# The Relationship Between Stunting and Body Resistance to Infection in Children

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## Abstract

**Background:** Stunting is a chronic nutritional problem due to malnutrition, especially during the first 1,000 days of life. In addition to affecting physical growth, stunting also affects children's cognitive development and immune system. Stunted children have a higher risk of recurrent infections such as respiratory infections and diarrhea, because their immune systems are not yet optimally developed. In Indonesia, the prevalence of stunting is still quite high and is one of the main health problems, caused by prolonged malnutrition that weakens the function of the child's immune system. **Objective:** To determine the relationship between stunting and resistance to infection in children, as well as the role of proper nutrition in improving health and endurance. **Methods:** A literature review covering various scientific sources from 2019-2024 through the Google Scholar, PubMed, and Science Direct databases with the keywords "stunting," "immunity," "infection," and "children." Secondary data on the prevalence of stunting and infection are used to show the relationship between these two factors. **Results and Discussion:** Stunted children are more susceptible to infection because their immune systems are not yet optimal due to a lack of essential nutrients such as protein, zinc, and vitamins. Research shows that an unbalanced diet and zinc deficiency can weaken the immune response, making children more likely to experience respiratory infections and diarrhea. Repeated infections worsen their nutritional status, creating a cycle of malnutrition and infection that is difficult to break. **Conclusion:** Stunting is closely related to low body resistance to infection. Children who experience stunting have a higher risk of recurrent infections due to a less than

optimal immune system. Appropriate nutritional intake, such as protein, zinc, and vitamins, plays an important role in increasing immunity and overcoming stunting.

**Keywords:** *Stunting, Immunity, Infection, Children*

## Introduction

Optimal child growth and development is an important indicator that reflects the nutritional and health status of the population in a region and is a primary indicator of the quality of human resources. The nutritional status of the community, especially toddlers, is a sensitive indicator for understanding overall nutritional status. Stunting is a condition caused by chronic malnutrition, so stunting in toddlers can be a primary indicator of maternal and infant health. Disrupted linear growth and body length that is not in accordance with age can cause delays in child growth and development. This linear growth deficit is caused by the accumulation of suboptimal nutritional intake in the first 1,000 days of life.[1]

Stunting is a health disorder characterized by a child's height being less than -2 SD (Standard Deviation) on the growth chart. Stunting can occur in the first 1000 days of life, starting from the conception phase. The first 1000 days of life are an important period for human development because it is the optimal period for brain cell growth. Stunting can cause health complications during a child's growth and development, and can even be permanent. In the short term, stunting causes stunted growth, while in the long term, stunting affects cognitive aspects and the possibility of contracting non-communicable diseases. Therefore, the incidence of stunting is one of the indicators of child welfare in a country.[1]

According to WHO in 2022,[2] the global prevalence of stunting among children under the age of five reached 22.3%, down from 33.0% in 2000. In absolute numbers, around 148.1 million children worldwide are stunted. The majority of stunting cases are found in South Asia and Sub-Saharan Africa, where around 80% of stunted children live.

According to the latest data from the 2022 Indonesian Nutritional Status Survey (SSGI), the prevalence of stunting in Indonesia has decreased to 21.6% from 24.4% in 2021. The government is targeting a reduction in the prevalence of stunting to 14% by 2024. This target can be achieved through cooperation between ministries and institutions, as well as targeted nutritional interventions, especially for mothers before and during pregnancy, and children aged 6 months to 2 years.

Stunting in toddlers requires special attention because it can inhibit physical growth, mental development, and health status of children. Recent studies have shown that children who experience stunting are at risk of having poor school performance, low education levels, and low income as adults. Children who experience stunting are at higher risk of growing into unhealthy and poor adults. Stunting in children is also associated with increased vulnerability of children to diseases, both infectious diseases and Non-Communicable Diseases (NCDs) and an increased risk of overweight and obesity. Long-term overweight and obesity can increase the risk of developing degenerative diseases. Stunting is associated with increased risk of morbidity and mortality, decreased physical capacity, developmental disorders, and motor and mental function of children. Health and nutrition are very important for early childhood for optimal growth and development according to their age. Attention to children's nutritional intake should begin in the first 1,000 days of life, from pregnancy to 2 years of age. This period is known as the golden age, where children experience rapid growth and development. After children are over 2 years old, it is necessary to pay attention to the fulfillment of nutritional intake because toddlers are susceptible to disease and nutritional problems.[3] Based on the explanation above, stunting conditions not only impact children's physical growth, but also affect children's mental development and long-term health.

## Method

The method used is a literature review to analyze literature from several sources. Reference sources come from Google Scholar, Pubmed, Science Direct, and the Public Health Journal from 2019-2024. The keywords used in the search are: stunting, body resistance, infection, and children. This article also uses secondary data on stunting incidents obtained from journals to show the relationship between risk factors and cases that occur.

## Results and Discussion

### Definition

According to the Ministry of Health of the Republic of Indonesia, stunting is a condition in which a child's height is lower than the standard set by WHO, caused by chronic malnutrition and other factors. Children who experience stunting show disturbances in cognitive development that can affect their ability to learn and adapt. Delayed cognitive development can increase the risk of infection, because children who do not develop optimally tend to have a weak immune system. The cause is being more susceptible to infectious diseases, such as

respiratory infections and diarrhea, which often occur in children with poor nutritional status. In this situation, the importance of appropriate nutritional interventions to increase children's resistance to infection becomes very clear. Efforts to prevent stunting by fulfilling nutrition during critical growth periods can strengthen children's immune systems and reduce the risk of infection later in life.[4] Therefore, understanding the relationship between stunting, cognitive development, and body resistance is very important in designing effective intervention strategies.

**Epidemiology**

In 2019, stunting became a global nutritional problem. As many as 149 million children, or 21.9% of the world's children, experienced stunting. According to the World Health Organization (WHO) report, in 2018 Indonesian Ministry of Health data,[5] Indonesia ranked second in the highest prevalence of stunting in Southeast Asia, with 30.8% of toddlers experiencing stunting. Until now, stunting in Indonesia is still a major concern because it can reduce the productivity of human resources in the future and increase the risk of disease in children. Stunting is a top priority that needs to be addressed so that Indonesia's development is not hampered by the increasing cases of stunting. In 2019, there were 27.7% of toddlers stunted in Indonesia. The 2018 Basic Health Research (Riskesdas) data recorded the highest prevalence of stunting in West Nusa Tenggara Province at 42.6%. Efforts continue to be made to reduce stunting rates, but major challenges remain, especially in terms of improving nutrition, sanitation, and access to health.

**The Effect of Stunting on the Immune System and Body Resistance**

Stunting, the result of chronic malnutrition, has a major impact on a child’s immune system and resistance to infection. Stunted children typically lack essential nutrients needed for optimal immune system development. According to studies on the impact of malnutrition on the immune system, stunted children have a weak immune response, making them susceptible to infection.[6] Effects of Stunting on the Immune System Deficiency of Essential Nutrients: Inadequate protein, iron, and other vitamins and minerals severely impact the function of immune cells, such as T and B cells, which play a role in fighting pathogens. Protein deficiency inhibits the synthesis of immune cells and antibodies, which are needed for the adaptive immune response. This makes it difficult for stunted children to fight infections, both viral and bacterial.

- Iron Deficiency: Iron deficiency is common in stunted children and negatively affects red blood cells and immune cells. Decreased iron levels can increase the risk of anemia, which directly affects the body's ability to fight infection. [6]
- Micronutrient Deficiencies: Deficiencies in vitamins A, C, and D can worsen a child's immune condition. Vitamin A is important for maintaining healthy mucosa that protects the body from disease. Vitamin C helps produce immune cells, while vitamin D regulates the immune response. Children who are stunted and deficient in micronutrients are more susceptible to respiratory infections and diarrhea. Disturbances in the intestinal system that occur due to stunting can reduce the body's ability to absorb nutrients and increase susceptibility to pathogens. Poor gut health worsens malnutrition in stunted children.[6] Research also shows that disruption of the gut microbiota due to stunting can affect the development of the immune system, which results in an increased risk of infection.
- Long-Term Impact: Stunting not only affects physical health and immunity in childhood, but can also have long-term consequences. Children who experience stunting are at high risk for future health problems, such as diabetes and heart disease related to a suboptimal immune system. [7]

Stunting has a direct impact on a child's immune system against infection. Children who experience stunting often have a suboptimal immune system, increasing the risk of infection. Therefore, it is important to ensure adequate nutritional intake, including essential minerals such as zinc, to increase a child's immunity. Adequate zinc plays an important role in supporting the growth of immune cells and the response to pathogens. Research by Purwandini and Atmaka found that children who get enough zinc have a lower risk of stunting and increased immunity to infection. Zinc plays a role in the development and function of T cells and the production of cytokines that are important for a proper immune response. [8]

In addition to Zinc, macronutrients such as protein, healthy fats, and complex carbohydrates also play an important role in supporting the immune system. Protein is needed for the synthesis of antibodies and immune cells. Healthy fats, especially omega-3 fatty acids, have anti-inflammatory effects that help improve the immune response. Complex carbohydrates are important for children's stamina and healthy metabolism to stay active. Research shows that interventions that increase zinc and other nutrient intakes in

children at risk of stunting can provide significant benefits. Providing zinc supplements and nutritional education can increase the consumption of foods rich in zinc and other nutrients to prevent stunting and improve children's health. [9,10]

**Long-Term Impacts of Stunting and Recurrent Infections**

Stunting has a major impact on a child's physical and cognitive development, and increases the risk of recurrent infections. Children who are stunted often suffer from malnutrition which affects their immune system. This makes them more susceptible to various infections. In addition to impacting health, stunting also has long-term consequences for cognitive development.

1. Impact on physical and cognitive development

   According to a systematic literature review by Rambe et al. [4] According to 2023 data, stunting has a negative impact on children's cognitive development. Children who experience stunting show lower performance in cognitive tasks, learning, memory, and fine motor skills. The decline in cognitive abilities is caused by the lack of essential nutritional intake during the critical period of brain development, especially in the first 1000 days of life. Deficiencies in nutrients such as protein, iron, and zinc affect the formation and function of brain cells, which have a direct impact on children's learning capacity. This study confirms that stunting is not only a physical problem, but also a major obstacle to children's intellectual potential. In the long term, this can reduce children's academic abilities and increase the risk of mental developmental delays that can continue into adulthood. [4]

2. Susceptibility to recurrent infections

   Children who are stunted are at higher risk of recurrent infections. Chronic malnutrition that causes stunting weakens the immune system, making it harder for children to fight off infections such as diarrhea and respiratory infections. Deficiencies in nutrients such as protein, zinc, and iron can affect the function of immune cells such as T and B cells that fight pathogens. [6] Children who are stunted often experience recurrent infections and malnutrition. Recurrent infections, especially in childhood, can worsen health by interfering with nutrient absorption, reducing appetite, and increasing metabolic demands. As a result, stunted children become increasingly susceptible to infections, which ultimately hinders their further development.

3. Risk of chronic disease

   Stunting and recurrent infections in childhood can increase the risk of chronic diseases in adulthood, such as diabetes, hypertension, and heart disease.[4] also emphasized that children who experience stunting are more likely to experience these diseases in the future, due to metabolic changes caused by chronic malnutrition and frequent recurrent infections.

4. Disorders of the gut and microbiota

   Stunting also affects digestive health, especially related to gut microbiota disorders. Disruption of gut microbiota balance affects the body's absorption of nutrients, which increases the risk of malnutrition and gastrointestinal infections such as diarrhea. [11]

## Conclusion

There is a significant relationship between stunting and resistance to infection. Children who experience stunting have an immature immune system, making them more susceptible to recurrent infections. The importance of proper nutritional intake, such as protein, zinc, and vitamins, is essential to support physical growth, and cognitive development, and increase resistance to infection. Consistent nutritional interventions are essential to address stunting and improve the health of children in Indonesia.

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