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THE RELATIONSHIP BETWEEN FAMILY HYGIENE PRACTICES AMONG FISHING HOUSEHOLDS AND STUNTING AMONG UNDER-FIVE CHILDREN IN PADANG SEURAHET VILLAGE

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Abstract

Stunting remains a major public health problem in Indonesia, particularly in coastal areas where family sanitation and hygiene conditions are inadequate. Padang Seuraheut Village, Johan Pahlawan Subdistrict, West Aceh, is a coastal area predominantly inhabited by fishing families with limited environmental sanitation, restricted access to clean water, and suboptimal hygiene practices. This study aimed to analyze the relationship between family hygiene practices and the incidence of stunting among under-five children in the village. This study employed a quantitative approach with a cross-sectional design and was conducted from August to December 2025. The study population comprised all children aged 12–59 months totaling 1,442, with a sample of 94 children selected using simple random sampling. Data on family hygiene practices were collected through mothers as respondents using questionnaires and observation checklists. Data were analyzed using the Chi-Square test. The results showed that all hygiene and sanitation variables were significantly associated with the incidence of stunting ($p < 0.05$). Poor handwashing practices with soap were strongly associated with stunting (100%), as were inadequate latrine conditions (75.0%), unhygienic food storage and preparation (76.6%), and improper waste and wastewater disposal (73.1%). These findings indicate that family hygiene practices and environmental sanitation play a substantial role in increasing the risk of stunting among under-five children. Improvements in sanitation facilities, family hygiene education, and community-based interventions in coastal areas should be prioritized as strategic measures for stunting prevention.

Keywords: family hygiene, sanitation, stunting, under-five children, fishermen families

INTRODUCTION

Health development is a fundamental foundation for creating a healthy, intelligent, and productive generation. One of the most serious public health challenges still faced by Indonesia is stunting, a condition of growth failure among under-five children caused by chronic malnutrition and recurrent infections, characterized by height-for-age below the standard. Stunting not only affects children's physical growth but also impairs cognitive development, intelligence, and future productivity. Therefore, stunting is considered an important indicator for assessing the quality of human resources in a country (Hariyana, 2019). Various efforts have been implemented by the Indonesian government to reduce stunting prevalence through both nutrition-specific and nutrition-sensitive interventions. The Indonesian Nutrition Status Survey (SSGI) in 2022 reported a national decline in stunting prevalence from 24.4% in 2021 to 21.6% in 2022. However, this figure remains above the maximum threshold set by the World Health Organization (WHO), which is 20%. Moreover, SSGI data revealed an increase in underweight and wasting cases, indicating that nutritional problems among under-five children remain complex and require comprehensive management (Ministry of Health of the Republic of Indonesia, 2022). At the provincial level, Aceh is categorized as having a high prevalence of stunting. The 2022 SSGI reported that the stunting prevalence in Aceh reached 31.2%, placing it as the fifth highest province nationally. This highlights that stunting in Aceh remains a major public health issue that requires serious and sustained interventions, particularly in high-risk areas. In 2022, West Aceh Regency became one of the priority areas for stunting reduction in Aceh Province. According to SSGI data, the prevalence of stunting in this regency reached 27.4%, indicating that stunting continues to be a serious public health problem. Additional data from the West Aceh Stunting Reduction Task Force in August 2024 recorded 152 stunted children

across 12 subdistricts. Among these, Johan Pahlawan Subdistrict reported the highest number of cases, with 92 cases out of 2,679 under-five children, followed by Sama Tiga Subdistrict with 28 cases out of 1,123 children, and Bubon Subdistrict with 20 cases out of 515 children. These figures demonstrate that despite ongoing efforts, stunting remains a significant health concern, particularly in areas with relatively high case numbers. Johan Pahlawan Subdistrict contributes the largest proportion of stunting cases in West Aceh Regency. This situation warrants special attention, considering that Johan Pahlawan serves as the regency's capital and is expected to have better access to health facilities and public services compared to other subdistricts. The subdistrict consists of 12 villages, most of which are located in coastal areas and inhabited predominantly by fishing communities.

Padang Seurahet Village is one of the coastal villages in Johan Pahlawan Subdistrict, West Aceh Regency, with a population of approximately 3,921 people, of whom 150 are active fishermen (West Aceh Statistics Bureau, 2023). Geographically, the village is located along the coast of Meulaboh, directly adjacent to the Indian Ocean. Most houses are densely built along the shoreline and river estuaries. This low-lying and compact settlement is highly susceptible to tidal flooding and heavy rainfall, resulting in damp and muddy environmental conditions. Most houses are semi-permanent structures made of wooden materials with limited ventilation. Domestic wastewater management systems are poorly organized, with greywater from washing and kitchen activities commonly discharged directly into open drains or the sea without closed drainage systems. Access to clean water is also limited, as most households rely on shallow dug wells that are vulnerable to seawater intrusion, particularly during the dry season. These conditions reflect inadequate environmental sanitation, both in terms of physical infrastructure and household hygiene behavior.

From an economic perspective, the livelihoods of fishing households in Padang Seurahet Village remain low and unstable. According to a study by Safriana (2022), the total monthly household income of fishermen in Padang Seurahet reached IDR 180,752,000, with an average income of IDR 6,025,067 per household. A portion of household income is contributed by fishermen's wives who work as small-scale traders, generating a total monthly income of IDR 54,369,000. Nevertheless, this income level remains relatively low when compared to household expenditures and the instability of fishing yields, which are highly dependent on weather conditions and fishing seasons. This economic uncertainty directly affects fishermen households' ability to improve housing conditions, construct adequate sanitation facilities, and meet children's nutritional needs. Limited income restricts families' capacity to improve housing infrastructure or expand access to clean water. Consequently, family hygiene practices tend to be suboptimal, as environmental cleanliness, liquid waste management, and regular handwashing are often neglected due to limited facilities and maintenance costs.

Damp housing conditions, open drainage systems, and clogged waterways further increase the risk of bacterial contamination and the spread of infectious diseases. These circumstances place fishing families in coastal Padang Seurahet at a higher risk of sanitation-related health problems, including stunting among under-five children. Several international studies have demonstrated a strong association between Water, Sanitation, and Hygiene (WASH) factors and stunting. A study by Bekele et al. (2020) published in *PLoS One* reported that children living in households with access to clean water and adequate handwashing facilities had a significantly lower risk of growth failure compared to those living in poor sanitation environments. Similarly, a study by Sahiledengle et al. (2022) in *BMC Public Health* confirmed that children living in households with unimproved latrines and open defecation practices had a significantly higher likelihood of stunting. These findings reinforce the notion that stunting is not solely caused by chronic malnutrition, but also by repeated exposure to infectious diseases resulting from unhygienic environments. In the context of Padang Seurahet Village, where sanitation infrastructure remains limited and access to clean water is suboptimal, improving family hygiene practices is urgently needed as part of a sustainable stunting prevention strategy.

However, despite substantial evidence linking hygiene factors to stunting, most existing studies continue to focus primarily on maternal and child nutrition, dietary intake, and nutritional supplementation interventions. These studies emphasize exclusive breastfeeding, complementary feeding practices, and micronutrient intake as the main determinants of stunting. In many cases, nutrition-focused interventions alone have not been sufficient to significantly reduce stunting prevalence. This indicates that environmental and behavioral factors, particularly family hygiene practices, also play a crucial role but remain underexplored. International evidence highlights the importance of hygiene practices in preventing stunting, yet most studies have been conducted in densely populated urban areas or agrarian rural settings, rather than in coastal communities with distinct socio-economic characteristics. Research specifically examining family hygiene practices in coastal fishing communities remains limited. Fishing households experience compounded vulnerabilities, including economic instability, dependence on unpredictable marine resources, limited access to clean water, inadequate sanitation facilities, and restricted access to basic health services.

These conditions place children in fishing families at higher risk of stunting due to the combined effects of nutritional deficiencies and increased exposure to infections resulting from poor hygiene practices. This research gap is particularly relevant in West Aceh, especially in Johan Pahlawan Subdistrict and Padang Seurahet Village. Recent data indicate relatively high stunting prevalence in this area despite its status as the regency's administrative center. This suggests the presence of determinants beyond nutrition, one of which may be family hygiene practices. Nevertheless, academic studies in Aceh have largely focused on maternal and child nutrition factors, such as feeding practices, exclusive breastfeeding, and micronutrient intake, with limited attention to the interplay between fishermen's socio-economic conditions, sanitation access, family hygiene behavior, and stunting incidence.

Therefore, this study offers novelty by addressing this gap through an examination of family hygiene practices among fishing households as an important determinant of stunting in coastal areas of West Aceh. This study is expected to broaden the understanding that accelerating stunting reduction requires not only nutritional interventions but also an integrated approach combining nutrition-specific strategies with improvements in family hygiene practices. The findings are anticipated to provide scientific evidence to support the formulation of public health policies and more context-specific intervention programs tailored to the needs of fishing communities in coastal areas of West Aceh.

LITERATURE REVIEW

Stunting is a form of chronic malnutrition characterized by length or height-for-age below the standard growth reference for children. This condition results from prolonged exposure to inadequate nutritional intake and recurrent infectious diseases, particularly during the first 1,000 days of life. According to the World Health Organization (WHO), stunting is defined as a condition in which a child's height-for-age Z-score (HAZ) falls below −2 standard deviations based on the WHO Child Growth Standards (Yadika et al., 2019). Numerous studies have demonstrated a strong association between family hygiene practices and the incidence of stunting among under-five children, especially in coastal areas. A study conducted by Adimuntja et al. (2025) in the coastal area of Mandala Subdistrict, Jayapura City, found that hygiene behavior and environmental sanitation were significantly associated with stunting. The study reported that hygiene behavior (p-value = 0.001) and environmental sanitation (p-value = 0.000) were significantly related to stunting among under-five children. These findings indicate that inadequate handwashing practices, poor latrine use, and improper household waste management can increase the risk of stunting in children.

A meta-analysis conducted by the Global Health Science Group (2025) revealed that children living in environments with poor sanitation had a 3.71-fold higher risk of experiencing stunting compared to those residing in environments with adequate sanitation. This evidence further reinforces the view that environmental factors and hygiene-related behaviors are critical determinants of stunting among under-five children. Based on these findings, it can be concluded that family hygiene practices are significantly associated with the occurrence of stunting among under-five children, including those from fishing households. Poor hygiene practices increase the risk of infectious diseases, which subsequently impair nutrient absorption and hinder optimal child growth.

METHODS

This study employed a quantitative approach with a cross-sectional design to examine the relationship between family hygiene practices among fishing households and the incidence of stunting among under-five children in Padang Seuraheut Village. The study was conducted from August to December 2025. The study population consisted of all children aged 12–59 months residing in the village, totaling 1,442 children. The sample size was determined using Slovin's formula with a 10% margin of error, resulting in a sample of 94 children selected through simple random sampling based on the Posyandu (integrated health post) registry. Although the unit of analysis in this study was the child, data on family hygiene practices were collected from mothers as respondents, as mothers were considered the most knowledgeable regarding daily household hygiene behaviors, including handwashing practices, latrine use, food storage, and waste disposal. All collected data were processed through editing, coding, data entry, and cleaning stages, and subsequently analyzed using the Chi-Square test with the assistance of SPSS version 26.

RESULT

1. Characteristics of Respondents

Tabel 1. Distribution of Respondents' Characteristics

Characteristics	Category	n	%
Mother's Age (years)	19–24	18	19,1
	25–34	42	44,7
	35–44	34	36,2
Mother's Education	Primary School	20	21,3
	Junior High School	28	29,8
	Senior High School	34	36,2
	Diploma/Bachelor's Degree (D3/S1)	12	12,8
Mother's Occupation	Housewife	56	59,6
	Civil Servant	8	8,5
	Private Employee	18	19,1
	Others	12	12,8
	Total	**94**	**100**

Based on the study findings, the characteristics of respondents indicated that the majority of mothers of under-five children were in the 25–34 age group, totaling 42 respondents (44.7%). In terms of educational level, most respondents had completed senior high school, with 34 respondents (36.2%), while those with a diploma or bachelor's degree (D3/S1) constituted the smallest group, with 12 respondents (12.8%). Regarding occupation, the majority of respondents were housewives, accounting for 56 respondents (59.6%), whereas respondents working as civil servants represented the smallest proportion, with 8 respondents (8.5%).

2. Univariate Analysis

Tabel 2. Distribution of Handwashing with Soap Practices

Handwashing with Soap	Frequency (n)	%
Good	48	51.1
Poor	46	48.9
Total	94	100.0

Based on Table 2, it was found that out of 94 respondents, the majority had good handwashing with soap (HWWS) practices, totaling 48 respondents (51.1%). Meanwhile, nearly half of the respondents demonstrated poor handwashing practices, accounting for 46 respondents (48.9%).

Tabel 3. Distribution of Latrine Ownership and Utilization

Latrine Ownership and Utilization	Frequency (n)	%
Good	48	51.1
Poor	46	48.9
Total	94	100.0

Referring to Table 3, of the 94 respondents included in the study, 48 respondents (51.1%) were categorized as having good latrine ownership and utilization, while 46 respondents (48.9%) fell into the poor category.

Tabel 4. Dis Distribution of Food Storage and Preparation Practices

Food Storage and Preparation Practices	Frequency (n)	%
Good	47	50.0
Poor	47	50.0
Total	94	100.0

Based on Table 4, of the total 94 respondents, 47 respondents (50.0%) had good food storage and preparation practices, while the remaining 47 respondents (50.0%) were classified as having poor practices.

Tabel 5. Distribution of Solid Waste and Wastewater Disposal Practices

Solid Waste and Wastewater Disposal	Frequency (n)	%
Good	52	55.3
Poor	42	44.7
Total	94	100.0

Based on Table 5, of the 94 respondents, 52 respondents (55.3%) had good solid waste and wastewater disposal practices, while 42 respondents (44.7%) were categorized as having poor practices.

Tabel 6. Distribution of Stunting Incidence

Distribution of Stunting Incidence	Frequency (n)	%
Yes	60	63.8
No	34	36.2
Total	94	100.0

Based on Table 6, out of a total of 94 respondents, 60 respondents (63.8%) were identified as stunted, while 34 respondents (36.2%) were not stunted.

3. Analisis Bivariat

Tabel 7. Analisis Bivariat

Variable	Stunting				Total		*p-value* (<0.05)
	Yes		NO				
	n	%	n	%	n	%	
Handwashing with Soap							
Good	12	26.1	34	73.9	46	100.0	0.000
Poor	48	100.0	0	0.0	48	100.0	
Latrine Ownership and Utilization							
Good	24	52.2	22	47.8	46	100.0	0.021
Poor	36	75.0	12	25.0		100.0	
Food Storage and Preparation Practices							
Good	24	51.1	23	48.9	47	100.0	0.010
Poor	36	76.6	11	23.4	47	100.0	
Solid Waste and Wastewater Disposal							

Good	22	52.4	20	47.6	42	100.0	0.02
Poor	38	73.1	14	26.9	52	100.0	

The analysis results demonstrated a statistically significant association between hygiene behaviors and environmental conditions with the incidence of stunting among respondents ($p < 0.05$). Regarding handwashing with soap, all respondents with poor handwashing practices were stunted (100%), whereas only 26.1% of those with good practices experienced stunting. This marked difference indicates that hand hygiene practices have a substantial influence on children's nutritional status. A similar pattern was observed for latrine ownership and utilization. Respondents with poor latrine conditions had a stunting prevalence of 75.0%, which was higher than that among respondents with proper latrine use (52.2%). In terms of food storage and preparation practices, respondents with poor practices experienced stunting at a rate of 76.6%, compared to 51.1% among those with good practices. Furthermore, solid waste and wastewater disposal also showed a clear disparity. Respondents categorized as having poor waste and wastewater disposal practices had a stunting prevalence of 73.1%, while those with good practices had a prevalence of 52.4%. Overall, these findings indicate that hygiene behaviors, household sanitation, and food handling practices play a crucial role in influencing the occurrence of stunting. Improvements in these aspects may serve as strategic measures to reduce stunting prevalence in the community.

DISCUSSION

1. Relationship between Handwashing with Soap and Stunting among Under-Five Children

Personal hygiene practices reflect healthy behavior patterns that play an important role in determining an individual's health status, particularly among vulnerable groups such as children. During the growth period, children are highly susceptible to various infectious diseases that can adversely affect their overall health. One of the most fundamental behaviors with a substantial impact on health is handwashing with soap (HWWS), which indirectly influences nutritional status and child growth by preventing exposure to disease-causing agents (Rosdiyawati, 2023). Consistent with this perspective, the findings of this study indicate that handwashing with soap is significantly associated with stunting among children. HWWS is a basic hygiene practice that is essential for maintaining child health, as it plays a critical role in preventing infectious diseases. Infectious diseases, particularly those affecting the gastrointestinal tract, can disrupt nutrient absorption and ultimately impair child growth and development (Sari et al., 2023).

This relationship is supported by the statistical analysis, which showed a p-value of 0.000 (< 0.05), indicating a statistically significant association between HWWS practices and stunting. Furthermore, the study revealed a striking difference in proportions between respondents with poor and good HWWS practices. All respondents (100%) with poor HWWS practices experienced stunting, whereas only 26.1% of respondents with good HWWS practices were stunted. This pronounced difference suggests that handwashing with soap has a substantial and tangible impact on child health and growth. Poor HWWS practices increase children's exposure to pathogenic microorganisms such as bacteria, viruses, and parasites, which are the primary causes of gastrointestinal infections (Sari et al., 2023). Recurrent infections, including intestinal parasitic infections, can lead to impaired nutrient absorption and trigger inflammatory processes in the intestinal lining. Over time, this condition may result in environmental enteric dysfunction (EED), a chronic inflammatory disorder of the intestine that is often subclinical but significantly reduces the gut's capacity to absorb nutrients optimally. EED is now recognized as one of the key biological mechanisms linking poor hygiene practices to stunting in children (Santoso et al., 2024).

The findings of this study are consistent with those reported by Syam et al. (2020), who found a significant association between handwashing with soap and stunting. Communities that routinely practiced HWWS before and after daily activities tended to have children with better nutritional status. Similar findings were reported by Novianti et al. (2020), who concluded that one of the hygiene-related factors associated with stunting among under-five children was the practice of handwashing with soap and running water. However, the findings of this study are not entirely consistent with some previous research. A study by Nisa et al. (2022) reported no significant association between handwashing habits and stunting (p-value = 1.000). This discrepancy may be attributed to differences in respondent characteristics, as most participants in that study had already adopted proper handwashing practices in accordance with WHO recommendations. The study also suggested that maternal handwashing habits could reduce the risk of stunting by up to 15%. Similarly, Nasution et al. (2022) found no significant association between HWWS and stunting (p-value = 0.607), although they emphasized that sanitation and hygiene behavior change interventions could potentially reduce stunting prevalence.

These variations across studies indicate that the relationship between HWWS and stunting does not exist in isolation but is influenced by multiple interacting factors, including maternal education, availability of sanitation facilities, childcare practices, socioeconomic status, and environmental quality. Therefore, HWWS should be understood as part of a broader health behavior system. The findings of this study can also be explained by the F-Diagram theory, which illustrates the primary pathways of pathogen transmission from feces to mouth through various intermediary routes, including fingers. Hands that are not washed with soap can act as vectors for pathogen transmission through food, drinking water, or frequently touched objects. Once pathogens enter the body, the risk of intestinal infection increases, which can subsequently affect nutritional status and child growth. This concept aligns with the One Health approach, which emphasizes the interconnectedness of human health, environmental conditions, and behavior, including the importance of basic hygiene practices such as handwashing with soap.

Field observations further support these findings, as some households were found to lack adequate handwashing facilities, including soap, running water, or designated handwashing areas. In addition, some mothers or caregivers had not established the habit of washing hands before food preparation, before feeding children, or after cleaning children. These low levels of HWWS practice may be attributed to limited health education, inadequate sanitation facilities, and low community awareness regarding the importance of clean and healthy living behaviors. In summary, handwashing with soap is an important factor associated with stunting. Therefore, increasing community awareness of the importance of HWWS, improving access to adequate facilities, and implementing continuous health education should be prioritized in stunting prevention programs. These findings not only reinforce existing theories and previous research but also highlight the crucial role of personal hygiene in ensuring optimal and sustainable child growth and development.

2. Relationship between Latrine Ownership and Utilization and Stunting among Under-Five Children

Latrine ownership and utilization are key components of environmental sanitation that play an important role in public health, particularly among vulnerable groups such as children. Adequate sanitation serves as a primary prevention measure against various environmentally transmitted diseases, especially infections that can adversely affect nutritional status and child growth. Therefore, household sanitation conditions, including the availability and use of latrines, are important factors in stunting prevention (Angraini, 2022). The results of this study indicate a significant association between latrine ownership and utilization and stunting, with a Chi-Square p-value of 0.021 (< 0.05). These findings suggest that poor sanitation conditions contribute to an increased risk of stunting. In terms of proportions, respondents with good latrine ownership and utilization had a stunting prevalence of 52.2%, whereas those with poor latrine conditions exhibited a higher prevalence of 75.0%. This difference highlights inadequate sanitation as an important risk factor for stunting.

Biologically, poor sanitation due to the absence of proper latrines or improper latrine use leads to environmental contamination with fecal matter. Fecally contaminated environments serve as major reservoirs for pathogenic microorganisms, including bacteria, viruses, and parasites. Repeated exposure to these pathogens increases the risk of gastrointestinal infections, which can impair nutrient absorption and directly affect linear growth. Chronic gastrointestinal infections can result in environmental enteric dysfunction (EED), a condition characterized by persistent intestinal inflammation and subclinical damage (Santoso, 2024). EED compromises intestinal mucosal integrity and reduces nutrient absorption capacity, providing a biological explanation for the relationship between inadequate sanitation, poor latrine ownership and use, and stunting. These findings are consistent with a study by Rizki Pratama et al. (2024) conducted in the Penengahan Primary Health Center area of South Lampung, which reported a significant association between latrine ownership and stunting ($p < 0.001$). Children living in households without latrines were at a higher risk of stunting due to increased exposure to infectious diseases.

Similarly, Soedjadi et al. (2024) found that sanitation factors were significantly associated with stunting. Their study reported that 84.6% of stunted children came from households with inadequate HWWS practices, and latrine ownership was also significantly associated with stunting ($p = 0.001$; OR = 3.048). Children living in households without latrines were more likely to experience stunting, emphasizing the importance of basic sanitation in stunting prevention. Research by Lega Bisa Diantara, Hilda Zulkifli, and Hamzah Hasyim (2023) from the Faculty of Public Health, Sriwijaya University, also found a significant relationship between latrine ownership and stunting ($p = 0.000$), with higher risk observed among children living in households without latrines. Field conditions further support these findings, as some households were observed to have latrines that did not meet health standards, such as leaking septic tanks or latrines located too close to clean water sources.

Overall, these findings indicate that proper latrine ownership and utilization are critical factors in stunting prevention. Adequate sanitation not only reduces the spread of infectious diseases but also protects children from pathogen exposure that disrupts nutrient absorption and growth. Therefore, sanitation improvement interventions, increased access to healthy latrines, and continuous education on proper latrine use should be integral components of stunting prevention strategies.

3. The Relationship between Food Storage and Preparation Practices and Stunting among Under-Five Children

Food storage and preparation are essential components of food sanitation that directly influence food safety, particularly for vulnerable groups such as under-five children. Improper food handling can lead to contamination by pathogenic microorganisms that cause infectious diseases, which may contribute to stunting. Gastrointestinal infections during early childhood not only affect acute health but also disrupt nutrient absorption and contribute to long-term growth impairment (Sari & Agustin, 2023). This study found a significant association between food storage and preparation practices and stunting, with a p-value of 0.010 (< 0.05). Respondents with poor food storage and preparation practices had a higher prevalence of stunting (76.6%) compared to those with good practices (51.1%). These findings indicate that food handling quality plays a critical role in preventing health problems that affect child growth.

Improper food storage practices, such as leaving food at room temperature for extended periods, failing to cover food, or storing food in unhygienic places, increase the risk of bacterial growth and contamination. Similarly, unhygienic food preparation practices, including the use of unclean utensils, insufficient cooking, and improper reheating, heighten children's exposure to gastrointestinal pathogens. Recurrent infections can cause intestinal inflammation and nutrient malabsorption, ultimately impairing growth. These findings align with a study by Habibi et al. (2025), which reported a significant association between household food safety practices and stunting (p = 0.000; OR = 8.5). Children from households with poor food safety practices were 8.5 times more likely to experience stunting. Similarly, Halawa et al. (2025) found significant associations between maternal hygiene, kitchen sanitation, and stunting.

Research by Sitanggang et al. (2022) also reported a significant relationship between food sanitation and stunting (p = 0.024), highlighting challenges in maintaining hygiene during food preparation and storage.

Biologically, recurrent gastrointestinal infections caused by contaminated food can lead to environmental enteric dysfunction (EED), resulting in chronic intestinal inflammation and impaired nutrient absorption. Even with adequate dietary intake, children may still experience growth failure due to malabsorption. These findings are further supported by Food Safety theory and the F-Diagram concept, which identify food as a key transmission pathway for pathogens. Improper food handling within the temperature "danger zone" (5°C–60°C) allows rapid bacterial growth, increasing the risk of infection and nutrient malabsorption. In conclusion, poor food storage and preparation practices significantly increase the risk of infection and stunting. Therefore, promoting household food safety practices, including proper food storage, hygienic preparation, separation of raw and cooked foods, and clean utensils, is essential. Continuous education for caregivers is crucial as part of comprehensive stunting prevention efforts.

4. Balita The Relationship between Solid Waste and Wastewater Disposal and Stunting among Under-Five Children

The environment in which children grow plays a substantial role in determining their health status. Household solid waste and wastewater management practices are critical factors that influence whether an environment supports health or becomes a source of disease transmission. Improper waste disposal creates contaminated environments that increase the risk of infectious diseases, which can adversely affect nutritional status and child growth (Saputra et al., 2024). Proper waste disposal is a key component of environmental sanitation that protects public health, especially among vulnerable populations. Clean environments reduce infection risks and indirectly support optimal growth, whereas poor waste management increases exposure to disease-causing pathogens (Gusti, 2025). This study found a significant association between waste disposal practices and stunting (p = 0.02). Respondents with good waste disposal practices had a stunting prevalence of 52.4%, while those with poor practices exhibited a higher prevalence of 73.1%. These findings highlight the importance of environmental sanitation in preventing stunting. Unclean environments resulting from improper waste disposal serve as breeding grounds for pathogenic microorganisms and disease vectors. Accumulated waste and indiscriminately discharged wastewater contaminate soil and water sources, increasing children's exposure to infections that impair nutrient absorption and growth.

The lack of proper waste disposal facilities often forces households to dispose of waste indiscriminately, increasing the incidence of environmentally related diseases such as dengue fever, malaria, typhoid, diarrhea, and diphtheria (Idawati et al., 2020). Recurrent infections from these diseases are closely linked to poor nutritional status and growth impairment. In conclusion, inadequate waste and wastewater disposal contributes to increased infection risk and stunting. Therefore, improving sanitation infrastructure, providing adequate waste disposal facilities, implementing regular waste management, and enhancing community awareness of environmental cleanliness should be integral to stunting prevention strategies. A clean and healthy environment supports reduced infection rates, improved nutritional status, and optimal child growth.

CONCLUSION

The findings of this study indicate that all hygiene and sanitation variables were significantly associated with the incidence of stunting. Regarding handwashing with soap (HWWS), 100% of respondents with poor HWWS practices were stunted, compared to 26.1% among those with good practices. In terms of latrine ownership and utilization, the prevalence of stunting was higher in the poor category (75.0%) than in the good category (52.2%). Poor food storage and preparation practices were also associated with a higher proportion of stunting (76.6%) compared to good practices (51.1%). Similarly, inadequate solid waste and wastewater disposal was associated with a higher prevalence of stunting (73.1%) compared to proper disposal practices (52.4%). These findings emphasize that suboptimal hygiene and sanitation conditions increase the risk of stunting; therefore, improvements in these aspects should be prioritized as key strategies for stunting prevention.

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