



FACTORS INFLUENCING STUNTING AMONG CHILDREN AGED 0–59 MONTHS

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ABSTRACT

Stunting is a condition characterized by impaired growth and development in children under five, caused by chronic nutritional deficiencies, resulting in a child being too short for their age. Objective to identify the factors associated with the incidence of stunting among children under five in West Nias Regency. This study was an analytical observational research with a case-control design conducted in West Nias Regency. The sample consisted of 25 children under five in the case group and 25 children in the control group, selected using purposive sampling. Data were collected using questionnaire and analyzed using the Chi-square test, and cross-tabulation was employed to assess the strength of the association between variables by examining the Odds Ratio (OR) values. The study showed that energy adequacy (OR = 8.333; CI = 2.280–38.762), protein adequacy (OR = 8.000; CI = 1.839–38.175), maternal knowledge (OR = 8.000; CI = 1.839–38.175), maternal education (OR = 23.677; CI = 4.385–118.568), and family income (OR = 14.222; CI = 2.690–61.680) were identified as risk factors for stunting. In contrast, other variables in this study, including low birth weight (OR = 1.678; CI = 0.346–10.604), breastfeeding history (OR = 0.463; CI = 0.35–5.988), and maternal occupation (OR = 1.356; CI = 0.563–4.64), were not found to be significant risk factors for stunting. Inadequate energy and protein intake, limited maternal knowledge, low maternal education, and low family income are risk factors for stunting among children aged 0–59 months.

Keywords: infant; risk factors; stunting

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INTRODUCTION

Stunting is a condition in which children under five have a height-for-age Z-score below -2 standard deviations (stunted), or below -3 standard deviations (severely stunted). The age of 24–59 months is a critical period for building quality human resources, especially the first two years, which are important for optimal brain growth and development. Therefore, this stage needs special attention (Rahmadiyah et al., 2024). Stunting is caused by nutritional deficiencies experienced during pregnancy and early childhood. Limited maternal knowledge about health and nutrition before pregnancy and during the postpartum period, inadequate healthcare services such as antenatal and postnatal care, limited access to nutritious food, and poor access to sanitation and clean water are also contributing factors to stunting (Prasetyo et al., 2023). Several factors are suspected to contribute to stunting, including maternal pregnancy history such as short maternal stature, short birth intervals, high parity, advanced maternal age during pregnancy, and young maternal age (under 20 years), all of which increase the risk of low birth weight infants. Inadequate nutritional intake during pregnancy is also a significant factor. Other contributing factors include failure to implement early initiation of breastfeeding (EIB), unsuccessful exclusive breastfeeding, and early weaning. Additionally, socioeconomic conditions and sanitation also play important roles in the occurrence of stunting (Santosa et al., 2022).

The impacts of stunting include suboptimal cognitive, motor, and verbal development in children, increased incidence of illness and mortality, shorter adult stature compared to average, and reduced learning capacity and performance during school age (Soliman et al., 2021). The prevalence of stunting in Indonesia is 19.8%, which is slightly below the target of 20.1%. In West Nias Regency, the 2024 SSGI data reported a stunting prevalence of 25.4%, ranking second after North Tapanuli among all regencies in North Sumatra Province. Although this represents an improvement compared to previous years, the prevalence remains high (A'ini et al., 2024). Stunting in children under five has significant impacts on both current and future child health. Stunting and other nutritional problems can be prevented, especially during the first 1,000 days of life, through interventions such as supplementary feeding and iron fortification of food (Jalaludin et al., 2025). Therefore, this study aims to identify the factors associated with the incidence of stunting among children under five in West Nias Regency.

METHOD

This study employed a quantitative research design, which utilizes numerical data and statistical analysis to test hypotheses or explain phenomena. The focus was on objective measurement, standardized data collection, and statistical methods to explore the factors contributing to stunting in West Nias Regency. The population included all children aged 0–59 months in West Nias, with a sample of 50 respondents divided equally into 25 cases and 25 controls, selected through purposive sampling. The study instruments consisted of respondent biodata forms, 1x24-hour food recall forms, and a maternal nutrition knowledge questionnaire. The results of the validity and reliability test show that $r = 0.520$ is greater than the r table value of 0.3203, which means the questionnaire is considered valid and reliable. Data analysis involved the Chi-square test to determine significant relationships between nominal variables, complemented by cross-tabulation to assess the strength of associations through Odds Ratio (OR) values.

RESULT

Based on Table 1, among the normal children, 16 (64%) had adequate energy intake while 9 (36%) had inadequate intake. In contrast, the majority of stunted children, 20 (80%), had inadequate energy intake. The Chi-square statistical test indicated that inadequate energy intake was a significant risk factor for stunting ($p = 0.003$; OR = 8.333; 95% CI: 2.280–38.762). Additionally, inadequate protein intake was more prevalent among the stunted group (30%) compared to the normal group, where the majority had adequate protein intake (24%). Statistical analysis showed that children with inadequate protein intake had an 8.000 times higher risk of stunting compared to those with adequate intake ($p = 0.006$; OR = 8.000; 95% CI: 1.839–38.175).

Table 1.
Cross-Tabulation of Energy and Protein Adequacy with Stunting Incidence

Nutritional Intake	Stunting		Normal		p-value	OR (CI 95%)
	f	%	f	%		
Energy Sufficiency						
Enough	16	64	5	20	0.003	8.333 (2.280-38.762)
Less	9	36	20	80		
Protein Adequacy						
Enough	16	70	6	24	0.006	8000 (1.839-38.175)
Less	9	30	19	76		

Based on the data presented in the table 2, the majority of both normal and stunted children were born with adequate birth weight, accounting for 72% and 68%, respectively. Statistical analysis indicated that low birth weight was not a significant risk factor for stunting ($p = 0.635$; OR = 1.678; 95% CI: 0.346–10.604). The lack of association between low birth weight and stunting may be attributed to the diminishing impact of birth weight after the first six

months of life, which tends to decline further by the age of two years.

Table 2.
Cross-Tabulation of Birth Weight and Breastfeeding History with Stunting Incidence

Characteristics of toddlers	Stunting		Normal		p-value	OR (CI 95%)
	f	%	f	%		
Birth weight						
Normal	17	68	18	72	0.635	1.678 (0.346-10.604)
LBW	8	32	7	28		
Breastfeeding history						
Exclusive	2	8	1	4	0.556	0.463 (0.35-5.988)
Not exclusive	23	92	19	76		

Table 3 shows that limited maternal knowledge was predominantly found in the stunted group (72%), while adequate maternal knowledge was more common in the normal group (68%). Bivariate analysis indicated that maternal knowledge was a significant risk factor for stunting ($p = 0.006$; OR = 8.000; 95% CI: 1.839–38.175). Children whose mothers had limited nutritional knowledge were eight times more likely to experience stunting compared to those whose mothers had adequate knowledge. Maternal knowledge influences appropriate food selection and feeding practices for children. The higher a mother's nutritional knowledge, the more likely she is to understand and choose healthy and nutritious foods for her child.

Table 3.
Cross-Tabulation of Maternal Nutrition Knowledge, Maternal Education, Employment Status, and Household Income

Social Economy	Stunting		Normal		p-value	OR (CI 95%)
	f	%	f	%		
Mother's Nutrition Knowledge						8.000
Enough	7	28	17	68	0.006	(1.839-38.175)
Less	18	72	8	32		
Maternal Education						23.677
Enough	7	28	17	68	0.000	(4.384-118.568)
Less	18	72	8	32		
Employment Status						1.356
Working	7	28	8	68	0.744	(0.563-4.464)
Not working	18	72	17	32		
Household Income						14.222
Enough	5	20	19	76	0.001	(2.690-61.680)
Less	20	80	6	24		

DISCUSSION

Energy adequacy in young children is a critical factor in preventing stunting. Sufficient energy intake supports optimal growth and development, thereby reducing the risk of stunting. Children with inadequate energy intake are at a significantly higher risk of experiencing stunting compared to those who receive adequate energy intake (Endrinikapoulos et al., 2023). Adequate energy is crucial for enabling protein utilization for growth and development, rather than its conversion into an energy source by the body. Energy deficiency in infants and children can significantly impede their growth and development. Common symptoms observed in affected children include inattention, restlessness, weakness, lack of enthusiasm, and diminished resistance to infectious diseases (Dipasquale et al., 2020). Protein, particularly animal-based protein, plays a vital role in preventing stunting in children. Animal protein contains complete and high-quality essential amino acids that are crucial for a child's growth and development. Stunting prevention should begin during pregnancy and continue through early childhood by ensuring exclusive breastfeeding and providing complementary foods (MP-ASI) rich in animal protein (Haryani et al., 2023).

Protein intake among children aged 24–59 months in Indonesia remains below the recommended dietary allowance, with an average intake of 111.5% based on a 24-hour recall assessment. The primary function of protein in the body is to support growth and tissue maintenance. For cells to synthesize new proteins, all essential amino acids must be present (Nurhayati et al., 2023). Growth or an increase in muscle mass occurs only when the required amino acids are available in amounts exceeding those needed for tissue maintenance and repair. Individuals consuming low-quality protein may exhibit symptoms of nutritional deficiency. The findings of this study suggest that protein utilization may still be insufficient and inefficient to support optimal linear growth (Wolfe et al., 2024). The data presented in the table indicate that the majority of both normal and stunted children were born with adequate birth weight, accounting for 72% and 68%, respectively. Statistical analysis showed that low birth weight (LBW) was not a significant risk factor for stunting ($p = 0.635$; OR = 1.678; 95% CI: 0.346–10.604). The lack of association between LBW and stunting may be due to the greater influence of birth weight on growth during the first six months of life, which gradually decreases by the age of two. If catch-up growth occurs within the first six months of life, there is a greater likelihood that the child will achieve normal height and avoid stunting in later stages of development (Cooke et al., 2023). This study is consistent with previous research, which found that, based on Chi-square test results, low birth weight (LBW) was not a risk factor for stunting ($p = 1.000$; OR = 1.288; 95% CI: 0.318–5.219) (Ernawati et al., 2022).

For the breastfeeding history variable, most children in both the normal and stunted groups did not receive exclusive breastfeeding, with 76% and 92% respectively. The statistical test showed no significant relationship between breastfeeding history and stunting ($p = 0.556$; OR = 0.463; CI = 0.35–5.988). From the interviews, most mothers said they did not give exclusive breastfeeding because their breast milk was not enough, so they used formula milk. However, most mothers gave complementary foods (MP-ASI) after the baby was 6 months old, as they knew that giving it too early could affect the baby's health and immune system. According to theory, the history of exclusive breastfeeding affects the risk of stunting in toddlers. Providing exclusive breastfeeding during the first six months of life is a significant protective factor against stunting. However, a child can still grow well if they receive adequate nutrition according to their needs, even if they do not receive exclusive breastfeeding (Hadi et al., 2021). Toddlers with a history of exclusive breastfeeding had a higher rate of stunting (39.3%). However, the chi-square statistical test showed a p-value of 0.826 ($p > 0.05$), indicating that there is no significant association between exclusive breastfeeding history and stunting in children aged 24–59 months (Yuliana et al., 2022).

For the variable of maternal education, 72% of mothers in the stunted group had a low level of education, while 68% of mothers in the normal group had a moderate level of education. The chi-square test showed that maternal education is a risk factor for stunting ($p = 0.000$; OR = 23.667; CI = 4.384–118.568). Maternal education has a strong influence on the occurrence of stunting in children. Mothers with higher education levels tend to have better knowledge and skills related to nutrition, child care, and access to health services, which can help reduce the risk of stunting. Educated mothers are also more likely to understand proper child care practices and maintain a clean and healthy environment (Rezaeizadeh et al., 2024). Educated mothers are more likely to understand the importance of good nutrition for their children, including proper nutrient intake, exclusive breastfeeding, and appropriate complementary feeding. Maternal education can also influence parenting practices, such as feeding, stimulation, and health care. In addition, educated mothers tend to have better access to relevant information and health services, such as regular check-ups at community health posts (posyandu), consultations with health professionals, and information on stunting prevention (Purnama, 2025). Maternal education can increase a mother's awareness of the importance of hygiene, sanitation, and a healthy lifestyle, which can positively affect a child's health. A mother's level of education is often linked to the family's economic condition. Educated

mothers are more likely to have better jobs and more stable incomes, allowing them to meet their family's nutritional needs, including those of their children (Moradhvaj & Samir, 2023).

For the employment status variable, the percentage of working mothers in the stunted group was 28%, while in the normal group it was 68%. Based on the statistical test, maternal employment was not a risk factor for stunting ($p = 0.744$; OR = 1.238; CI = 0.343–4.464). Maternal employment status can influence the risk of stunting in children. Some studies suggest that working mothers may have a higher risk of having stunted children compared to non-working mothers. This may be related to several factors, including limited time for child care, less controlled feeding patterns, and reduced attention to the child's development (Supadmi et al., 2024). In this study, maternal employment status did not play a major role as a direct cause of stunting in toddlers. However, it may still influence feeding practices, nutrient intake, and parenting patterns. The lack of a significant relationship between maternal employment and stunting may be due to the fact that non-working mothers do not necessarily provide better child care than working mothers. Interview results showed that many non-working mothers had heavier household responsibilities, which sometimes left them with limited time to prepare a variety of nutritious meals for their children (Aprianti, 2023). Poor parenting is not always caused by a mother's employment status, but can also be due to other factors, such as a lack of knowledge about nutrition (Puspita et al., 2024). This study is consistent with previous research, showing that the percentage of working mothers in the stunting group (44.7%) is similar to that in the normal group (31.6%). The Chi-square test showed that having a working mother is not a risk factor for stunting ($p = 0.744$; OR = 1.356; CI = 0.563–4.464) (Supadmi et al., 2024).

The family income variable shows that a low per capita income is more common in the stunting group (80%) compared to the normal group (24%). Statistical analysis indicates that low family per capita income is a risk factor for stunting ($p = 0.001$; OR = 14.222; CI = 2.690–61.680). Toddlers from families with low per capita income are 14.222 times more likely to experience stunting compared to those from families with sufficient income. Economic status has a significant impact on the occurrence of stunting in children. Children from low-income families are more at risk of stunting due to limited access to nutritious food, healthcare services, and proper education (Zamzamy, 2024). Most toddlers with growth problems come from low-income families. Higher income levels tend to improve a person's food consumption, and better nutritional knowledge is linked to a greater variety of foods consumed (Shabnam et al., 2021).

CONCLUSION

The 2024 SSGI data shows that the prevalence of stunting in West Nias Regency is still quite high at 25.4%. Low energy and protein intake, lack of mother's knowledge, low mother's education, and low family income are risk factors for stunting in children aged 0-59 months in West Nias. The government and related sectors are expected to improve mothers' knowledge about the nutritional needs of toddlers through education, community empowerment, better sanitation and clean water, child growth monitoring, equal access to healthcare, and by creating village alert programs.

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