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Systematic Review: The Relationship Between Environmental Sanitation and the Incidence of Stunting

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Abstract

Stunting in children under five is a crucial public health issue in developing countries, including Indonesia. Poor environmental sanitation has been identified as a significant factor influencing the incidence of stunting. This study aims to review the latest literature linking environmental sanitation conditions with the prevalence of stunting. The method used in this research is a literature review, utilizing several research articles from the past five years obtained from various scientific journal sources. The type of study is an observational analytic survey with a case-control design. The research was conducted by comparing two groups: cases and controls. Based on the literature review, poor environmental sanitation, particularly access to clean water and adequate sanitation facilities, has a significant relationship with the high prevalence of stunting in children across various countries. Providing clean water, proper sanitation facilities, and hygiene education programs have been proven to reduce stunting rates. Improving access to environmental sanitation and hygiene is a critical step in reducing the prevalence of stunting. Sanitation interventions should be a priority in public health programs in developing countries.

Introduction

Stunting, or impaired growth, is a chronic nutritional issue that threatens the health and development of children under five in many developing countries, including Indonesia. This phenomenon is caused by prolonged malnutrition, which negatively impacts both the physical and cognitive growth of children. Stunting is not only rooted in inadequate nutritional intake but is also often associated with low socioeconomic factors. In communities with high poverty levels, unbalanced diets, and an inability to access nutritious food, the risk of stunting increases (Leocádio et al., 2021; Laksono et al., 2024). This condition is further exacerbated by a lack of education about proper nutrition, as well as cultural and dietary habits that do not support health. According to data from the World Health Organization (WHO), stunting is also closely related to the high prevalence of infections caused by an unclean living environment, including poor sanitation and limited access to clean water (Kamila & Salami, 2022; Syaputri et al., 2023; Raharini & Yuniarti, 2023; Wibasusanti et al., 2024).

Poor environmental sanitation is one of the main factors significantly affecting the nutritional status of children, especially in developing countries. Inadequate sanitation increases the risk of infections such as diarrhea, which is highly dangerous for children (Mebrahtom et al., 2022; Hailu et al., 2021; Alum et al., 2024). These infections not only cause dehydration and weight loss but also affect the absorption of essential nutrients for child growth and development. The impact of poor sanitation is serious, as it contributes to the high incidence of stunting, where

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children fail to reach the appropriate height for their age due to chronic malnutrition. A study by Gebru et al. (2019) found a clear link between poor sanitation and stunting, with children living in environments with inadequate sanitation being more prone to growth impairments.

Environmental sanitation plays a crucial role in preventing stunting in children under five, as stated in literature reviews and data obtained from the Indonesian Ministry of Health (Kemenkes). According to the 2018 Riskesdas data, the prevalence of stunting in children under five in Indonesia reached 30.8%, a figure well above the threshold set by the World Health Organization (WHO), which is 20%. This indicates that stunting is a serious public health issue requiring more attention from various parties. The Ministry of Health also emphasized that poor sanitation and lack of access to clean water are major contributing factors to the high stunting rates in Indonesia. Inadequate sanitation can trigger various infectious diseases that potentially disrupt child growth and development, with long-term negative effects (Okesanya et al., 2024; Rhue et al., 2023; Finlay et al., 2021).

The 2021 Ministry of Health report noted that 24.1% of households in Indonesia still lack access to adequate sanitation, and 6.7% of households still practice open defecation. This condition increases the risk of diarrheal infections and other infectious diseases, directly contributing to stunting incidents (Bagamian et al., 2023; Dimitrova et al., 2023; Girma et al., 2024; Nasrin et al., 2021). Based on this data, there is a strong correlation between areas with poor sanitation access and high stunting prevalence. Moreover, the 2021 Indonesian Toddler Nutrition Status Survey (SSGBI) reported that the stunting prevalence in some provinces with inadequate sanitation, such as East Nusa Tenggara (NTT), reached 37.8%, showing a connection between poor sanitation and high stunting rates.

Riskesdas 2018 data shows that the incidence of diarrhea in children in Indonesia remains high, with a rate of 11.1% among toddlers. This figure reflects the serious challenges in preventing stunting, as diarrhea is one of the leading causes of the condition. When children experience recurrent diarrhea, their risk of stunting increases significantly, as their bodies cannot absorb the nutrients needed for optimal growth. Therefore, improving sanitation at home not only impacts short-term health but also contributes to improving the quality of life and potential of future generations (Momberg et al., 2022; Ross et al., 2021). By increasing access to and the quality of sanitation, we can reduce stunting prevalence and provide a better future for Indonesian children.

Additionally, exclusive breastfeeding, basic health practices such as handwashing with soap, and maternal nutritional knowledge are crucial in preventing stunting. The 2021 Ministry of Health report noted that exclusive breastfeeding in Indonesia has only reached 61.33%, still below the national target of 80%. Exclusive breastfeeding plays a role in preventing malnutrition and supporting optimal child growth, which is one effort to reduce stunting prevalence.

In addition to sanitation factors, the Ministry of Health also highlights that socioeconomic factors such as economic status, family size, and a history of Low Birth Weight (LBW) contribute to stunting incidence. Riskesdas (2018) data shows that children from low-income families are at higher risk of stunting compared to those from higher-income families.

Methods

This study utilizes methods drawn from various research articles published in the last five years, sourced from a wide range of reputable scientific journals. The type of research is an observational analytic survey with a case-control design, where the study compares two groups: the case group experiencing stunting and the control group not experiencing stunting. The literature search was conducted systematically by selecting relevant articles that discuss the relationship between sanitation and the prevalence of stunting in children. At this stage, the

research aims to examine in depth how sanitation conditions can affect children's health and contribute to the problem of stunting.

The collected data were then thoroughly analyzed to identify trends and relevant findings regarding sanitation interventions and their impact on stunting prevalence. Through this analysis, researchers aim to identify key factors in sanitation that contribute to reducing stunting rates among children. The results of this analysis are expected to provide deeper insights into the importance of effective and sustainable sanitation interventions as part of efforts to prevent stunting. Additionally, this research is expected to serve as a foundation for better public policy-making in addressing sanitation and nutrition issues in society, as well as inspire intervention programs that can improve children's overall health.

Result and Discussion

The study conducted by Gebru et al. (2019) revealed a significant relationship between poor sanitation conditions and the high prevalence of stunting in Ethiopia. The research found that children living in environments with limited access to clean water have a higher risk of experiencing stunting. This highlights the importance of good sanitation in preventing growth problems in children. Stunting, which leads to impaired physical growth and cognitive development, is more prevalent in areas with poor sanitation and inadequate clean water facilities. Furthermore, chronic diarrhea frequently experienced by children in poor sanitation environments is a major factor that worsens stunting. This disease leads to nutrient malabsorption, where the body is unable to absorb essential nutrients optimally. As a result, children exposed to prolonged diarrhea suffer from malnutrition, contributing to stunting. Therefore, improving sanitation and access to clean water is crucial in reducing stunting prevalence and enhancing the health and well-being of children in Ethiopia.

Research by Rah et al. (2020) in South Asia revealed that improving access to adequate sanitation can significantly reduce stunting rates by up to 15%. Proper sanitation includes providing adequate toilet facilities and access to clean water, as well as implementing consistent personal hygiene programs. Adequate sanitation facilities are essential in creating a clean environment, preventing exposure to germs and bacteria that cause infections. Better access to sanitation not only improves environmental health but also plays a role in improving the quality of life, especially for children in vulnerable areas. Additionally, good sanitation is directly linked to the prevention of intestinal infections, which are often the leading cause of malnutrition in children. Intestinal infections can disrupt the absorption of nutrients necessary for optimal growth, making children in poor sanitation conditions more prone to stunting.

Access to clean water is a key element in environmental sanitation that has a significant impact on public health, especially for children. Adequate and quality clean water availability is a major factor in preventing various waterborne diseases, such as diarrhea and worm infections. In areas with sufficient access to clean water, the risk of transmitting these diseases can be reduced, allowing communities to live healthier lives. Thus, clean water plays a crucial role in creating a healthy environment and supporting a better quality of life.

Moreover, access to clean water also influences children's growth and development. A study by Arifin et al. (2021) in Indonesia showed that regions with good access to clean water tend to have lower stunting prevalence compared to areas that rely on contaminated water sources. Clean water not only prevents infections that can hinder nutrient absorption but also supports overall health, which is vital for children's development. Therefore, providing access to clean water is a priority in efforts to improve children's health and well-being, as well as the overall welfare of communities.

Sanitation interventions have always proven to play a major role in lowering the prevalence of stunting especially in resource-restrained environments. As Sari et al. (2020) emphasize, the efforts targeting access to clean water, development of adequate sanitation infrastructure, and

encouraging of personal hygiene measures, in particular frequent handwashing with soap have played a role in quantifiable reductions in stunting among children in rural Indonesia. Though these results do confirm the significance of environmental sanitation, they also imply that such initiatives cannot operate independently; sustainability and behavioral change is a critical aspect of the long-term effect. Thus, the comprehensive approach of the public health programs should be concerned with the proper infrastructure provision as well as community involvement, education, and monitoring tools that would help to make sure that the gains in sanitation can be translated into the permanent elimination of stunting.

The study by Ferdian & Wikarta (2023) showed that investment in improving sanitation infrastructure and access to clean water in developing countries has a significant impact on reducing stunting rates. Improving sanitation infrastructure not only prevents the spread of infectious diseases but also plays an important role in creating a healthier environment, especially for children. Clean water and adequate sanitation help reduce the risk of exposure to pathogens that often affect children's immune systems, thereby improving overall health and preventing growth disorders such as stunting. With the availability of adequate sanitation facilities, the risk of infections that often affect children's nutritional status can be minimized. A clean and hygienic environment reduces the likelihood of diarrhea or other waterborne infections.

The results of the review show that poor environmental sanitation has a significant impact on the high prevalence of stunting. Unsanitary environments, particularly those related to access to clean water and sanitation facilities, have been proven to increase the risk of stunting in children. According to the research by Gebru et al. (2019), children living in environments with limited access to clean water are more likely to experience stunting. This condition is caused by the lack of access to clean water, which is essential for maintaining personal hygiene and preventing the spread of diseases. Poor sanitation triggers various health problems, especially gastrointestinal infections directly related to nutrient absorption.

According to the 2021 report by the Ministry of Health (Kemenkes), a long-standing issue with the Indonesian public health situation is the lack of access to proper sanitation (24.1% of households) and the continued practice of open defecation (6.7%). These circumstances are not only infrastructural shortcomings but systemic hazards which have a disproportionate impact on the wellbeing of children. Defecation and lack of sanitation encourage spread of infectious diseases like diarrhea which when frequent causes nutrient to be absorbed and directly leads to malnutrition. In the long-run, this chronic nutritional deficiency turns out to be a major cause of stunting. So, the issues of sanitation and access to clean water should be perceived not as auxiliary but as a basic intervention in the field of public health. Unless significant changes are made in these aspects, any attempts to curb the prevalence of stunting are likely to be limited, because the environment determinants of child health still go around causing disease and malnourishment cycles.

Table 1. Reviewed Article Results

No.	Research Tittle	Method	Variable	Result
1.	Author: Samuel Marganda, Deli Syaputri, Teddy Bambang, Nelson Tanhjung, Risnawati, Adisyah Putra (2023)	*Case Control*	1. Clean Water 2. Household food hygiene and sanitation	There is an effect of clean water sanitation (p=0.002, OR=2.764) and household food hygiene and sanitation (p=0.004, OR=2.562) on stunting in toddlers

	Impact of Clean Water Facilities and Household Food Hygiene on Stunting in Toddlers			
2.	Aurhor: Siti Novianti, Agus Nurjaman (2022) Relationship Between Environmental Factors and Diarrhea History on Stunting in Children Aged 6-23 Months	*Case Control*	1. Education 2. Occupation 3. Income 4. Diarrhea history 5. Access to sanitation 6. Access to drinking water 7. Diarrhea history	There is a relationship between diarrhea history, access to sanitation, and access to drinking water with the incidence of stunting in children aged 6-23 months
3.	Author: Aimmatus Shofifah, Lilis Sulistyorini, Sarva Mangala Praveena (2022) Home Environmental Sanitation and Infectious Disease History as Regional Risk Factors for Stunting in Toddlers in Drokilo Village, Kedungadem District, Bojonegoro	*Case Control*	1. Gender 2. Age 3. Home environmental sanitation 4. Infectious disease history	|There is a significant relationship between home environmental sanitation and infectious disease history with the incidence of stunting in toddlers in Drokilo Village, Kedungadem District, Bojonegoro Regency
4.	Author Aimmatus Shofifah, Lilis Sulistyorini, Sarva Mangala Praveena (2022) Home Environmental Sanitation and Infectious Disease History as Regional Risk Factors for Stunting in Toddlers in Drokilo Village,	*Case Control*	1. Gender 2. Age 3. Home environmental sanitation 4. Infectious disease history	There is a significant relationship between home environmental sanitation and infectious disease history with the incidence of stunting in toddlers in Drokilo Village, Kedungadem District, Bojonegoro Regency

	Kedungadem District, Bojonegoro			
5.	Author: Rasyika Nurul Fadjriah, Rusdianto Rusdianto, Herman Herman, Vidyanto Vidyanto (2021) Factors Related to Stunting in Toddlers in the Working Area of Tikson Raya Health Center	*Case Control*	1. Exclusive breastfeeding 2. Infectious diseases 3. Basic health behavior 4. Environmental sanitation 5. Maternal nutrition knowledge	Exclusive breastfeeding, infectious diseases, basic health behavior, environmental sanitation, and maternal nutrition knowledge are related to the incidence of stunting in toddlers in the working area of Tikson Raya Health Center, Banggai Laut Regency.
6.	Author: Joko Sugiyant, Setyo Sri Raharjo, Yulia Lanti Retno Dewi (2019) Impact of Exclusive Breastfeeding and Contextual Factors on Stunting Villages in Bontang, East Kalimantan, Indonesia	*Case Control*	1. Child's age 2. Nutritional status 3. Maternal education 4. Maternal height 5. Exclusive breastfeeding 6. Economic status 7. Number of family members 8. Infectious disease history 9. Environmental sanitation 10. History of LBW birth	There is a relationship between exclusive breastfeeding, economic status, number of family members, infectious disease history, environmental sanitation, and LBW birth history with the incidence of stunting in Bontang, East Kalimantan, Indonesia

The results of the literature review in this study clearly show that environmental sanitation has a significant relationship with the incidence of stunting in children. An environment that does not support hygiene, especially one with limited access to basic sanitation facilities such as toilets and clean water, is proven to increase the risk of stunting. Stunting, a chronic growth disorder affecting children's physical and cognitive development, is commonly found in environments with poor sanitation. This occurs because poor sanitation increases children's exposure to various infections, particularly intestinal infections like diarrhea, which directly impacts the body's ability to absorb nutrients optimally. This condition is exacerbated by the lack of access to clean water needed for hygiene and disease prevention. Therefore, improving environmental sanitation is one of the key steps in efforts to reduce the prevalence of stunting in communities.

It is important to note that poor sanitation, such as limited access to clean water and lack of toilet facilities, leads to an increase in gastrointestinal infections. These infections, especially diarrhea, frequently recur in children living in areas with inadequate sanitation, which in turn causes malabsorption of nutrients. When the body cannot absorb essential nutrients, children become vulnerable to malnutrition, which is a major factor contributing to stunting (Ali, 2021; Kiani et al., 2022; Febriani et al., 2022). Therefore, increasing access to clean water and basic sanitation facilities, along with education on the importance of hygiene, becomes a fundamental step in stunting prevention efforts. Targeted interventions should include education on the importance of handwashing with soap and the consistent application of clean living behaviors within the family environment.

In addition to the direct impact on health, poor sanitation also affects the overall quality of life in society. In communities with adequate access to sanitation and clean water, the risk of spreading infectious diseases such as diarrhea and worm infections can be reduced (Brown et al., 2013; Echazú et a., 2015; Omarova et al., 2018). The reduction in the incidence of these diseases contributes to the improvement of children's nutritional status, thereby reducing the risk of stunting. Efforts to improve environmental sanitation must also be carried out sustainably, involving various parties, from the government, and communities, to non-governmental organizations, to provide adequate infrastructure, particularly in areas prone to stunting. This approach must be accompanied by ongoing educational programs on the importance of sanitation and personal hygiene to prevent various infections that could lead to malnutrition.

To tackle the problem of stunting related to environmental sanitation, comprehensive measures are needed that include improving sanitation infrastructure and health intervention programs. The provision of adequate sanitation facilities, the construction of clean water access, and structured hygiene programs must be prioritized in public health policies. Moreover, programs to prevent intestinal infections must be expanded, including community education on the importance of maintaining environmental cleanliness and adopting clean living behaviors. The government should also extend sanitation improvement programs to underdeveloped rural and urban areas where stunting prevalence is still high. By improving environmental sanitation, it is hoped that not only the stunting rate will be reduced, but also the overall quality of life in society can be enhanced.

The concluding research findings reiterate the fact that environmental sanitation is crucial in preventing childhood stunting. The permanent connection between low standards of sanitation and a high level of stunting shows that it is not just a personal lifestyle problem, but a systemic health problem of society. Although, in past studies, there is a consistent affirmation that, increased access to clean water and good sanitation amenities drastically reduce the levels of stunting, these interventions are not usually equally effective because of the distinction in infrastructure, resources distribution, and the education levels of the general population. This shows that the stunting issue is not a problem that can be solved by isolated improvements but an issue that needs strategic solutions that integrates the development of infrastructures and behavioral change campaigns.

Government efforts should not be restricted to the rhetoric of policies but should be translated in sustainable programs to provide equitable access to clean water, hygienic toilets and health education programmes to communities. Meanwhile, citizen involvement will be critical to developing hygiene culture and conducting institutions to service provision. This kind of two-tier response: systemic investment and grassroots activation not only enhances the work to lower the occurrence of stunting but also creates the possibility of additional positive impacts on the whole population, such as lowering the prevalence of infectious diseases and increasing livelihoods.

Conclusion

The results of this analysis indicate that several crucial factors contribute to the incidence of stunting, including poor environmental sanitation, access to clean water, diarrhea history, and the socioeconomic conditions of the community. Inadequate sanitation increases the risk of infection and disease, especially in vulnerable children, which in turn can hinder their physical growth and mental development. Moreover, access to clean water is essential for maintaining health and preventing disease. The inability to obtain clean and safe drinking water is often the main cause of diarrhea, which is one of the primary risk factors for stunting. Low socioeconomic conditions also play a significant role in creating a poverty cycle that hinders families from providing proper nutrition to their children, thus increasing the risk of stunting.

To address this issue, efforts to improve sanitation, access to clean water, and exclusive breastfeeding should be top priorities. In addition, increasing maternal nutrition knowledge is also crucial to ensuring that children receive the necessary nutrients for optimal growth. Synergy between the government, community, and relevant institutions is needed to create an environment that supports children's growth. The government can take strategic steps in improving sanitation infrastructure and providing clean water, while communities and related institutions can actively participate in outreach on the importance of nutrition and health. With good collaboration, it is hoped that the prevalence of stunting can be significantly reduced, creating a healthier and more productive generation in the future.

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