) and Tello et al., (2022) in Ecuador, who jointly concluded that inadequate complementary feeding practices during the critical growth window cause energy and protein deficits that cannot be overcome by breast milk alone.

The high correlation between inappropriate complementary feeding (MP-ASI) and stunting is caused by failure to meet nutritional gaps, where energy and micronutrients from breast milk are no longer able to meet the needs of rapid physical growth after six months of age. A specific deficit in animal protein intake is believed to be the main trigger for the inhibition of growth hormone synthesis and cellular maturation, resulting in stunted height in children that is difficult to overcome in the future. These abnormalities in nutritional care reflect barriers at the household level in converting the availability of local foods into quality nutritional intake, which ultimately triggers the emergence of chronic malnutrition in toddlers in the study area.

Overall, the factors analyzed in this study do not stand alone, but are interrelated in shaping the risk profile for stunting. Low maternal health literacy (knowledge) is the root cause that limits mothers' ability to understand the importance of antenatal care (ANC) and iron supplementation, as well as to implement proper nutritional care (exclusive breastfeeding and complementary feeding). Failure at any stage, whether during pregnancy or early growth, causes a domino effect that exacerbates chronic malnutrition. Therefore, addressing stunting in this region requires a holistic approach that aims to improve mothers' knowledge while facilitating access to sustainable nutritional support.

Research Limitations

In this study, the cross-sectional design does not allow for establishing a definite causal relationship between risk factors and stunting; this design only captures relationships at a specific point in time. Next, the data collection through interviews is prone to social desirability bias, whereby mothers may exaggerate positive health behaviors (such as breastfeeding or iron consumption) to meet perceived expectations. Additionally, the data collection instruments used in this study were not rigorously verified against standard

psychological or literacy scales. Finally, this analysis ignores key socioeconomic variables, such as household income, food security, and parental employment, which are known to be significant distal determinants of child nutrition. Future longitudinal studies incorporating these variables are needed to provide a more comprehensive causal model.

CONCLUSION

This study concluded that stunting in toddlers in the Secanggang Community Health Center working area was significantly influenced by low maternal knowledge, inadequate ANC visits, non-compliance with iron supplementation, and failure to provide exclusive breastfeeding and appropriate complementary feeding. The strongest determinant in this study was the practice of exclusive breastfeeding, with infants who did not receive exclusive breastfeeding showing the highest proportion of stunting. This confirms that postnatal interventions through breastfeeding support are as important as health monitoring during pregnancy.

The findings of this study imply that efforts to reduce stunting cases in the Secanggang Community Health Center cannot rely solely on routine clinical procedures. It must be followed by strengthening mothers' health literacy. The mismatch between high participation in health services (such as ANC and iron tablet consumption) and low maternal knowledge suggests that interventions to date may have been procedural rather than transformative in changing mothers' understanding of the essence of nutrition. Therefore, health workers need to shift their paradigm from simply distributing nutritional supplements to an integrated, persuasive educational approach, especially in helping mothers prioritize exclusive breastfeeding and animal protein in complementary foods as the main nutritional protection. In terms of policy, local governments need to design "Pro-Breastfeeding Health Centers" programs that integrate classes for pregnant women with lactation counselor support at the village level to break the chain of chronic malnutrition by empowering mothers to manage the first 1,000 days of life independently and appropriately.

REFERENCES

- Abri, N. (2022). Identification of Socio-Demographic Factors with the Incidence of Stunting in Elementary School Children in Rural Enrekang. *Journal of Health and Nutrition Research*, 1(2), 88–94. <https://doi.org/https://doi.org/10.56303/jhnresearch.v1i1.20>
- Adilah, H., Syafiq, A., & Sukoso. (2023). Correlation Of Anemia In Pregnant Women With Stunting Incidence : A Review. *Indonesian Journal of Multidisciplinary Science*, 2(9), 3155–3169.
- Aisyah, N., Putri, S., Adiwinoto, R. P., Arundani, P., & Nugraheni, P. A. (2024). The

- Relationship Between Feeding Patterns and Maternal Knowledge about Nutrition with the Incidence of Stunting in Children Age 0-5 Years in the Working Area of the Gedongan Health Center , Mojokerto City. *AgriHealth: Journal of Agri-Food, Nutrition and Public Health*, 5(1), 21–28. <https://doi.org/http://dx.doi.org/10.20961/agrihealth.v5i1.83808>
- Ali, A. (2023). Brain and Stunting : Integrative Clinical and Community Stunting Prevention Perspectives in Disorders of Brain Development. *International Journal Papier Public Review*, 4(1), 60–69. <https://doi.org/https://doi.org/10.47667/ijppr.v4i1.216>
- Anyanwu, O., Ghosh, S., Kershaw, M., Cherinet, A., & Kennedy, E. (2022). Dietary Outcomes, Nutritional Status, and Household Water, Sanitation, and Hygiene (WASH) Practices. *Current Developments in Nutrition*, 6(4). <https://doi.org/https://doi.org/10.1093/cdn/nzac020>
- Aprilina, H. D., Nurkhasanah, S., & Hisbulloh, L. (2021). Mother 's nutritional knowledge and behavior to stunting prevalence among children under two years old : case-control. *Bali Medical Journal (Bali MedJ)*, 10(3), 1211–1215. <https://doi.org/10.15562/bmj.v10i3.2868>
- Astuti, A., Muyassaroh, Y., & Ani, M. (2020). The Relationship Between Mother's Pregnancy History and Baby's Birth to the incidence of stunting in infants. *Journal of Midwifery Science : Basic and Applied Research*, 2(1), 1–5. <https://doi.org/http://ejournal.poltekkes-smg.ac.id/ojs/index.php/JOMISBAR/manager>
- Aswi, A., Rahardiantoro, S., Kurnia, A., Sartono, B., Handayani, D., Nurwan, & Cramb, S. (2024). Childhood stunting in Indonesia: assessing the performance of Bayesian spatial conditional autoregressive models. *Geospatial Health*, 19(2). <https://doi.org/10.4081/gh.2024.1321>
- Beal, T., Tumilowicz, A., Sutrisna, A., Izwardy, D., & Neufeld, L. M. (2018). A review of child stunting determinants in Indonesia. *Maternal and Child Nutrition*, 14(4), 1–10. <https://doi.org/10.1111/mcn.12617>
- Cerf, M. E. (2023). Maternal and Child Health , Non-Communicable Diseases and Metabolites. *Metabolites*, 13(6), 1–20. <https://doi.org/https://doi.org/10.3390/metabo13060756>
- Clara, M., Ribeiro, S. A., Sousa, L. S. De, Aldo, Â., Lima, M., Leal, B., & Maciel, L. (2025). Undernutrition and Intestinal Infections in Children : A Narrative Review. *Nutrients*, 17(9), 1–32. <https://doi.org/https://doi.org/10.3390/nu17091479>
- Fatmah, M., Yantina, Y., & Nurliyani. (2023). The Relationship Between The Mother Factor. *JKM (Jurnal Kebidanan Malahayati)*, 9(2), 307–311. <https://doi.org/10.33024>
- Gabain, I. L., Ramsteijn, A. S., & Webster, J. P. (2023). Parasites and childhood stunting – a mechanistic interplay with nutrition, anaemia, gut health, microbiota, and epigenetics. *Trends in Parasitology*, 39(3), 167–180. <https://doi.org/10.1016/j.pt.2022.12.004>
- Hadi, H., Fatimatasari, F., Irwanti, W., Kusuma, C., Alfiana, R. D., Asshiddiqi, M. I. N., Nugroho, S., Lewis, E. C., & Gittelsohn, J. (2021). Exclusive Breastfeeding Protects Young Children from Stunting in a Low-Income Population : A Study from Eastern Indonesia. *Nutrients*, 13, 1–14. <https://doi.org/https://doi.org/10.3390/nu13124264>
- Hadi, M. (2023). Association Between Exclusive Breastfeeding and Stunting in Children : A Systematic Review. *Journal of Advance Research in Medical & Health Science*, 9(6), 90–94. <https://doi.org/https://doi.org/10.53555/nnmhs.v9i6.1740>
- Harumi, A. M., Wardani, N. E. K., & Sholikah, S. M. (2025). Relationship Between Antenatal Care History and Parenting Patterns with the Incidence of Stunting in Toddlers. *Journal La Medihealthico*, 06(01), 10–19. <https://doi.org/10.37899/journallamedihealthico.v6i1.1709>
- Hasni, D., Anugrah, N. S., Asri, Z. Al, Jelmila, S. N., & Baiturrahmah, U. (2023). The

- Relationship Between Exclusive Breastfeeding and. *Nusantara Hasana Journal*, 3(7), 161–173. <https://doi.org/https://doi.org/10.59003/nhj.v3i7.1081>
- Hidayati, T., & Pratiwi, R. C. D. (2022). The Correlation Between Feeding Patterns and The Incidence of Stunting in Children Aged 0-59 Months. *Journal of Health Science*, 15(2), 126–131. <https://doi.org/https://doi.org/10.33086/jhs.v15i02.2732>
- Joe, W., Prakash, A., Azimi, S. M. Y., Galvin, M., & Murira, Z. (2025). Levels , severity , and determinants of stunting in children 0 – 59 months in Afghanistan : Secondary analysis of Multiple Indicator Cluster Survey , 2022-23. *PLOS Glob Public Health*, 5(4), 1–18. <https://doi.org/10.1371/journal.pgph.0004423>
- Limardi, S., Hasanah, D. M., Made, N., & Utami, D. (2022). Dietary intake and stunting in children aged 6-23 months in rural Sumba, Indonesia. *Pediatric Nutrition & Metabolic Disease*, 62(5), 341–356. <https://doi.org/https://doi.org/10.14238/pi62.5.2022.341-56>
- Malonda, N. S. H., Warouw, F., Kawatu, P. A. T., & Sanggelorang, Y. (2020). History of Exclusive Breastfeeding and Complementary Feeding as a Risk Factor of Stunting in Children Age 36-59 Months in Coastal Areas. *Journal of Health, Medicine and Nursing*, 70, 52–57. <https://doi.org/http://www.iiste.org/>
- Marita, Z., Okinarum, G. Y., Huda, M. H., & Dwihestie, L. K. (2023). Analysis of Stunting Incidents Based on Mother ' s Knowledge. *International Journal of Nursing Information (IJNI)*, 2(2), 1–6. <https://doi.org/10.58418/Ijni.V2i2.54>
- Masuke, R., Msuya, S. E., Mahande, J. M., Diarz, E. J., Stray-, B., Jahanpour, O., & Mgongo, M. (2021). Effect of inappropriate complementary feeding practices on the nutritional status of children aged 6-24 months in urban Moshi , Northern Tanzania : Cohort study. *PLoS ONE*, 16(5), 1–16. <https://doi.org/10.1371/journal.pone.0250562>
- Ministry of Health of Indonesia. (2020). *Buletin Jendela Data dan Informasi Kesehatan: Situasi Balita Pendek (Stunting) di Indonesia*. Jakarta : Ministry of Health of Indonesia.
- Ministry of Health of Indonesia. (2024). *Hasil Survei Status Gizi Indonesia (SSGI) 2024*. Jakarta : Ministry of Health of Indonesia.
- Montenegro, C. R., Dvoretzkiy, S., Gomez, G., Dewitt, T., Hincapie, O., Gracia, D., & Misas, J. D. (2022). The pediatric global burden of stunting : Focus on Latin America. *Lifestyle Medicine*, 3(June), 1–11. <https://doi.org/https://doi.org/10.1002/lim2.67>
- Muslimatun, S., Ade, L., & Wiradnyani, A. (2016). *Dietary diversity , animal source food consumption and linear growth among children aged 1 – 5 years in Bandung , Indonesia : a longitudinal observational study*. 116. <https://doi.org/10.1017/S0007114515005395>
- Nisar, Y. Bin, Aguayo, V. M., Billah, S. M., & Dibley, M. J. (2020). Antenatal Iron-Folic Acid Supplementation Is Associated with Improved Linear Growth and Reduced Risk of Stunting or Severe Stunting in South Asian Children Less than Two Years of Age : A Pooled Analysis from Seven Countries. *Nutrients*, 12, 1–19. <https://doi.org/http://dx.doi.org/10.3390/nu12092632>
- Oktarina, C., Dilantika, C., Sitorus, N. L., & Basrowi, R. W. (2024). Relationship Between Iron Deficiency Anemia and Stunting in Pediatric Populations in Developing Countries : A Systematic Review and Meta-Analysis. *Children*, 11, 1–14. <https://doi.org/https://doi.org/10.3390/children11101268>
- Qomah, I., Takziah, M., & Rahmayanti, R. (2024). The Relationship between mother's knowledge and the incidence of stunting in toddlers in polindes, mundar village, south labuan amas district, hulu sungai tengah regency in 2024. *Journal of Health Management and Pharmacy Exploration*, 2(2), 33–42. <https://doi.org/https://shmpublisher.com/index.php/johmpe/article/view/383>

- Ramadhan, M. F., Dimiati, H., Hidayaturrahmi, & Indah, R. (2024). The Correlation between Stunting, Maternal Knowledge, and Nutritional Care in Aceh, Indonesia. *Amerta Nutrition*, 8(4), 513–518. <https://doi.org/10.20473/amnt.v8i4.2024.513-518>
- Renn, O., Laubichler, M., Lucas, K., Kröger, W., Schanze, J., Scholz, R. W., & Schweizer, P. (2022). Systemic Risks from Different Perspectives. *Risk Analysis*, 42(9), 1902–1920. <https://doi.org/https://doi.org/10.1111/risa.13657>
- Saavedra, J. M., & Prentice, A. M. (2022). Nutrition in school-age children : a rationale for revisiting priorities. *Nutrition Reviews*, 81(7), 823–843. <https://doi.org/https://doi.org/10.1093/nutrit/nuac089>
- Santoso, C. A., & Sodik, M. A. (2025). The Relationship Between Pregnant Women ' s Participation in Pregnant Women ' s Classes and Integrated ANC (Ante Natal Care) With the Incidence of Stunting in Toddlers in The Work Area of Pesantren I Public Health Center Kediri City. *Indonesian Journal of Nutritional Epidemiology and Reproductive*, 8(2), 49–53. <https://doi.org/https://doi.org/10.30994/ijner.v8i2.334>
- Sari, K., & Sartika, R. A. D. (2023). The Impact of Iron Supplementation During Pregnancy and Change of Consumption among Stunting Children Aged 6 - 24 Months During the COVID - 19 Pandemic in Indonesia. *International Journal of Preventive Medicine*, 14(18), 1–7. <https://doi.org/10.4103/ijpvm.ijpvm>
- Sari, N., Randell, M., Sari, N., Manjorang, M., & Randell, M. (2021). Exclusive Breastfeeding History Risk Factor Associated with Stunting of Children Aged 12 – 23 Months Exclusive Breastfeeding History Risk Factor Associated with Stunting of Children Aged 12 – 23 Months. *Kesmas*, 16(1), 28–32. <https://doi.org/10.21109/kesmas.v16i1.3291>
- Scheffler, C., Hermanussen, M., Bogin, B., Liana, D. S., Taolin, F., Cempaka, P. M. V. P., & Irawan, M. (2020). Stunting is not a synonym of malnutrition. *European Journal of Clinical Nutrition*, 74, 377–386. <https://doi.org/10.1038/s41430-019-0439-4>
- Setyowati, E., Musfiroh, M., Arief, I., Samsuddin, & Sari, A. L. (2022). Exclusive Breastfeeding as an Effort to Prevent Stunting in Toddlers. *NeuroQuantology*, 20(5), 3668–3675. <https://doi.org/10.14704/nq.2022.20.5.NQ22664>
- Simbolon, D., Adevianti, D., Setianingsih, L., & Andriani, L. (2021). The Relationship Between Maternal And Child Health Services With The Prevalence Of Stunting Based On The Basic Health Research In Indonesia. *The Indonesian Journal of Public Health*, 16(2), 177–187. <https://doi.org/10.20473/ijph.v16i2.2021.177-187>
- Siregar, R. J., Harahap, M. L., & Suryani, E. (2024). Determinants of Stunting Among Children Under Five Years in Indonesia : Evidence from the 2021-2022 Demographic and Health Survey. *International Journal of Public Health Excellence (IJPHE)*, 3(2), 666–676. <https://doi.org/10.55299/ijphe.v3i2.794>
- Soesanti, I., Saptandari, P., Adiningsih, & Qomaruddin, M. B. (2020). The practice of complementary feeding among stunted children under the age of two. *Infectious Disease Reports*, 12(1), 29–32. <https://doi.org/10.4081/idr.2020>
- Soliman, N., Soliman, A., Alyafei, F., Elsiddig, S., Alaaraj, N., Hamed, N., Ahmed, S., & Itani, M. (2024). Persistent Global Burden of Stunting Among. *European Journal of Medical and Health Sciences*, 6(2), 15–20. <https://doi.org/https://doi.org/10.24018/ejmed.2024.6.2.2080>
- Sudarianti, Susanti, R., & Sari, R. A. (2022). Mother ' s Behavior and Knowledge in Preventing Stunting Through Breastfeeding Complementary Feeding to Children Aged 6-24 Months. *Science Midwifery*, 10(4), 3156–3163. <https://doi.org/https://doi.org/10.35335/midwifery.v10i4.782>
- Suryani, E. (2025). The Relationship Between Nutritional Care Patterns and ANC Frequency with Stunting Incidence in Newborns : A Prospective Cohort Study in North Sumatra.

- Journal of Public Health Sciences*, 4(03), 298–324.
<https://doi.org/10.56741/IISTR.jphs.001102>
- Tello, B., 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*, 17(19), 1–15.
<https://doi.org/https://doi.org/10.1186/s13006-022-00461-0>
- Traore, S. S., Bo, Y., Kou, G., & Lyu, Q. (2023). Iron supplementation and deworming during pregnancy reduces the risk of anemia and stunting in infants less than 2 years of age : a study from Sub - Saharan Africa. *BMC Pregnancy and Childbirth*, 1–8.
<https://doi.org/10.1186/s12884-023-05399-7>
- Triana, N. Y., Faculty, H., Java, C., Haniyah, S., Faculty, H., & Java, C. (2020). Relationship of Exclusive Breastfeeding , Complementary Feeding and Nutritional Intake with Stunting in Children in Karanglewas Health Center. *Advances in Health Sciences Research*, 20, 74–78. <https://doi.org/https://doi.org/10.2991/ahsr.k.200204.017>
- Umiyah, A., & Hamidiyah, A. (2020). Exclusive Breastfeeding With Stunting. *STRADA Jurnal Ilmiah Kesehatan*, 9(2), 471–477. <https://doi.org/10.30994/sjik.v9i2.454>
- Virginia, A., Maryanto, S., & Anugrah, R. M. (2020). The Correlation Between Complementary Feeding And First Complementary Feeding Time With Stunting In Children Of 6-24 Months In Leyangan Village, East Ungaran, Semarang Regency. *Jurnal Gizi Dan Kesehatan*, 12(27), 29–39.
- Wahyuni, F. C., Karomah, U., Basrowi, R. W., Sitorus, N. L., & Lestari, L. A. (2023). The Relationship between Nutrition Literacy and Nutrition Knowledge with the Incidence of Stunting : A Scoping Review Hubungan Literasi Gizi dan Pengetahuan Gizi terhadap Kejadian Stunting : A Scoping Review. *Amerta Nutrition*, 7(3), 71–85.
<https://doi.org/10.20473/amnt.v7i3SP.2023.71-85>