

ENVIRONMENTAL SANITATION AT HOME AND HISTORY OF INFECTION DISEASES AS RISK FACTORS FOR STUNTING IN TODDLERS IN DROKILO VILLAGE, KEDUNGADEM DISTRICT, BOJONEGORO REGENCY

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Abstract

Introduction: Stunting is one of the nutritional issues that becomes the triple burden of malnutrition and affects the world, especially in almost every nation. Indonesia is listed as the third country with the greatest stunting prevalence in the Southeast Asia/South-East Asia Regional (SEAR) areas. This study aimed to examine the connections between stunting incidence a history of infectious diseases, as well as the connections between toddlers who experience stunting events a history of infectious diseases among toddlers in Drokilo Village. **Methods:** This study used a case-control research design and an analytical observational approach. It involved 51 toddlers samples and included dependent variables i.e., stunting incidence and independent variables i.e., environmental sanitation at home and a history of infectious diseases. Bivariate analysis was utilized together with Chi-square test to examine the variables. **Results and Discussion:** Male toddlers over the age of two years frequently experienced stunting. With a p-value of 0.046, environmental sanitation at home was associated with a lower stunting incidence. With a p-value of 0.037, a history of infectious diseases was associated with higher stunting incidence. **Conclusion:** Environmental sanitation at home a history of infectious diseases had significant relationships with stunting incidence in toddlers. In short, these two factors may cause stunting in toddlers in Drokilo Village, Kedungadem District, Bojonegoro Regency.

INTRODUCTION

Stunting is a malnutrition experienced by a fetus in the womb as a result of reduced nutritional intake for a long period and unmet nutritional needs (1). There are as many as 151 million stunted children in the world under the age of five years, and 55% of the child population in Asia were stunted as well. According to the Study of the Nutritional Status of Toddlers in Indonesia (SSGBI) in 2019, the prevalence rate of stunting in Indonesia was still quite high at 27.67% when compared to that in Southeast Asia at 24.7%. The World Health Organization (WHO) collected data on the prevalence of stunting in toddlers between 2013 and 2017. From the data collection, based on the Southeast Asia/South-East Asia Regional (SEAR) ranking, Indonesia was the

third country with the highest prevalence of stunting (2). Thus, stunting is a major nutritional concern that become a priority to solve for the government and the Indonesian. According to the Nutrition Status Monitoring in 2015-2017, the number of toddlers with stunting cases was more than with malnutrition, underweight, and obesity.

The Regulation of Indonesian Minister of Health No. 2 of 2020 about Child Anthropometry Standards Stipulates the anthropometric standards are commonly used to assess stunting in children. In the standards, the Z-score limit is used to measure PB/U or TB/U; if a value of standard deviation reaches -3 SD and -2 SD, it is considered a short child. In addition, a value of -3 SD means a very short child (3). Stunting may be a direct, indirect, or underlying effect of several health

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reasons. Some direct causes of stunting include irregular feeding habits, non-diverse food consumption by infants and toddlers aged 6 to 23 months, diseases such as diarrhea, and inadequate basic vaccines. Meanwhile, indirect causes of stunting are population's food insecurity, the lack of monitoring of toddlers' growth, and the poor hygienic residential. Additionally, poverty, low educational background, and understanding of parents about child health are other causes of stunting (2,4).

The length of time spent for formal education does not guarantee sufficiency of knowledge and awareness of child nutritional and food needs. Knowledge is obtained not only from formal education, but also counseling or socialization from community health centers or parties related to child health. Currently, access to information is very easy with the advancement of technology. Despite having a low education degree, mothers still have a chance to increase their knowledge about the needs of toddlers and themselves from various media (5).

Stunting is a serious health issue that, if not addressed right now, will result in debilitating conditions and deaths. Short-term effects of stunting include sluggish cognitive development, poor physical growth, and metabolic abnormalities (6). Stunting may have long-term effects as well such as a decline in reproductive health, a rise in obesity incidence, and an increase in the prevalence of different diseases, such as other non-communicable diseases. Previous studies on stunting conducted in Indonesia address some contributing factors to stunting such as the use of toilet facilities, latrine cleanliness, types of latrines, open defecation behavior, absence of septic tank installment in latrines, and dumping of toddler feces outside of latrines.

Children who experience long-term nutritional problems, specifically an insufficient intake of nutrients, can develop stunting, which limits their growth. Based on the guidelines outlined in the Regulation of Indonesian Ministry of Health Number 2 of 2020, stunting is also referred to as undernutrition, a nutritional state determined by a child's height index for age (TB/U) with a z-score of less than -2 SD (standard deviation). Stunting offers a significant risk because it not only hinders child growth physically but also make children more susceptible to illness, impair their intelligence, and slow down the growth of their brain. One of the primary strategies being employed to speed up the eradication of stunting is expanding access to clean water and excellent environmental sanitation (7).

Environmental sanitation is the main key to determining the level of human health. Human health degree is influenced by the contaminated drinking

water sources, the quality of the community's living environment, and various possibilities to develop diseases. Environmental sanitation gives negative impacts on aspects of life if it is not considered and maintained properly.

Housing is a group of houses that are used as a place to live and are equipped with various kinds of facilities such as the provision of drinking water, waste disposal, electricity, and other facilities. Building and maintaining house cleanliness are considered able to reduce the risk of stunting. For the criteria for a simple healthy house, it has a land area of between 60-90 square meters, equipped with bedroom facilities, bathrooms, sewerage (latrines), and kitchens, a building area between 21-36 square meters, tiled floors in each room, plastered walls, and ceilings (8). Stunting can be avoided in several ways, such as by ensuring that pregnant women and young children receive the appropriate nutrition from the time they are conceived; balancing exclusive breastfeeding with wholesome complementary foods; continuing to breastfeed the baby up to six months old; constantly monitoring children's growth and development; and maintaining a clean environment.

Numerous illnesses, particularly which are triggered by the environment, emerge due to poor environmental cleanliness in surroundings. Infectious diseases are prevalent in various places. Hence, it is necessary for mothers to strengthen toddler's immune system as toddlers are still at a very susceptible age to disease.

An infectious disease can easily strike both two-year-old babies and toddlers. Vomiting, nausea, and diarrhea are the most common symptoms of infectious diseases as a result of poor nutrition intake. When toddlers do not receive appropriate nutrition, the feeding style may have an adverse effect on the child's growth and development.

Based on the aforementioned issues, this current study aimed to investigate the relationships between environmental sanitation at home, a history of infectious diseases, and risk of infectious diseases with stunting incidence in toddlers.

METHODS

This current study used an analytical or observational approach with a case-control research design. All stunted toddlers in Drokilo Village recorded in February 2022 were selected as the population. In this study, we used two sample groups: case group and control group. Sampling of the control group was carried out after the case group was sampled. The case group

that met the inclusion criteria were then matched to the control group with a ratio of 1: 2 (17 toddlers in the case group and 34 toddlers in the control group). The total sample of this study was 51 toddlers. The dependent variable was the prevalence of stunting in toddlers, while the independent variables involved environmental sanitation at home, a history of infectious diseases, and risk of infectious diseases. Primary methods of data collection in this study were observation, direct measurement, and questionnaire-based interviews. The interview was conducted using a valid and reliable survey version 2018 from the Basic Health Research, which was developed in previous research in the work areas of the Sumberjambe, Kasiyan, and Sumberbaru Primary Healthcare Center of Jember Regency. Bivariate analysis and the Chi-square test were used to analyze the data. Results will show an association if the test yields a p-value of less than or equal to 0.05. This study was emphasized to measure the amount of risk related to the independent variables based on the values of odds ratios (OR) obtained (9).

RESULTS

Characteristics of Respondents

According to Table 1, male toddlers were more likely to experience stunting than female toddlers. Stunting is also most common in toddlers between the ages of 24 and 59 months and at the age of older than two years.

Table 1. Frequency Distribution of Toddlers' Characteristics

Toddlers' Characteristics	Height per Age (TB/U)				Total	
	Stunted		Not Stunted		n	%
	n	%	n	%		
Gender						
Man	9	52.9	15	44.1	24	47.1
Woman	8	47.1	19	55.9	27	52.9
Total	17	100.0	34	100.0	51	100.0
Age						
0-23 months	3	17.6	7	20.6	10	19.6
24-59 months	14	82.4	27	79.4	41	80.6
Total	17	100.0	34	100.0	51	100.0

The Relationship between Environmental Sanitation at Home and Stunting Incidence

The Chi-square test showed a p-value of 0.046 (see Table 2). It means that environmental sanitation was associated with the prevalence of stunting in toddlers. Toddlers living in families with poor environmental sanitation at home had a 5.9 times higher risk of stunting

than with adequate environmental sanitation (OR = 5.921).

Table 2. Relationship between Environmental Sanitation at Home and Stunting Incidence

Environmental Sanitation at Home	TB/U				Total		p-values
	Stunted		Not Stunted		n	%	
	n	%	n	%			
Not healthy	15	88.2	19	55.9	34	66.7	0.046
Healthy	2	11.8	15	44.1	17	33.3	
Total	17	100.0	34	100.0	51	100.0	

Odds Ratio = 5.921

In this study, as many as 66.7% of respondents owned houses that did not meet proper sanitation criteria in terms of house materials. For example, most of their houses were not equipped with ceilings; the walls of the house were made of wood; the houses had earthen floors, and their vents were installed in less than 10% of the house area. Most of the clean water sources in Drokilo Village were already available to fulfill the community's needs. Only 5.9% of the houses did not have clean water facilities. The water came from groundwater taken through jet pumps. The houses usually had individual clean water sources, which were not shared with other households. Good quality water must be odorless, tasteless, and not cloudy/colorless. Almost all houses already had qualified latrines because Drokilo Village had already become an ODF village since 2015. However, the waste management in the village appeared to be problematic as many respondents threw garbage including diapers into rivers and dumped wastewater to stagnant open sewers. When viewed from occupants' behavior, many respondents did not used to opening the windows of their family rooms or the windows of the common rooms every day. Besides, most of the respondents did not dispose feces from diapers to latrines before throwing the diapers into the trash cans.

The Relationship between Infectious Diseases and Stunting Incidence

The Chi-square test showed a p-value of 0.037 (see Table 3). This indicates that a history of infectious diseases was related to stunting incidence in toddlers. Toddlers who never suffered from an infectious disease were 4.6 times more likely to experience stunting than those who did. In Drokilo Village, diarrhea was the most common infectious disease that struck toddlers (45.5%). Effects of contagious disease lasts for a long period and frequently—more than six times in the previous year.

Table 3. Relationship between History of Infectious Diseases and Stunting Incidence

Infectious Diseases	TB/U				Total		p-values
	Stunted		Not Stunted		n	%	
	n	%	n	%			
Exist	13	76.5	14	41.2	27	52.9	0.037
Not Exist	14	23.5	20	58.8	24	47.1	
Total	17	100.0	34	100.0	51	100.0	

Odds Ratio = 4.643

The Relationship between Environmental Sanitation and Risk of Infectious Diseases

As shown in Table 4, this study also found a correlation between environmental sanitation at home and a history of infectious diseases in toddlers (p = 0.037). Toddlers living in unhealthy households could be 4.4 times higher at risk of developing infectious diseases than in healthy homes.

Table 4. Relationship between Environmental Sanitation at Home and Risk of Infectious Diseases

Environmental Sanitation at Home	State of Infectious Diseases				Total		p-values
	There is an Infectious Disease		No Infectious Disease		n	%	
	n	%	n	%			
Unhealthy House	22	81.5	12	50.0	34	66.7	0.037
Healthy House	5	18.5	12	50.0	17	33.3	
Total	27	100.0	24	100.0	51	100.0	

Odds Ratio = 4.400

DISCUSSION

The toddlers' characteristics found in this study are similar to previous research. For example, a study conducted in Majalengka Regency showed no relationship between the sex of children and stunting incidence, but male children had a double risk of stunting compared to female children (10). Growth and development of male children are easily disrupted due to psychological factors, such as understanding, control of expression, and various other emotions. Such psychological states may be affected by the environment and affection the child receives (11). In South Bangka region, research showed gender was not one of the causes of stunting in toddlers. However, nutritional intake primarily contributes to stunting. Both male and female sex also may contribute to stunting if children do not get sufficient nutritional and protein intake during their growth period (12). At the ages of one and two year, the child's growth and development happen very quickly. If babies consume sufficient nutrients at that age, stunting will not appear until they are over two years old where the adverse effects of bad nutrition intake are more visible. Stunting frequently happens in toddlers at

an early age and develops more severely as they are older. In contrast to this current study, previous research in the Kepanjen Primary Healthcare Center in Malang Regency claimed that stunting predominantly affected toddlers at a young age, but the age did not contribute to increased prevalence of stunting. In other words, stunting can occur at any age (13).

Environmental sanitation at home is one of the causes of stunting in toddlers. In the work area of the Kerkap Primary Healthcare Center in North Bengkulu Regency, environmental sanitation was found to be correlate with stunting occurrences (p = 0.008; OR = 3.8). With the OR value obtained, the previous research indicated that mothers living at houses with inadequate environmental sanitation were 3.8 times more likely to have children with risk of stunting (14). Floor type used at houses was related to the incidence of diarrhea in toddlers (p = 0.004; OR = 5.614) (15). In relation to stunting incidence, previous research examined clean water facilities, family latrines, handwashing facilities with soap, liquid waste management facilities, and solid waste management facilities. All variables obtained p-values of > 0.05, indicating that sanitation facilities had a significant relationship with stunting incidence in toddlers (16).

Meanwhile, previous research in Nagari Balingka, Agam Regency revealed different findings that there was no correlation between environmental sanitation and the prevalence of stunting in children under five. The respondents whose houses had poor environmental sanitation had 30.4% of stunting prevalence, while those with the opposite condition had 51.7%. The households took water from wells for drinking although the water was not very clear. Drinking the well water is still safe when it is boiled first (17). Poor environmental sanitation occurs not only in Indonesia but also other parts of the world like in Bangladesh where latrine facilities were lacking and turned out causing decreased nutritional status of children such as stunting and wasting. In Bangladesh, 12.4% of people carried out open defecation due to inaccessibility to sanitary facilities (18). Clean and healthy lifestyle of the family members could avoid stunting. Thus, it is necessary for each individual to improve their knowledge about the importance of personal hygiene. Besides, maintaining environmental and food hygiene can prevent the emergence of various diseases, especially in children (19).

Moreover, this current study found a history of infectious infections was correlated with stunting incidence in children aged 12-59 months. Children with a history of infectious infections had a 3.2 times higher risk of stunting (p = 0.000; OR = 3.236). As many as

29.4% of children suffered from an infectious disease for a prolonged period and even almost developed stunting. Stunted children with additional infectious diseases will also likely fail to progress growth and development properly (20). Toddlers who are confirmed to be stunted are considered having serious nutritional problems because they may experience several side effects due to their malnutrition status. The short-term effects may include slow cognitive growth, physical growth failure, and metabolic disorders, and the long-term effect is until adulthood. Stunting can also result in decreased reproductive health, increased risk of obesity, and increased risk of non-communicable diseases.

Poor nutrition intake will worsen the condition of toddlers who had health complaints due to infectious diseases (21). The long-term complaints may decrease child's weight (22). Chronic infectious illnesses and chronic malnutrition, which persistently start to spread, are the more dangerous causes of stunting. However, mothers can prevent the effects of the diseases by applying proper diets for their babies to increase TNF, IL-1 (particularly IL-1) and IL-6, three pro-inflammatory cytokines produced as the body's defense system. These cytokines can decrease endochondral preference, which in turn slows down chondrocyte proliferation and inhibits growth. When child's immune system becomes weak due to inadequate intake of exclusive breast milk, the child is going to be susceptible to infectious diseases. Eventually, this condition also affects the child's body strength at the growth and development stages (23).

Having infectious diseases such as diarrhea, ARI, helminthiasis, and pulmonary tuberculosis will give impacts on the absorption of nutrients in the child's digestion and may interrupt the child's development and growth period (24–25). Even worse, improper nutrition intake may lead to digestive tract disorders as babies develop infectious diseases which influence their appetite (26).

Trash and wastewater management must be carefully examined to avoid infectious disease. For example, households need to distinguish wet waste and dry waste and group them based on organic waste and inorganic waste. Every trash bin they have must be covered to avoid the spread of disease vectors. The sewerage can be set up using a pipe or culvert in a closed state. Some disease vectors, which possibly grow in waste dump places, are flies, mosquitoes, rats, cats, and others. While poor waste management, otherwise, interferes with the environmental sanitation at home (27).

Environmental sanitation also deals with people's behavior. Research conducted in Pasuruan Regency found a substantial correlation between smoking behavior at home and the incidence of stunting in toddlers. Numerous dangerous compounds in cigarettes can pollute goods at home. Smoking can interfere with a woman's ability of pregnant at a young age and the child's development. For example, it may cause premature birth and low birth weight, which become risk factors for stunting (28).

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CONCLUSION

Stunting incidence and environmental sanitation at home were significantly correlated (OR = 5.921). Poor environmental sanitation at home in terms of house materials, home sanitation facilities, and family members' behavior can result in risk of infectious diseases in toddlers. Besides, a history of infectious diseases had a substantial association with stunting incidence (OR = 4.643). Environmental sanitation at home posited a significant association with the risk of infectious diseases (OR = 4.400). Environments where children live should always be clean, and parents should always practice clean and healthy lifestyle to keep their children healthy and prevent them from contact with various illnesses

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