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The Relationship Between Low Birth Weight (LBW) and Basic Immunization Status with the Incidence of Stunting in Toddlers

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ABSTRACT
Stunting is a chronic nutritional problem that has a serious impact on children's growth and development. This study aims to determine the relationship between low birth weight (LBW) and basic immunization status with the incidence of stunting in toddlers in the Selayo Public Health, Solok Regency in 2019. The study used a case-control design with 58 respondents (29 stunted, 29 not stunted) selected by purposive sampling. Data were obtained through interviews and observations of KIA books, analyzed using the Chi-Square test at a 95% confidence level. The results showed a significant relationship between LBW and the incidence of stunting (p = 0.047; OR = 3.9) and between incomplete basic immunization status and stunting (p = 0.029; OR = 4.1). It was concluded that LBW and basic immunization status play an important role in increasing the risk of stunting. The implications of this study encourage increased nutrition education for pregnant women and the implementation of complete basic immunization to reduce the prevalence of stunting.

Keywords: *Stunting, LBW, Basic Immunization, Toddlers*

INTRODUCTION

Stunting is a significant health problem worldwide, especially in developing countries like Indonesia. Stunting is a condition of failure to thrive in toddlers due to chronic malnutrition that impacts the child's physical and cognitive development (UNICEF, 2024) . The International Health Organization states that stunting not only affects a child's height but also increases the risk of various diseases in the future (WHO, 2021) . Indonesia had a prevalence of 30.8% of children under five years old stunted in 2020 (Kementrian Kesehatan Republik Indonesia, 2020). In Indonesia, stunting is not only a personal health issue but also affects social and economic development. This figure is

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still far above the WHO's global target of 20%, although there has been a decrease from the previous year.

West Sumatra Province has a 21.3% stunting rate, with Solok Regency having the highest stunting rate at 39.9% (Ministry of Health of the Republic of Indonesia, 2018) . This indicates that public health programs, particularly those related to stunting prevention, still need to be strengthened. According to the Solok Health Office in the Selayo Public Health in Solok Regency is one of the areas with a high stunting rate. In 2019, 713 toddlers were stunted there (Solok Health Office, 2020) .

One of the main risk factors for stunting is low birth weight (LBW). Babies born weighing less than 2,500 grams are more susceptible to growth and developmental disorders. LBW can increase the risk of stunting in toddlers by up to fivefold. Low birth weight babies tend to experience delays in achieving optimal growth, especially if they do not receive adequate nutrition during their development(Ananda et al., 2025) .

In addition to LBW, basic immunization status also plays a crucial role in preventing stunting. Immunization protects toddlers from infectious diseases that can disrupt their growth. Research by previous author reports that children who do not receive complete immunizations are at greater risk of stunting because they are susceptible to infectious diseases that inhibit growth (Kawareng, 2024) . Basic immunization, which includes vaccinations for diphtheria, hepatitis B, polio, and others, is crucial for protecting toddlers from infectious diseases that can worsen nutritional status. A lack of nutrition can lead to a person being susceptible to infectious diseases, resulting in decreased appetite, impaired absorption in the digestive tract, or increased nutrient needs due to illness, leading to unmet nutritional needs (Modjo & et al., 2024) .

However, many toddlers in Indonesia still do not receive complete basic immunizations. Data from the Ministry of Health in 2020 showed that approximately 10% of toddlers in Indonesia had not received complete basic immunizations, largely due to low parental knowledge and limited access to health services. This lack of awareness about the importance of basic immunizations poses a major challenge in stunting prevention efforts, as immunizations not only prevent infection but also support optimal physical growth in toddlers (Ministry of Health of the Republic of Indonesia, 2020) .

The high prevalence of stunting in Indonesia highlights the urgent need for effective interventions, especially among vulnerable populations such as toddlers (Herawati et al., 2025) . Stunting not only impairs physical growth but also affects cognitive development, leading to long-term consequences on educational achievement, productivity, and overall quality of life. Therefore, understanding the risk factors contributing to stunting is essential for designing preventive measures (Bagus et al., 2025) . Research by previous authors hows that exclusive breastfeeding and a history of LBW are significantly associated with stunting in children aged 24–59 months. Breast milk plays a crucial role in meeting infants' nutritional needs. Breast milk consumption can also boost a baby's immunity , thereby reducing the risk of infectious diseases. The causes of LBW are

generally multifactorial. Infants with LBW are at greater risk of experiencing developmental and growth disorders in childhood.

Based on the high prevalence of stunting and the importance of LBW and basic immunization, this study was conducted to analyze the relationship between these two variables and the incidence of stunting in toddlers in the Selayo Public Health in Solok Regency. The results are expected to contribute to preventive efforts to reduce stunting rates through maternal nutrition programs and optimization of basic immunization. With a better understanding of the factors influencing stunting, it is hoped that more targeted interventions can be implemented, such as enhancing maternal nutrition programs, improving the implementation of basic immunizations, and increasing public awareness of the importance of early stunting prevention. These preventive measures are expected to reduce the prevalence of stunting and improve the quality of life of Indonesian children in the future.

METHODS

This study uses an analytical survey design with a case-control study approach. The research aims to determine the relationship between LBW and basic immunization status with the incidence of stunting in children under five in the working area of the Selayo Health Center, Solok Regency. The population in this study consists of all children under five aged 0-59 months registered in the working area of the Selayo Health Center, totaling 4,569 children. The research sample consisted of 58 respondents, comprising 29 toddlers with stunting (case group) and 29 toddlers without stunting (control group). The sampling technique used is purposive sampling, which involves selecting respondents based on specific criteria that align with the research objectives. To control for confounding variables related to age and gender, this study ensured that the case and control groups had similar age and gender distributions. The case group (toddlers with stunting) and the control group (toddlers without stunting) were selected based on comparable age and gender distributions to reduce the influence of these variables on the outcome of stunting incidence.

Data collection was conducted thru interviews and direct observation of the KIA (Mother and Child Health) books to obtain information on the history of birth weight and basic immunization status in toddlers. Additionally, height measurements are taken to determine the nutritional status of toddlers based on the height-for-age (H/A) indicator using a high-accuracy microtoise, especially for assessing children. The collected data was then analyzed using the Chi-Square test to examine the relationship between the independent variables LBW and basic immunization status) and the dependent variable (stunting incidence). Bivariate analysis was conducted to test the relationship between these two factors and the occurrence of stunting in toddlers with a 95% confidence level.

RESULTS

1. The Relationship Between Low Birth Weight (LBW) and Stunting in Toddlers

The analysis results showed that there were 18 toddlers (31%) with a history of LBW. There are 13 toddlers (44.8%) experienced stunting, while 5 toddlers (17.2%) did not experience stunting. The Chi-Square test showed p = 0.047 (<0.05) with OR = 3.90 (CI 95%: 1.163–13.078), which means that toddlers with a history of LBW have a 3.9 times greater risk of experiencing stunting compared to toddlers with normal birth weight.

Table 1. Relationship Between Low Birth Weight (LBW) and Stunting in Toddlers

Low Birth Weight	The Incidence of Low Birth Weight Levels						
	Case		Control		Total		p-value
a. LBW	13	44.8%	5	17.2%	18	31	0.047
b. No LBW	16	55.2%	24	82.8%	40	69	
Total	29	100%	29	100%	58	100	

2. The Relationship Between Basic Immunization Status and Stunting in Toddlers

A total of 21 toddlers (36.2%) did not receive complete basic immunizations. There are 15 toddlers (51.7%) experienced stunting, while 6 toddlers (20.7%) did not experience stunting. The Chi-Square test results showed p=0.029 (<0.05) with OR=4.1 (95% CI: 1.292–13.057), meaning toddlers who did not receive complete basic immunizations had a 4.1 times greater risk of experiencing stunting compared to toddlers with complete basic immunizations.

Table 2. Relationship Between Basic Immunization Status and Stunting in Toddlers

Basic Immunization Status	The Incidence of Low Birth Weight Levels						
	Case		Control		Total		p-value
a. Incomplete	15	51.7%	6	20.7%	21	36.2	0.029
b. Complete	14	48.3%	23	79.3%	37	63.8	
Total	29	100%	29	100%	58	100	

DISCUSSION

1. Low Birth Weight and Stunting

The results of this study indicate a significant relationship between LBW and the incidence of stunting in toddlers in the Selayo Community Health Center, Solok Regency. Toddlers born with low birth weight (less than 2500 grams) have a 3.9 times greater risk of experiencing stunting compared to toddlers with normal birth weight. This study is in accordance with previous research conducted by researcher which found that toddlers with low birth weight have a much higher risk of stunting compared to toddlers with normal birth weight (Halli et al., 2022) . Babies with LBW are more susceptible to growth and developmental disorders, caused by their bodies' inability to catch up with optimal growth after birth (Suyami, 2023) .

However, compared with research findings in other areas, such as at the Tilango Community Health Center, Gorontalo Regency, conducted by research which found no significant association between LBW and stunting. This is due to the dominant role of environmental, behavioral, and socioeconomic factors in influencing a child's overall nutritional status and growth. Furthermore, this study highlights the importance of local factors, such as maternal nutritional status and access to adequate prenatal health care. These differences in results may be influenced by differences in health patterns, socioeconomic conditions, and policies in each region. Therefore, it is important to consider the local context when analyzing this relationship to determine more appropriate intervention strategies (Ananda et al., 2025) . Babies born with low birth weight often experience delays in organ maturation and an imperfect immune system, which makes them more susceptible to infections and other complications (Tri Winarti Suhardi and Sudarmanto, 2024) .

Factors that cause LBW include maternal malnutrition during pregnancy, maternal illness, and low socioeconomic status (Putri Rizkiyah Salam, 2021) . Mothers with poor nutritional status or suffering from illnesses such as hypertension or diabetes are at greater risk of giving birth to babies with LBW. Furthermore, issues such as an unbalanced diet and lack of access to prenatal health services also contribute to the increase in LBW rates. Therefore, it is important for the government to strengthen nutrition education programs for pregnant women to reduce the risk of LBW and its impact on toddler growth (Fitri, 2018) .

LBW is also associated with stunted cognitive development. Research by previous author shows that babies born with low birth weight often experience delays in brain development, which can ultimately contribute to impaired cognitive and motor development later in life (Utami & Widiyaningsih, 2023) . Furthermore, LBW is also associated with other physical disorders, such as respiratory and digestive system problems. Therefore, optimal postnatal health care is crucial to ensure that toddlers born with low birth weight can pursue optimal development.

LBW prevention can be achieved by improving the nutritional intake of pregnant women, such as by consuming foods rich in protein, vitamins, and minerals, and participating in appropriate maternal health programs (Suryani, 2020) . Furthermore, nutritional intervention programs for pregnant women need to be expanded to include routine health monitoring, including weight and blood pressure checks, to detect the risk of LBW early (UNICEF, 2023) . Strengthening the role of health cadres and medical personnel in providing counseling to pregnant women is also essential to reduce the prevalence of LBW.

Overall, LBW is a significant risk factor for stunting in toddlers, and reducing the number of low birth weight infants can significantly contribute to stunting prevention efforts (Wulandari, 2021). Interventions involving improved maternal nutrition and routine health monitoring must be implemented more intensively and involve all relevant parties. With a more comprehensive and collaborative approach, it is hoped that the prevalence of low birth weight and stunting can be significantly reduced (Ministry of Health of the Republic of Indonesia, 2019) .

Based on the researcher's assumption, low birth weight indicated by growth retardation since in the womb is one of the contributors to stunting in children. This is caused by toddlers who

have a history of LBW being susceptible to disease and the imperfect function of body organs in babies born with LBW. In addition, poor nutritional care for children in the first 1,000 days of life such as not getting early initiation of breastfeeding (IMD), not being given exclusive breastfeeding, incomplete basic immunization, providing food that does not meet the child's body needs, and poor care will worsen child growth in the future and will increase mortality, morbidity, and disability rates in children so that stunting will also become more widespread, it occurs because children cannot catch up on growth like children born with normal weight because the child's body system in supporting growth is also disrupted .

Based on the results of the study, it was also found that toddlers with a history of normal birth weight or not LBW experience *stunting* . This is associated with other factors that cause a child to become stunted, such as not receiving exclusive breastfeeding (exclusive breastfeeding), early introduction of complementary foods (MP ASI), a history of infection in the child, insufficient nutritional needs of the child, and environmental factors. Therefore, it is important for health workers to provide nutritional education to pregnant women to prevent LBW, as well as improve the quality of prenatal care to ensure optimal fetal growth.

2. Basic Immunization Status and Stunting

The results of this study also show a significant relationship between incomplete basic immunization status and the incidence of stunting in toddlers. Toddlers who do not receive complete basic immunizations are at 4.1 times greater risk of experiencing stunting than toddlers who do . This research aligns with research by researcher which confirms that basic immunizations can reduce mortality and morbidity caused by vaccine-preventable diseases. Immunization protects children from serious diseases that can hinder their growth by strengthening their immune systems to make them more resistant to infection (Kawareng, 2024) .

However, the results of this study differ slightly from those in other regions, where basic immunization factors may not have as strong an impact as found in this study. In some regions, for example, lack of immunization is more related to parental knowledge and awareness, while in others, access to health services is a key factor (Sawitri Dewi & Ikhwah Mu'minah, 2020) . This study reinforces the importance of health education and public understanding of the benefits of basic immunization, which can help significantly reduce the prevalence of stunting.

Research by previous author revealed that basic immunization serves as protection against infectious diseases that can inhibit growth (Rifana Atifa Vasera & Budi Kurniawan, 2023) . Diseases such as diarrhea, pneumonia, and upper respiratory tract infections can cause weight loss and metabolic disorders, which risk worsening stunting in toddlers. Based on health theory , it explains that immunization prevents recurrent infections that can drain energy and inhibit growth (Riona et al., 2025) .

Immunization is one of the most effective ways to prevent infections in toddlers, especially in developing countries like Indonesia, where infectious diseases remain a leading cause of childhood mortality . Although basic immunization is a mandatory government program, some

toddlers still have not received complete basic immunizations. According to data from the Indonesian Ministry of Health approximately 10% of toddlers in Indonesia have not received complete basic immunizations (Ministry of Health of the Republic of Indonesia, 2020) . This is due to several factors, including low parental knowledge about the importance of immunization, limited access to health facilities, and the existence of myths and misinformation regarding vaccination.

Interventions to increase basic immunization coverage are crucial for reducing the prevalence of stunting. Research by rearcher shows that increasing public awareness of the benefits of basic immunization can significantly increase the number of toddlers receiving complete vaccinations (Maghfirah et al., 2025) . The government needs to intensify public education programs on the importance of immunization and address barriers to access to health services in remote areas (Rauf et al., 2025) . Furthermore, health workers at the community health center level must be more proactive in providing accurate information to parents regarding the appropriate immunization schedule and the benefits of vaccination.

To accelerate the reduction in stunting prevalence, basic immunization must be a priority in child health programs. Effective immunization programs can help improve children's nutritional status and growth, as well as reduce mortality and disability from infectious diseases. Therefore, the government, health workers, and the community must work together to ensure that every toddler receives complete basic immunizations, as a crucial step in preventing stunting and improving the quality of children's health in Indonesia.

As a preventative measure, nutrition education for pregnant women is essential to reduce the prevalence of LBW, which in turn can reduce stunting rates. Furthermore, synergy between the government, health workers, and the community is needed to increase basic immunization coverage. Active community involvement and increased awareness of the importance of immunization are crucial to reducing stunting rates (Desmita et al., 2025) . Counseling programs involving families and communities can increase knowledge about good nutrition and the importance of immunization.

Based on researchers' assumptions, stunting in children is partly caused by a weakened immune system that is unable to fight off disease. This occurs because the body is not strong enough to fight off incoming germs due to the lack of passive immunity received from basic immunizations. This makes children susceptible to disease, and their immune system is slow to respond to disease. Consequently, problems such as frequent illness and decreased appetite arise. Therefore, with a weakened immune system when a child is sick, the child will experience growth disorders and ultimately develop growth retardation, such as stunting.

To increase basic immunization coverage, it is crucial to educate the public about the benefits of immunization, especially to address prevailing myths and misconceptions. Furthermore, strengthening access to health services, particularly in remote areas, is crucial to ensure every toddler receives timely immunizations (Maghfirah et al., 2025) .

Other steps that need to be taken include reducing social and cultural barriers that hinder immunization and strengthening immunization monitoring systems. Educational programs

involving community leaders and families can help raise awareness about the importance of immunization (Pratama et al., 2024) . Increasing basic immunization coverage is expected to reduce the prevalence of stunting and improve the quality of growth of Indonesian children.

CONCLUSIONS

This study shows that LBW and basic immunization status are significantly associated with stunting in toddlers. Toddlers born with LBW are at higher risk of stunting, primarily due to growth retardation caused by suboptimal organ maturation and a weakened immune system. Furthermore, toddlers who do not receive complete basic immunizations are also at greater risk of stunting because they are susceptible to infectious diseases that can disrupt their growth. These findings reinforce the importance of maternal health, monitoring infant birth weight, and implementing complete basic immunizations to prevent stunting in toddlers.

The implications of this study emphasize the crucial role of maternal health in preventing LBW, as well as the need for comprehensive basic immunization to prevent stunting. Therefore, more intensive education programs for pregnant women and parents are needed regarding the importance of good nutrition during pregnancy and complete vaccination for children. Furthermore, increasing access to healthcare, particularly in remote areas, must be a government priority to ensure broader immunization coverage.

Policy recommendations to address stunting include strengthening maternal health programs with a focus on optimal nutrition and regular check-ups during pregnancy. The government also needs to strengthen basic immunization policies by expanding vaccination services at community health centers (Puskesmas) and integrated health posts (Posyandu), and conducting educational campaigns to reduce immunization awareness. With appropriate preventive measures, it is hoped that the prevalence of stunting can be reduced and the quality of life of Indonesian children can be improved.

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