

Maternal factors associated with stunting among children under two years in South Nias, Indonesia: a cross-sectional study

Ivan Elisabeth Purba¹, Yenni Gustiani Tarigan¹, Arisman Zendrato^{2,3}, Agnes Purba⁴, Taruli Sinaga¹

¹Public Health Department, Pharmacy and Health Sciences Faculty, Sari Mutiara Indonesia University, Medan, Indonesia

²Study Program Master of Public Health, Postgraduate Directorate Faculty, Sari Mutiara Indonesia University, Medan, Indonesia

³Somambawa Community Health Centre, South Nias District, North Sumatra, Indonesia

⁴Midwife Department, Pharmacy and Health Sciences Faculty, Sari Mutiara Indonesia University, Medan, Indonesia

Article Info

Article history:

Received Dec 8, 2023

Revised Jan 16, 2024

Accepted Feb 28, 2024

Keywords:

Antenatal care visits
Complementary feeding
Exclusive breastfeeding
Knowledge
Stunting

ABSTRACT

The Indonesian Nutritional Status Survey 2022 reported that the prevalence of stunted children in South Nias, a district in North Sumatra, was 27.2%, higher than the regional and national prevalence of stunting. Stunting can be caused by many factors including maternal nutritional status, exclusive breastfeeding, and inadequate food intake. This research aims to analyze the relationship between maternal factors and cases of stunting in children under two years at Somambawa Community Health Center, South Nias Regency. It was a quantitative study with a cross sectional design. Using a total sampling technique, 72 mothers with children under two years were included in the study. Exact fisher statistical and logical regression tests were carried out in bivariate and multivariate analyses. This study found that there was a significant relationship between antenatal care visits (p-value=0.000) and exclusive breastfeeding (p-value=0.000) with stunting in children under two years old. Exclusive breastfeeding was the most dominant predictor of stunting in the study, namely 84 times (p-value=0.000; OR 84.00). Meanwhile, complementary feeding and knowledge did not show a significant relationship with stunting. Therefore, health education to provide information and knowledge about stunting, especially about exclusive breastfeeding and complementary food for babies is suggested.

This is an open access article under the [CC BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.



Corresponding Author:

Yenni Gustiani Tarigan

Public Health Department, Pharmacy and Health Sciences Faculty, Sari Mutiara Indonesia University
St. Kapten Muslim No. 79, Sei Sikaming, Medan Helvetia, Medan, Indonesia

Email: yennigangustiani@gmail.com

1. INTRODUCTION

Stunting is a serious condition where children experience impaired growth and development due to chronic nutritional deficiency, which is characterized by below standard height or length of body. It becomes a threat to children's quality of life in the future as this condition may inhibit not only physical growth, but also children's brain (cognitive) development, reduce learning quality and productivity in adulthood, even increase the risk of noncommunicable disease [1]. According to UNICEF report in 2021, stunting does not only cause poor physical growth in children, but also disrupt mental development and increase the risk of mortality [2]. The Indonesian basic health research as known as *riset kesehatan dasar (Rikesdas)* reported that the prevalence of stunting was 37.8% in children under two years of age (0–24 months) [3].

The results of the Indonesian nutrition status survey or *survei status gizi Indonesia (SSGI)* of the Ministry of Health of the Republic of Indonesia in 2022 show that North Sumatra Province is the 19th

highest stunting prevalence region in Indonesia, reaching 21.1%. This percentage is still high even though there is a decline from that of 2021 (25.8%) [4]. According to the data from the North Sumatra Province report of basic health research 2018, more than one million families are at risk of stunting, and over one fifth are families with children under two years of age [5].

The high prevalence of stunting are often associated with many factors, including maternal nutritional status, exclusive breastfeeding, and inadequate food intake, not to mention maternal characteristics, such as age, education, number of children, knowledge and height [6], [7]. In terms of age characteristics, adolescent pregnancy will impact on risking their children resulted from a competition for nutrients between mothers and their babies [8]. Meanwhile, mothers with low education and limited knowledge about nutrition and improper parenting patterns may also put their children at risk of stunting [9].

According to the health profile released by South Nias Government, the prevalence of stunting in this regency was 27.2% in 2022, making it as the 12th highest stunting prevalence in North Sumatra Province. The report reveals a fluctuating trend in the last three years, where in 2020, a total of 1,369 babies in 37 districts were reported to be stunted, increased to 2006 stunted babies in 2021, but reduced to 1,390 in 2022. By looking at the declining trend in 2022, from 34.4% to 27.2%, the measures in managing stunting in the regency have shown favorable results. However, despite the decline, stunting remains a pivotal concern for the government. Somambawa District was chosen because, socioeconomic factors such as family financial factor which were evident in the preliminary survey. Many mothers were still at a relatively young age and from low educational backgrounds which were prone to negatively affect their knowledge about nutrition for their children. Additionally, it was also found that there were households who had more than four children with minimal gap age. This added work burden to mothers as the pivotal caregivers of children in the family. Aside from these, this district was also chosen because this area was remote with limited access to the urban areas [10].

The prevention and reduction of the risk of stunting should be done since pregnancy until the early life of children, including meeting nutritional needs of expectants, providing exclusive breast milk until six months of age, providing complementary feeding for babies, monitoring children's growth and development as well as maintaining environment cleanliness [4], [11]. Based on presidential regulation no. 72 of 2021, the strategies to accelerate stunting reduction encompass reducing the prevalence of stunting, improving the quality of preparation for family life, ensuring adequate nutritional intake, improving parenting patterns, increasing access and quality of health services and increasing access to drinking water and sanitation [12]. A systematic review also revealed that three main phases require the optimal mother roles to prevent stunting in children during the golden phase such as the preconception phase, the prenatal phase, and the infant-toddlerhood phase [13].

Even though maternal factors play crucial roles in preventing and reducing the risk of stunting in babies, many women who seem to have limited knowledge on how to care for their babies. One example is that mothers who neglect the importance of early initiation of breastfeeding for babies in the first hours of their lives [13]. Yellowish breast milk, which is actually colostrum-rich and can protect babies from viruses and diseases, is often thought to be spoiled and thrown [1]. The inability of mothers to breastfeed their babies from birth until they are six months old means can also cause babies do not receive exclusive breast milk. Another example of inappropriate parenting pattern by mothers which can be associated with stunting is not providing nutritious complementary foods for babies since month 6 until at least month 24 or longer. Consequently, babies have higher risk of experiencing nutritional problems leading to stunting [14]. To date, stunting is still a strategic national issue since the Indonesian government targets the decline of stunting prevalence to 14% in 2024. Therefore, this study focuses on analyzing maternal factors associating with stunting in working area of Somambawa Community Health Center in South Nias.

2. METHOD

This research was a quantitative study using a cross sectional design aiming at analyzing the relationship between antenatal care visits, exclusive breastfeeding status, complementary feeding, and mother's knowledge with the incidence of stunted children under two in working area of Somambawa Community Health Center in South Nias. The population in this study encompassed mothers with children under two years of age, who were registered at the integrated health post as known as *pusat pelayanan terpadu (posyandu)* in 12 villages, in the working area of Somambawa Community Health Center in South Nias, with the total of mothers was 72. A total sampling technique was performed since the number of the population was below 100. This research was conducted from January until June 2023.

The independent variables in the study included visit for antenatal care, exclusive breastfeeding, complementary feeding, and mothers' knowledge. Mother's age, height, education, and number of children were only for supplementary information concerning mothers' characteristics and were not included in

relational analysis. Meanwhile, the incidence of stunting in children under two served as dependent variable. The data was collected by conducted direct interviews with mother who had children under two using a structured questionnaire, which was adopted from Anmaru [15]. Prior to the administration, the questionnaire had been examined to ensure the validity and reliability. The primary data in the study was obtained directly from respondents through interviews and observations using questionnaires, which recorded maternal factors including number of children, mothers' age, mothers' knowledge, complementary feeding, education, exclusive breastfeeding, height, antenatal care visits. On the other hand, the secondary data was obtained from literature study and information on the number of stunted babies and number of antenatal care visits from the chief of Somambawa Community Health Center.

Antenatal care visits were measured by the number of mothers' visit for antenatal care, which were categorized "irregular" if the number of visits was less than 6 times (2 times in trimester 1, 1 time in trimester 2, and 3 times in trimester 3) and "regular" if the number of visits was at least 6 times (2 times in trimester 1, 1 time in trimester 2, and 3 times in trimester 3). In terms of exclusive breastfeeding, this study categorized this variable into non-exclusive breastfeeding (NEBF) and exclusive breastfeeding (EBF). Furthermore, complementary feeding fell into two categories: no complementary foods (if the foods given were not types of complementary foods in addition to breast milk for babies and children aged 6–23 months and the additional foods for recovery for children at the age range of 24–59 months were family foods) and receive complementary feeding (if children in the age range of 6–23 months received complementary foods in addition to breast milk and the additional foods for recovery for children aged 24–59 months were types of foods consumed by the family). Meanwhile, mothers' knowledge was assessed by administering 10 multiple-choice questions; each correct answer was scored 1, while each wrong answer was scored 0. Mothers' knowledge was classified into poor if the score range was 0–5, and good if the score range was 6–10. Stunting in children under two years of age was the main outcome measured in this study. Indicators of nutritional status based on height for age, or the height of children reaching a certain age, are called stunting. The height indicator for a period is determined based on the z-score or deviation of height from the average height used based on WHO growth standards. To calculate the z-score, WHO Anthro software was used. The height/age index is: stunting = < -3.0 SD to -2.0 SD; normal/no stunting = -2.0 SD is the limit for the nutritional status category [16].

Initially, univariate and bivariate analyses were performed in data analysis. Univariate analysis was carried out by displaying frequency distribution and percentage of each variable, whilst bivariate analysis was carried out by performing exact fisher to examine the relationship between mothers' characteristics and the incidence of stunting in children under two, with significance degree of 95% ($\alpha \leq 0.05$). In order to examine the relations of the maternal factors and the independent variables, this study run multivariate analysis by utilizing multiple logistic regression test. The variables which included in the regression test were those which obtained p-value < 0.25 on bivariate test. This analysis was to identify the most dominant variable associated with stunting. SPSS 21 version was employed in data analysis.

3. RESULTS AND DISCUSSION

Data collection process was carried out in 10–12 May 2023, when the health officers from Somambawa Community Health Center visited the integrated health posts in the working area. The sample included mothers with children under two in Somambawa District. The characteristics of the respondents are illustrated in Table 1.

Table 1. Respondents' characteristics (n=72)

	Characteristics	Frequency	%
Age	At risk	32	44.4
	Not at risk	40	55.6
Education	Uneducated	29	40.3
	Elementary	18	25.0
	Secondary	13	18.1
	Junior high	5	6.9
	Higher education	7	9.7
Number of children	Few (1-2)	14	19.4
	Many (>3)	58	80.6
Height	At risk	25	34.7
	Not at risk	47	65.3

Results in Table 1 show that 32 respondents (44.4%) were at risk, while the other 40 (55.6%) were not at risk. In terms of education, 29 respondents (40.3%) did not have any educational background, 18 (25%) were from primary, 13 (18.1%) were from secondary, 7 (9.7%) were from higher education, and only

5 (6.9%) were from junior high level. Data in Table 1 also shows that the majority of the respondents had many children, 58 (80.6%), and only 14 (19.4%). Furthermore, in terms of mothers' height, over half of the respondents, 47 (65.3%) were at risk, and the remaining 25 respondents (34.7%) had risky height.

As it is depicted in Table 2, the age mean of children under two in the study was 17.71 months (SD=3.5), with the minimum age score was 12 old and the maximum was 24 months. In terms of sex, there were 10 (13.9%) female stunted children and 5 (6.9%) male stunted children in the study. Table 3 shows that 14 respondents (19.4%) who had irregular antenatal care (ANC) visits were stunted, while only 1 stunted respondent (1.4%) was found among respondents with regular ANC visits. The statistical result obtained p-value 0.000 ($p < 0.05$), indicating that there was a relationship between ANC visit and stunting. In other words, respondents with irregular ANC visits are prone to experience stunting. In terms of exclusive breastfeeding, it was found that all respondents who did not receive exclusive breastfeeding, 14 respondents (19.4%), were stunted, whereas only 1 stunting case (1.4%) was found among respondents who received exclusive breastfeeding. The p-value 0.000 ($p < 0.05$) from the statistical test shows that there was a statistical relationship between exclusive breastfeeding and stunting. Results from the analysis also found that 13 (18.1%) respondents who received complementary foods experienced stunting, whereas only two respondents (2.8%) were stunted from respondents who received complementary foods. The statistical analysis obtained that p-value was 0.108, indicating there was no significant relationship between complementary foods and stunting. In terms of knowledge, the study found that 12 (16.7%) respondents with poor knowledge were stunted, while 3 (4.2%) stunted respondents were found among respondents with good knowledge. The p value 0.687 ($p < 0.05$) from the statistical test shows that there was no relationship between mothers' knowledge and stunting. However, despite the stunting cases found in respondents with good knowledge, the cases were relatively lower compared to those with poor knowledge. Table 4 illustrates the results of multivariate analysis using Backward LR method reveal that the dominant independent variable associated with stunting is exclusive breastfeeding, with p-value 0.000 < 0.05 . The OR value, 84.00, indicates that exclusive breastfeeding has 84 times higher impact on stunting in Somambawa District, South Nias.

Table 2. Characteristics of children under two (n=72)

Characteristics		Stunted n=15	Not stunted n=57
Age (month), n (%)	Mean (SD)	17.71 (3.5)	18.26 (2.76)
	Median (min-max)	18 (12-24)	18 (14-23)
Sex, n (%)	Male	5 (6.9)	20 (27.8)
	Female	10 (13.9)	37 (51.4)

Table 3. Results of bivariate analysis

Variables	Incidence of stunting			p-value
	Stunted N (%)	Not stunted N (%)	Total N (%)	
ANC Visits				
Regular	1 (1.4)	48 (66.7)	49 (68.1)	0.000^b
Irregular	14 (19.4)	9 (12.5)	23 (31.9)	
Total	15 (20.8)	57 (79.2)	72 (100)	
Exclusive breastfeeding status				
Non-exclusive breastfeeding	14 (19.4)	0 (0)	14 (19.4)	0.000^b
Exclusive breastfeeding	1 (1.4)	57 (79.2)	58 (80.6)	
Total	15 (20.8)	57 (79.2)	72 (100)	
Complementary feeding				
No complementary feeding	13 (18.1)	56 (77.8)	69 (95.8)	0.108 ^b
Received complementary feeding	2 (2.8)	1 (1.4)	3 (4.2)	
Total	15 (20.8)	57 (79.2)	72 (100)	
Knowledge				
Poor	12 (16.7)	49 (68.1)	61 (84.7)	0.687 ^b
Good	3 (4.2)	8 (11.1)	11 (15.3)	
Total	15 (20.8)	57 (79.2)	72 (100)	

Table 4. Results of multivariate analysis

Variable	B value	OR	p-value
Exclusive breastfeeding	4.1431	84.00	0.000
Constanta	-6.628	0.001	0.002

This study found that exclusive breastfeeding is the most dominant factor associating with stunting in Somambawa District, South Nias. There were still many children who did not receive exclusive breastfeeding from their mothers (19.4%). As expected, all children whose mothers did not give exclusive breastfeeding were stunted, whereas only 1.4% of children with exclusive breastfeeding experienced stunted. The result of this study was in supported by that of Sari *et al.* [17] finding that children who did not receive exclusive breastfeeding were at 3.1 times higher risk to be stunted than their counterparts. A study conducted in Pakistan also found that the odds of stunting were significantly lower in breastfed children in their second year than in children in their third year of life [AOR: 4.35, 95% CI=(2.01, 9.33)] [18]. Other study conducted in Malawi, a low-income country, also found that exclusive breastfeeding of infants under six months is associated with higher risk of stunted incidence [19]. An intervention study in Bangladesh showed that EBF was identified as a significant factor associated with stunting and the Suchana intervention had a positive impact on EBF practices in rural children in vulnerable areas of Bangladesh. The prevalence of stunting was significantly lower in children who were exclusively breastfed in both intervention and control areas [20].

Giving breast milk to babies is the best way to improve the quality of human resources from an early age. Exclusive breastfeeding for newborns is an effort to prevent infectious diseases, malnutrition and death in babies and toddlers [18], [20]. Mothers in the Somambawa districts reported that they did not give breast milk exclusively to their babies because of low production of breast milk, difficulties to suck, inverted nipples, jobs, influence from commercial for milk substitution. Aside from these, children's poor nutritional status can also occur due to mothers' ignorance about how to give breast milk to their children. Mothers' lack of understanding and knowledge about the benefits of breast milk and breastfeeding is the biggest factor that causes mothers to be easily influenced and switch to formula milk. Exclusive breast milk is essential for babies 0–6 months because it can help the baby's growth and development process and improve their immune system [21].

This study also found that the ANC visits was significantly associated with stunting in children under two. Amaha and Woldeamanuel [22] reported every visit to ANC clinic reduces the risk of stunting by 6.8% ($p < 0.0001$). This study also suggests that maternal education, number of ANC visit, and place of delivery are the most important predictors of child stunting in Ethiopia. The finding of this study is also supported by a study conducted in Timor Leste which found that wealth index, postnatal care visits, breastfeeding, age of child, and size of child at birth are also associated with stunting [23]. Maternal and neonatal mortality can be reduced by good antenatal care because every ANC visit is an indicator to see the health service quality in pregnant women [24]. Quality examination of pregnant women may prevent early complications or defects in the mother and fetus, making it become a factor in preventing stunting in children [25], [26].

Poor quality of antenatal care and irregular visits of antenatal care increase the risk of babies having low birth weight by 6 times [27], [28]. Consequently, babies with poor quality and irregularity of antenatal care have a high risk to be stunted since low birth weight is a determinant of stunting [29], [30]. Low visit of antenatal care itself is argued to be linked to the poor quality of the antenatal care. A study in Burkina Paso found that women living in a health area where the level of ANC quality was high were three times more likely to use ANC services (OR: 2.96, 95% CI 1.46–6.12) than those in health areas with low ANC service quality [31]. High frequency of ANC visit is highly suggested, specifically, to pregnant mothers with short body height as it is a strategy to optimize mothers' health status and prevent babies' low birth weight that serves as a predictor of stunting. It is also necessary for government to think about strategies that can increase the frequency of ANC visits by improving health service quality [32], [33]. The relatively low ANC visit in the study was seemingly due to the remote geographical location which limit the access to health facilities.

Despite the fact that this study did not find any significant relationship between complementary feeding and stunting, the proportion of stunting was apparently high in children under two who did not receive complementary feeding from their mothers (18.1%). Providing complementary foods to babies can prevent babies from energy and chronic protein deficiencies which inhibit their physical growth [34]. Children with complete complementary foods are favorably benefited as their nutrient needs are met [35]. The low proportion of complementary feeding found in the study was probably due to lack of knowledge about the importance of complementary foods for babies and how to provide the foods using natural resources. When the mothers were interviewed, they reported their limited knowledge about the balanced complementary foods. Many of the respondents believed that their babies cried because they were hungry, making the mothers gave the babies food, even though they were still one month old. Aside from this, they also reported that they gave foods to their babies in a very early age because the elders suggested them. In other words, giving babies with food in their early age is customary in their culture. It is probably due to their limited knowledge that foods may cause babies to have digestive problems even death [36], [37]. It is normally because the food is not properly prepared or too solid for babies, while their digestion system is not ready to process the food and may cause stunting [1], [38].

Previous studies suggest a strong relationship between mothers' or family' knowledge and stunting [39], [40]. However, this study did not find any significance in the relationship between mothers'

knowledge and stunting. It is because knowledge does not guarantee babies to have normal nutritional status. This may be influenced by other factors, such as economic, socio-culture, and environmental factors [41], [42]. Several respondents in the study reported that and hindered the researcher from asking the respondents to fill the questionnaire in person. Approximately 40% of the respondents in the study did not have any education background and 25% could only complete the elementary level.

The sample size of this quantitative study is relatively small, influencing the research results, in spite of the significant relation between ANC visits and stunting this study obtained. The results of the analysis cannot explain the relationships between the other variables from previous studies and stunting among children under two, such as complementary feeding and mothers' knowledge. The variable which was analyzed is limited to the variables suggested in the survey with cross sectional design, resulting in the inability to explain the process in the variables and their correlational relationships. Moreover, the quantitative method in the study cannot explain the factors and how they are related to culture, which is still highly valued in Indonesia, particularly in rural areas. Previous studies reported relevant results, such as the value of children, eating restriction, and nutritional intake pattern. In terms of location, the results of this study cannot be used to make a generalization for all provinces in Indonesia, as Nias Island is only an outermost and underdeveloped island in Indonesia. This makes the characteristics and social background of the respondents may be different from those in urban areas.

4. CONCLUSION




In conclusion, there is a relationship between ANC visits and exclusive breastfeeding with stunting in children under two. This study also concludes that the most dominant factor in stunted children under two in Somambawa District is exclusive breastfeeding. Therefore, measures to prevent stunting, such as community outreach and health promotion, should be conducted to improve mothers' knowledge about stunting, particularly on the importance of exclusive breastfeeding, balanced nutrition, and complementary feeding to babies. Mothers' participation and engagement in health promotion will contribute to the improvement of knowledge and awareness about nutrition in children. Additionally, it is also necessary to introduce and promote family medicinal plants that can be used to meet nutritional needs for children under two years of age. Conducting researches on stunting with larger population, more diverse geographical background and different research design is suggested to attain more comprehensive results and knowledge about stunting in Indonesia.

REFERENCES




- [1] World Health Organization, "Infant and young child feeding: Model chapter for textbooks for medical students and allied health professionals." *World Health Organization*, 2009. [Online]. Available: <https://www.ncbi.nlm.nih.gov/books/NBK148957/> (accessed: October 5, 2023).
- [2] UNICEF, "Fed to fail: The crisis of children's diets in early life," 2021 Child Nutrition Report New York, 2021. [Online]. Available: <https://reliefweb.int/report/world/fed-fail-crisis-childrens-diets-early-life-2021-child-nutrition-report-enarru> (accessed: October 7, 2023).
- [3] Ministry of Health Republic of Indonesia, "Nasional report of basic health research 2018," Jakarta, 2019. [Online]. Available: <https://ghdx.healthdata.org/record/indonesia-basic-health-research-2018> (accessed: October 16, 2023).
- [4] Ministry of Health Republic of Indonesia, "Nutritional status survey results Indonesia health development policy agency." 2022, [Online]. Available: <https://repository.badankebijakan.kemkes.go.id/id/eprint/4855/> (accessed: October 16, 2023).
- [5] Ministry of Health Republic of Indonesia, "North Sumatra Province report basic health research 2018," Jakarta, 2019. [Online]. Available: <https://dinkes.sumutprov.go.id/unduh/downloadfile?id=1810> (accessed: October 16, 2023).
- [6] S. H. Quamme and P. O. Iversen, "Prevalence of child stunting in Sub-Saharan Africa and its risk factors," *Clinical Nutrition Open Science*, vol. 42, pp. 49–61, Apr. 2022, doi: 10.1016/j.nutos.2022.01.009.
- [7] Z. Kubeka and P. Modjadji, "Association of stunting with socio-demographic factors and feeding practices among children under two years in informal settlements in Gauteng, South Africa," *Children*, vol. 10, no. 8, p. 1280, Jul. 2023, doi: 10.3390/children10081280.
- [8] N. Akseer *et al.*, "Characteristics and birth outcomes of pregnant adolescents compared to older women: An analysis of individual level data from 140,000 mothers from 20 RCTs," *eClinical Medicine*, vol. 45, Mar. 2022, doi: 10.1016/j.eclinm.2022.101309.
- [9] M. A. L. Suratri *et al.*, "Risk factors for stunting among children under five years in the Province of East Nusa Tenggara (NTT), Indonesia," *International Journal of Environmental Research and Public Health*, vol. 20, no. 2, Jan. 2023, doi: 10.3390/ijerph20021640.
- [10] South Nias District Health Service, "Nias Selatan health report 2022," 2023. [Online] Available: <https://dinaskeehatan.niasselatankab.go.id/> (accessed: December 15, 2023).
- [11] S. Sufri, Nurhasanah, M. Jannah, *et al.*, "Child Stunting Reduction in Aceh Province: Challenges and a Way Ahead." *Maternal Child Health Journal*, vol. 27, no. 5, pp. 888–901, 2023. doi: 10.1007/s10995-023-03601-y.
- [12] Global Nutrition Report, "Nutrition for growth (N4G) commitment 2021," 2021. Available: <https://globalnutritionreport.org/resources/nutrition-growth-commitment-tracking/indonesia/>
- [13] A. Saleh, S. Syahrul, V. Hadju, I. Andriani, and I. Restika, "Role of maternal in preventing stunting: A systematic review," *Gaceta Sanitaria*, vol. 35, pp. 576–582, 2021, doi: 10.1016/j.gaceta.2021.10.087.

- [14] R. Masuke *et al.*, "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*, vol. 16, no. 5 May, May 2021, doi: 10.1371/journal.pone.0250562.
- [15] Y. Y. R. Anmaru, "Factors affecting stunting among toddlers ages 24-59 months in Kedungjati Village Grobogan District," *Thesis*, Universitas Negeri Semarang, 2019.
- [16] World Health Organization, "Child growth standards." 2023, Accessed: Oct. 20, 2023. [Online]. Available: <https://www.who.int/tools/child-growth-standards/software>.
- [17] N. Sari, M. Y. Manjorang, Zakiyah, and M. Randell, "Exclusive breastfeeding history risk factor associated with stunting of children aged 12–23 months," *Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*, vol. 16, no. 1, pp. 28–32, 2021, doi: 10.21109/KESMAS.V16I1.3291.
- [18] B. Syeda, K. Agho, L. Wilson, G. K. Maheshwari, and M. Q. Raza, "Relationship between breastfeeding duration and undernutrition conditions among children aged 0–3 Years in Pakistan," *International Journal of Pediatrics and Adolescent Medicine*, vol. 8, no. 1, pp. 10–17, Mar. 2021, doi: 10.1016/j.ijpam.2020.01.006.
- [19] J. Kuchenbecker *et al.*, "Exclusive breastfeeding and its effect on growth of malawian infants: Results from a cross-sectional study," *Paediatrics and International Child Health*, vol. 35, no. 1, pp. 14–23, Feb. 2015, doi: 10.1179/2046905514Y.0000000134.
- [20] M. A. Haque *et al.*, "Influence of the Suchana intervention on exclusive breastfeeding and stunting among children aged under 6 months in the Sylhet region of Bangladesh," *Maternal and Child Nutrition*, vol. 19, no. 4, Oct. 2023, doi: 10.1111/mcn.13535.
- [21] R. Pearson *et al.*, "Optima nutrition: An allocative efficiency tool to reduce childhood stunting by better targeting of nutrition-related interventions," *BMC Public Health*, vol. 18, no. 1, p. 384, Dec. 2018, doi: 10.1186/s12889-018-5294-z.
- [22] N. D. Amaha and B. T. Woldeamanuel, "Maternal factors associated with moderate and severe stunting in Ethiopian children: Analysis of some environmental factors based on 2016 demographic health survey," *Nutrition Journal*, vol. 20, no. 1, p. 18, Dec. 2021, doi: 10.1186/s12937-021-00677-6.
- [23] K. Nomura, A. K. C. Bhandari, E. L. A. Matsumoto-Takahashi, and O. Takahashi, "Risk factors associated with stunting among children under five in Timor-Leste," *Annals of Global Health*, vol. 89, no. 1, Sep. 2023, doi: 10.5334/aogh.4199.
- [24] L. Benova, Ö. Tunçalp, A. C. Moran, and O. M. R. Campbell, "Not just a number: Examining coverage and content of antenatal care in low-income and middle-income countries," *BMJ Global Health*, vol. 3, no. 2, Apr. 2018, doi: 10.1136/bmjgh-2018-000779.
- [25] A. Santosa, E. N. Arif, and D. A. Ghoni, "Effect of maternal and child factors on stunting: Partial least squares structural equation modeling," *Clinical and Experimental Pediatrics*, vol. 65, no. 2, pp. 90–97, Feb. 2022, doi: 10.3345/cep.2021.00094.
- [26] A. S. Setiawan, R. Indriyanti, N. Suryanti, L. Rahayuwati, and N. Juniarti, "Neonatal stunting and early childhood caries: A mini-review," *Frontiers in Pediatrics*, vol. 10, Jul. 2022, doi: 10.3389/fped.2022.871862.
- [27] G. Uwimana, M. Elhoumed, M. A. Gebremedhin, M. M. Azalati, L. Nan, and L. Zeng, "Association between quality antenatal care and low birth weight in Rwanda: A cross-sectional study design using the Rwanda demographic and health surveys data," *BMC Health Services Research*, vol. 23, no. 1, p. 558, May 2023, doi: 10.1186/s12913-023-09482-9.
- [28] A. E. Weyori, A. A. Seidu, R. G. Aboagye, F. A. Holmes, J. Okyere, and B. O. Ahinkorah, "Antenatal care attendance and low birth weight of institutional births in Sub-Saharan Africa," *BMC Pregnancy and Childbirth*, vol. 22, no. 1, p. 283, Dec. 2022, doi: 10.1186/s12884-022-04576-4.
- [29] C. R. Titaley, I. Ariawan, D. Hapsari, A. Muasyaroh, and M. J. Dibley, "Determinants of the stunting of children under two years old in Indonesia: A multilevel analysis of the 2013 Indonesia basic health survey," *Nutrients*, vol. 11, no. 5, p. 1106, May 2019, doi: 10.3390/nu11051106.
- [30] S. Neupane, S. Scott, E. Piwoz, S. S. Kim, P. Menon, and P. H. Nguyen, "More is not enough: High quantity and high quality antenatal care are both needed to prevent low birthweight in South Asia," *PLoS Global Public Health*, vol. 3, no. 6, Jun. 2023, doi: 10.1371/journal.pgph.0001991.
- [31] H. Badolo, A. R. Bado, H. Hien, M. De Allegri, and A. S. Susuman, "Determinants of antenatal care utilization among childbearing women in Burkina Faso," *Frontiers in Global Women's Health*, vol. 3, May 2022, doi: 10.3389/fgwh.2022.848401.
- [32] S. Phommachanh, D. R. Essink, M. Jansen, J. E. W. Broerse, P. Wright, and M. Mayxay, "Improvement of quality of antenatal care (ANC) service provision at the public health facilities in Lao PDR: Perspective and experiences of supply and demand sides," *BMC Pregnancy and Childbirth*, vol. 19, no. 1, p. 255, Dec. 2019, doi: 10.1186/s12884-019-2345-0.
- [33] U. Haruna, G. Dandeebo, S.Z Galaa, "Improving Access and Utilization of Maternal Healthcare Services through Focused Antenatal Care in Rural Ghana: A Qualitative Study," *Advances in Public Health*, vol. 2019, doi: 10.1155/2019/9181758.
- [34] A. D. Elisanti, R. D. Jayanti, D. I. Amareta, E. T. Ardianto, and E. A. Wikurendra, "Macronutrient intake in stunted and non-stunted toddlers in Jember, Indonesia," *Journal of Public Health Research*, vol. 12, no. 3, 2023, doi: 10.1177/22799036231197178.
- [35] A. Endrinikapoulos, D. N. Afifah, M. Mexitalia, R. Andoyo, I. Hatimah, and N. Nuryanto, "Study of the importance of protein needs for catch-up growth in Indonesian stunted children: A narrative review," *SAGE Open Medicine*, vol. 11, 2023, doi: 10.1177/20503121231165562.
- [36] Y. Vandenplas, B. Hauser, and S. Salvatore, "Functional gastrointestinal disorders in infancy: Impact on the health of the infant and family," *Pediatric Gastroenterology, Hepatology and Nutrition*, vol. 22, no. 3, pp. 207–216, 2019, doi: 10.5223/pghn.2019.22.3.207.
- [37] A. H. Hashmi *et al.*, "Feeding practices and risk factors for chronic infant undernutrition among refugees and migrants along the Thailand-Myanmar border: A mixed-methods study," *BMC Public Health*, vol. 19, no. 1, pp. 1–16, Dec. 2019, doi: 10.1186/s12889-019-7825-7.
- [38] I. Soesanti, P. Saptandari, S. Adiningsih, and M. B. Qomaruddin, "The practice of complementary feeding among stunted children under the age of two," *Infectious Disease Reports*, vol. 12, no. 11, p. 8723, Jul. 2020, doi: 10.4081/idr.2020.8723.
- [39] L. Rahayuwati *et al.*, "The influence of mother's employment, family income, and expenditure on stunting among children under five: A cross-sectional study in Indonesia," *Journal of Multidisciplinary Healthcare*, vol. 16, pp. 2271–2278, Aug. 2023, doi: 10.2147/JMDH.S417749.
- [40] M. Saaka, "Relationship between mothers' nutritional knowledge in childcare practices and the growth of children living in impoverished rural communities," *Journal of Health, Population and Nutrition*, vol. 32, no. 2, pp. 237–248, 2014.
- [41] L. N. Masilela and P. Modjadji, "Child nutrition outcomes and maternal nutrition-related knowledge in rural localities of Mbombela, South Africa," *Children*, vol. 10, no. 8, p. 1294, Jul. 2023, doi: 10.3390/children10081294.
- [42] M. Shahid *et al.*, "Does mothers' awareness of health and nutrition matter? A case study of child malnutrition in marginalized rural community of Punjab, Pakistan," *Frontiers in Public Health*, vol. 10, 2022, doi: 10.3389/fpubh.2022.792164.




BIOGRAPHIES OF AUTHORS

Ivan Elisabeth Purba    is an associate professor in Public Health at Sari Mutiara Indonesia University in North Sumatra. She is also an expert in the fields of health administration and policy, health law and regional development management. She can be contacted at email: poerba.ivanelis@gmail.com.






Yenni Gustiani Tarigan    is an assistant professor in Public Health at Sari Mutiara Indonesia University in North Sumatra. She is most passionate about environmental and occupational health, with a focus on bio-aerosol exposure to human or workers and its effect on human health. She is also interested in exploring environmental determinants of human health and well-being in later life. She is eager to learn from international experts about health research, to network with fellow researchers and to increase her understanding of global health. She can be contacted at email: yennigangustiani@gmail.com.






Arisman Zandrato    is a pharmacy and pharmacist graduate. He has also graduated Master of Public Health from Sari Mutiara Indonesia University in North Sumatra. Currently he is working as pharmaceutical staff member at the South Nias Health Service, North Sumatra. He can be contacted at email: zandratoarisman@gmail.com.



Agnes Purba    currently works at Professional Program in Midwifery Sari Mutiara Indonesia University. She has over 10 years' experience of midwifery teaching and research. She can be contacted at email: agnespurba24@yahoo.co.id.



Taruli Rohana Sinaga    completed her undergraduate studies in the Community Nutrition and Family Resources Study Program at the Bogor Agricultural Institute, Masters studies in Public Health Sciences Study Program at Indonesia University in 2009. Furthermore, she got her Doctoral Degree at Lincoln University College Kuala Lumpur Malaysia in 2022. Until now she works as a lecturer at Sari Mutiara Indonesia University, Medan. Her area of teaching interest is nutrition and Health Statistics or Biostatistics. She can be contacted at email: taruli71@yahoo.co.id.