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Analysis of Risk Factors Associated with Stunting Incidence in Children Under Five in Southeast Minahasa Regency, North Sulawesi Province

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ABSTRACT

Stunting is a developmental disorder that affects children under the age of five, particularly during the first 1,000 days of life, as a result of chronic malnutrition and repeated infections. The objective of this study is to examine the history of Low Birth Weight (LBW), gestational age, feeding practices, and immunization status in relation to the incidence of stunting in children under five years old in Southeast Minahasa District. This study used a quantitative case-control design. The sample consisted of 78 children, with 39 cases and 39 controls. The research instrument was a questionnaire. The case-control design employed the chi-square test, and the association measure calculated was the Odds Ratio, along with logistic regression analysis. The analysis technique included univariate, bivariate, and multivariate analyses. The univariate results showed that 69.2% had a history of LBW, 94.9% were born to mothers aged under 20 years, 59.0% had poor feeding practices, and 84.6% had incomplete immunization status. The bivariate analysis revealed a significant relationship between LBW (p=0.007), gestational age (p=0.008), feeding practices (p=0.006), and immunization status (p=0.041) with the occurrence of stunting. LBW was the most dominant factor associated with stunting, with an Odds Ratio (OR) of 3.922, p-value 0.013, and a 95% Confidence Interval (CI) of 1.336-11.512.

INTRODUCTION

One of the nutritional issues in society is stunting. Stunting is a developmental disorder that affects children under five years of age, particularly during the first 1,000 days of life, as a result of chronic malnutrition and repeated infections (WHO, 2015).

In 2020, globally, 149.2 million children under the age of 5, or 22.0%, experienced stunting. In Asia, 53% of children under the age of 5 were affected by stunting (UNICEF, 2021). According to the Indonesian Nutrition Status Study, the prevalence of stunting in Indonesia in 2021 was 27.5%, which decreased to 21.6% in 2022 (SSGI, 2022). The prevalence of stunting in North Sulawesi in 2022 was 20.5% (SSGI, 2022). The Southeast Minahasa Regency, according to the 2022 SSGI data, ranked third in the highest stunting cases in North Sulawesi, with a prevalence of 26.5%. Based on the data from the Southeast Minahasa Health Office, the number of stunted children under five in 2022 was 122, and by July 2024, it decreased to 39 children.

Stunting is not caused by a single factor but is the result of multiple interconnected factors. Babies with low birth weight (LBW) experience delayed growth and development due to intrauterine growth retardation that begins during pregnancy and continues after birth. LBW babies are slower in growth and development and often face difficulties with breastfeeding compared to babies born with a normal birth weight (Rahayu & Puswanti, 2021).

Teenage mothers typically receive less early prenatal care. Most pregnant adolescent girls have a body mass index (BMI) in the underweight category, which can lead to low birth weight babies and higher infant mortality (Larasati et al., 2018). The dietary patterns of toddlers play a crucial role in their growth process, as food contains essential nutrients. If a toddler's diet is not properly managed, their growth can be disrupted, leading to thinness, short stature, and even malnutrition (Prakhasita, 2018).

Immunization is an effort to provide immunity to babies and toddlers by injecting vaccines into the body, prompting the body to produce antibodies to protect against specific diseases. Incomplete immunization leads to weakened immunity in toddlers, making them more susceptible to infections. If a toddler with an infection is left untreated, it can result in stunting (Rahayu, 2020).

Based on interviews and initial observations with healthcare workers in Southeast Minahasa Regency, stunting cases are caused by several risk factors, such as low birth weight (LBW), gestational age, feeding practices, and parental knowledge. Given the above factors, this study aims to examine the relationship between low birth weight (LBW) history, gestational age, feeding practices, immunization status, and the incidence of stunting in toddlers in Southeast Minahasa Regency.

METHODS

The type of research used in this study is quantitative with a case-control design. The study was conducted in Southeast Minahasa Regency from May to October 2024. The sample for this study was determined through total sampling of all toddlers affected by stunting. The samples were grouped into two categories: cases and controls, with each group having specific inclusion and exclusion criteria, and were selected in a 1:1 ratio. A total of 78 toddlers participated, consisting of 39 cases and 39 controls. The research instrument used was a questionnaire. The case-control design employed the chi-square test, and the measure of association calculated was the Odds Ratio. Logistic regression analysis was also used to explain the correlation between several independent variables and the dependent variable simultaneously. This study aligns well with your expertise in health research, especially considering your focus on health-related issues like child health, and could offer valuable insights into stunting in early childhood, which might complement your ongoing work on public health.

RESULTS

Univariate Analysis

The research findings in Table 1 show the distribution based on gender for both the cases and controls in toddlers, which is the same: 17 male toddlers (43.6%) and 22 female

toddlers (56.4%). The age distribution (in months) for the cases indicates that the highest number of cases occurred in toddlers aged 25-36 months, with 13 toddlers (33.3%), while the fewest cases were found in toddlers aged 49-59 months, with 1 toddler (2.6%). For the controls, the highest number of toddlers was in the age group of 25-48 months, with 14 toddlers (35.9%), and the fewest controls were in the age group of 0-12 months, with 8 toddlers (20.5%). The distribution based on respondent gender for both cases and controls was the same: 20 male respondents (51.3%) and 19 female respondents (48.7%).

Table 1. Distribution of Respondent Characteristics

Characteristics		Group			
		Case		Control	
		n	%	n	%
Gender of Toddler	Male	17	43,6	17	43,6
	Female	22	56,4	22	56,4
Toddler's Age (months)	0 – 12	5	12,8	8	20,5
	13 – 24	11	28,2	10	25,6
	25 – 36	13	33,3	14	35,9
	37 – 48	9	23,1	7	17,9
	49 – 59	1	2,6	0	0,0

Source: Primary Data, 2024

Bivariate Analysis

Table 2. The Relationship Between Low Birth Weight History, Gestational Age, Feeding Practices, and Parental Knowledge.

Variable		Stunting Incident				Total		OR 95% CI	*p-Value*
		Case		Control					
		n	%	n	%	n	%		
Birth Weight	LBW	27	69,2	14	35,9	41	52,6	4,018	0,007
	Not LBW	12	30,8	25	64,1	37	47,4		
Gestational Age	< 20 Years	37	94,9	27	69,2	64	82,1	8,222	0,008
	≥ 20 Years	2	5,1	12	30,8	14	17,9		
Feeding Practices	Poor	23	59,0	10	25,6	33	42,3	4,169	0,006
	Good	16	41,0	29	74,4	45	57,7		
Immunization Status	Incomplete	33	84,6	24	61,5	57	73,1	3,294	0,022
	Complete	6	15,4	15	38,5	21	26,9		

Source: Primary Data, 2024

Based on Low Birth Weight (LBW), it was found that in the case group, 27 (69.2%) children under five had a history of LBW, while 14 (35.9%) did not. In the control group, 12 (30.8%) children under five had a history of LBW, and 25 (64.1%) did not. Regarding gestational age, in the case group, 37 (94.9%) mothers were pregnant at age <20 years, while 2

(5.1%) mothers were pregnant at age ≥20 years. In the control group, 27 (69.2%) mothers were pregnant at age <20 years, and 12 (30.8%) mothers were pregnant at age ≥20 years.

Regarding feeding practices, in the case group, 23 (59.0%) respondents reported poor feeding practices, while 16 (41.0%) respondents reported good feeding practices. In the control group, 10 (25.6%) respondents reported poor feeding practices, while 29 (74.4%) respondents reported good feeding practices. For immunization status, in the case group, 33 (84.6%) children under five had incomplete immunization status, while 6 (15.4%) had complete immunization status. In the control group, 24 (61.5%) children under five had incomplete immunization status, and 15 (38.5%) had complete immunization status.

Multivariate Analysis

Table 3. Results of Multivariate Analysis of Stunting Risk Factors

Variable	B Value	95% CI	*p-Value*
Low Birth Weight	3.922	1.336-11.512	0,005
Constanta	-0.509		

Source: Primary Data, 2024

Multivariate analysis was conducted using multiple logistic regression with the Backward LR (Likelihood Ratio) method. This method involves entering all independent variables as candidates into the logistic regression model, and then systematically removing each independent variable based on a specific statistical significance criterion. Based on Table 3, the most dominant factor associated with the risk of stunting in children under five is Low Birth Weight (LBW), with $p < 0.005$.

DISCUSSION

The Relationship Between Low Birth Weight (LBW) and the Incidence of Stunting

Based on the results of a study conducted in Southeast Minahasa Regency, Chi-Square test results revealed that infants with a history of LBW were more prevalent, with 41 infants (52.6%), while 37 infants (47.4%) had no LBW history, with a p-value of 0.007, which is significant (<0.05). This indicates a risk between LBW and the risk of stunting, with an odds ratio (OR) of 3.922. Thus, infants with a history of LBW have a 3.922 times higher likelihood of experiencing stunting compared to those without a history of LBW.

These findings are in line with a study conducted by Sholihah in 2023 using the Chi-Square test with a significance level of 5% ($\alpha=0.05$), which found a p-value of 0.022 ($p<0.05$), indicating a relationship between LBW and the incidence of stunting in infants. Additionally, the odds ratio (OR) obtained was 4.333, meaning that infants with a history of LBW have a 4.333 times greater chance of experiencing stunting compared to infants without a history of LBW (Sholihah, 2023). Conversely, a study conducted by Susanti in 2024 found that out of 13 children with a history of LBW, 2 children (15.4%) experienced stunting, while 11 children (84.6%) did not. On the other hand, out of 85 children without a history of LBW, 77 children (90.6%) did not experience stunting, while 8 children (9.4%) did. Using the Fisher Exact test, a

p-value of 0.618 (>0.05) was obtained, indicating that there was no significant relationship between LBW history and the incidence of stunting (Susanti, 2024).

Infants born with low birth weight are more likely to experience stunting later in life. Several factors contribute to this phenomenon, including limited nutritional reserves from birth, growth disturbances occurring in the womb, and an underdeveloped immune system in LBW infants. These findings reinforce the idea that LBW during the early stages of life is a crucial risk factor in child growth development, which can hinder height growth and lead to stunting. Contributing factors include inadequate nutritional reserves, intrauterine growth disturbances, and a more vulnerable immune system, making LBW infants more susceptible to infections.

The Relationship Between Gestational Age and the Incidence of Stunting

Based on the results of a study conducted in Southeast Minahasa Regency, Chi-Square test results revealed that mothers aged <20 years accounted for 64 individuals (82.1%), while mothers aged ≥20 years comprised 14 individuals (17.9%), with a p-value of 0.008, which is significant (<0.05). This indicates a risk between maternal age and the risk of stunting, with an odds ratio (OR) of 4.184, meaning that mothers aged <20 years have a 4.184 times greater chance of having a child who experiences stunting compared to mothers aged ≥20 years.

A study conducted by Putri et al. in 2023 revealed a significant relationship between adolescent pregnancies and the incidence of stunting, with a p-value of 0.001 and an odds ratio (OR) of 5.09. Adolescent pregnancies can lead to serious health and social issues, affecting both the physical and mental health of teenagers as well as the overall community (Putri et al., 2023). This finding is consistent with a study conducted by Fiolentia and Ernawati in 2021, which also found a significant relationship between adolescent pregnancies and the incidence of stunting at the Harapan Baru Health Center in Samarinda Seberang, with a p-value of 0.000, indicating that H0 was rejected. This suggests a clear relationship between adolescent pregnancies and the incidence of stunting in that area, where mothers under 20 years of age gave birth to 10 children who experienced stunting, accounting for 22.2% of the total, while 35 other children did not experience stunting, representing 77.8%.

Maternal age is a critical aspect that should be considered in efforts to prevent stunting. Therefore, it is essential to continuously improve reproductive health among adolescents, provide comprehensive antenatal counseling, and expand access to healthcare services for pregnant women, particularly those who are teenagers or over 35 years old. Pregnant women who are very young or very old have a higher likelihood of giving birth to children who experience stunting compared to women aged between 20 and 35 years. This is due to several factors. First, pregnant teenagers are often still in their growth phase, so their nutritional intake may be inadequate to support fetal development. Second, older pregnant women are at higher risk for complications such as preeclampsia and gestational diabetes, which can affect fetal growth. Third, both adolescent and older pregnant women tend to have less knowledge about reproductive health and proper pregnancy care practices.

Relationship Between Feeding Parenting Patterns and Incidence of Stunting

Based on the research conducted in Southeast Minahasa Regency, the Chi-Square test results show that 33 children (42.3%) received poor feeding parenting patterns, while 45

children (57.7%) received good feeding parenting patterns. A total of 64 children (82.1%) were involved in the study, with a p-value of 0.006, which is significant (<0.05), indicating a relationship between feeding parenting patterns and stunting risk. The odds ratio (OR) was found to be 3.720, meaning that children receiving poor feeding parenting patterns have a 3.720 times higher likelihood of experiencing stunting compared to those with good feeding parenting patterns.

A study by Ratnawati and Suparmi in 2022 also found a significant relationship between child feeding factors and parenting patterns with the occurrence of stunting. Children who received inadequate feeding patterns had a 9.04 times higher risk of stunting compared to those who received proper nutrition from their mothers. Additionally, poor parenting patterns increased the risk of stunting by 7.94 times when compared to children who were raised with good parenting practices (Ratnawati & Suparmi, 2022). These findings are in line with a study by Putri and Zainal in 2024, which revealed a significant relationship between maternal parenting patterns, including aspects of feeding, psychosocial stimulation, sanitation, personal hygiene, and utilization of healthcare services, with the prevalence of stunting in children (Putri & Zainal, 2024).

An ideal parenting pattern includes exclusive breastfeeding during the first six months of life, followed by the timely introduction of appropriate and nutritious complementary foods, as well as the implementation of clean and hygienic feeding practices. On the other hand, improper parenting practices, such as introducing complementary foods too early, providing nutritionally inadequate foods, or practicing unhygienic feeding habits, can hinder children's growth and increase the risk of stunting. These mismatched parenting patterns can disrupt nutrient absorption, trigger digestive tract infections, and impede the overall physical development of children.

Relationship Between Immunization Status and Incidence of Stunting

Based on the research conducted in Southeast Minahasa Regency, the Chi-Square test results show that 57 children (52.6%) had incomplete immunization status, while 21 children (47.4%) had complete immunization status, with a p-value of 0.041, which is significant (<0.05). This means there is a risk between immunization status and the risk of stunting, with an OR of 3.569. Children with incomplete immunization have a 3.569 times higher likelihood of experiencing stunting compared to those with complete immunization.

A study conducted by Wanda et al. in 2021 found a significant relationship between basic immunization history and the incidence of stunting in children in Hegarmanah Village, Jatinangor District, with a p-value of <0.05 (p=0.00 <0.05). Additionally, the study revealed that children with incomplete immunization had a 4.9 times higher risk of stunting compared to children who received complete immunization (Wanda et al., 2021). These findings align with the research by Aprilia and Tono in 2023, which also found a connection between basic immunization history and the incidence of stunting in children. Poor health conditions in children can result in delayed growth and development, with children suffering from chronic illnesses being more likely to experience impaired growth (Aprilia & Tono, 2023).

Children who do not receive complete immunization are more likely to experience stunting compared to those who receive full immunization. Unimmunized children are more susceptible to various infections, which can interfere with nutrient absorption and hinder their

growth. Furthermore, immunization is often accompanied by other healthcare services, such as growth and development monitoring, providing healthcare providers with opportunities to detect nutritional problems early. Immunization programs are typically integrated with other health promotion initiatives, including nutrition promotion, which helps improve parental understanding of the importance of nutrition for children. Therefore, immunization status not only protects children from infectious diseases but also plays a crucial role in stunting prevention efforts.

Low Birth Weight (LBW) as the Most Dominant Factor in Stunting Incidence

Among the variables, a history of low birth weight (LBW) is the most significant factor, as babies born weighing less than 2500 grams are often associated with various health problems, including stunting. In addition, the history of LBW, feeding parenting patterns, and parental knowledge all show an Odds Ratio (OR) greater than 1, indicating that these factors increase the risk of stunting.

CONCLUSION

This study concludes that a history of Low Birth Weight (LBW), gestational age, feeding patterns, and parental knowledge are factors associated with the incidence of stunting in children under five in Southeast Minahasa Regency.

It is recommended that the government improve access to and the quality of healthcare services for mothers and children, particularly in remote areas, as well as provide sexual education for adolescents and counseling on proper parenting practices. These efforts could help reduce the risk factors for stunting.

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