Journal of Community Medicine and Public Health Research
Vol. 05, No. 02, December 2024

Zaerozi et al.
Study of Bacteriological Content and Risk Factors

STUDY OF BACTERIOLOGICAL CONTENT AND RISK FACTORS OF DRINKING WATER CONSUMPTION PATTERNS IN CASES OF STUNTING TODDLER

Ahmad Zaerozi [ID], **Tri Joko, Nurjazuli**

Environmental Health Study Program, Faculty of Public Health, Universitas Diponegoro, Indonesia.

ABSTRACT

Stunting is one of global nutrition problems, especially in developing countries including Indonesia. The prevalence of stunting in Demak Regency, Indonesia, in 2021 was 4.34%, and in 2022 it was 2.99%. However, stunting problem remains a priority because the impact of stunting can hinder efforts to enhance the health of the society and the development of the quality of human resources. Risk factors for stunting are influenced by behavioral aspects of the environment, like sanitation and drinking water. This study aimed to determine the content of bacteriological factors that contribute to the risk pattern of drinking water consumption in cases of stunting toddlers in Temuroso Village, Working Area of Guntur I Health Center, Demak Regency, Indonesia. This study was a quantitative observational case study. The population included families and toddlers in Temuroso Village, totaling as many as 854 people. The sampling technique was purposive sampling, so the sample size was 182 people for cases and controls. Data analysis used Chi-Square test and linear regression test. The bacteriological content was predominantly negative (66.5%), with the majority of subjects showing no infections (67%). Most participants fell into the high drinking water consumption category (62.1%). Stunting incidence was significantly associated with bacteriological content (p <0.0001) and drinking water consumption patterns (p <0.0001). Among these, bacteriological content was the most dominant factor influencing stunting (exp B =0.199). In summary, the primary risk factors for stunting among toddlers in Temuroso Village, within the Guntur I Health Center working area, Demak Regency, were bacteriological content (p <0.000) and drinking water consumption patterns (p <0.000).

How to cite:
Zaerozi, A., Joko, T., Nurjazuli, 2024. Study of Bacteriological Content and Risk Factors of Drinking Water Consumption Patterns in Cases of Stunting Toddler.. Journal of Community Medicine and Public Health Reseacrh, 5(2): 163-177.

INTRODUCTION

Stunting is a significant nutritional issue affecting many countries globally, particularly in low- and middle-income nations. It is concerning due to its association with increased risks of morbidity, mortality, and suboptimal brain development, which can lead to delayed motor skills and mental development[1].

Journal of Community Medicine and Public Health Research
Vol. 05, No. 02, December 2024

Zaerozi et al.
Study of Bacteriological Content and Risk Factors

According to the 2020 Basic Health Research Data, the prevalence of stunting in Indonesia was 30.8%[2]. In Central Java Province, the prevalence reached 28.5%, exceeding the national average of 28.0%[3].

Demak Regency, a district in Central Java, has been prioritized for stunting interventions. Although stunting rates have declined, the issue remains a priority due to its impact on public health efforts and human resource development. The government of Demak has implemented policies and strategies aimed at reducing stunting. However, stunting remains intertwined with the country's demographic dynamics. Indonesia's demographic bonus, characterized by a high proportion of productive-age residents, could be jeopardized by stunting, which threatens to undermine economic growth if not addressed. Despite efforts, the stunting reduction rate in Indonesia over the past five years has remained slow, ranging between 27-29%, indicating a persistent chronic issue[4,5].

The solution of stunting is influenced by behavioral changes and preventive practices at the individual, family, community, and policy levels[6]. Environmental factors such as sanitation and access to clean drinking water are also key contributors[7]. While many households have access to basic sanitation, the quality of drinking water remains a concern[8]. A Water Quality Survey revealed that nearly 67% of households consume contaminated water, with Escherichia coli, derived from animal or human waste, being a common contaminant[9]. A study in Kalasan, Sleman, Indonesia found that several drinking water depots did not meet standards and were contaminated with *E. coli*[10].

Inadequate drinking water contributes to infectious diseases that can affect a child's growth and development, potentially leading to stunting[11]. Communities lacking access to safe drinking water are at a higher risk of health issues, particularly stunting. Clean water, along with proper sanitation, is essential for preventing infections and improving the nutritional status of young children[12]. Studies have identified poor water quality and unsafe water handling practices as predictors of stunting[13]. A study by Fortune also found that a factor in the incidence of stunting is the lack of decent and reliable physical quality of drinking water[14]. People often store water in containers like gallons or buckets, which, if not properly maintained, can become contaminated and lead to diarrheal diseases[15]. Drinking of contaminated water often happens because there is a habit that the drinking water is kept in unsafe places and environments that predisposed the drinking water to bacterial contamination[16].

Families without access to a safe water source are at more than twice the risk of stunting in children compared to those with reliable water sources[17]. Safe drinking water must meet physical quality standards, including being clear, colorless, odorless, and free from impurities[18]. Inadequate water sanitation can lead to infections such as diarrhea or parasitic infestations, impairing nutrient absorption and leading to weight loss in children[19]. Unsafe water management practices, such as improper storage or handling, increase the risk of bacterial contamination, exacerbating nutritional issues like stunting, underweight, and wasting[20,21]. Behavioral practices related to water consumption and storage are critical factors in preventing waterborne diseases and stunting[22]. Research by Nurjazuli et al. identified drinking water quality and handling

Journal of Community Medicine and Public Health Research
Vol. 05, No. 02, December 2024

Zaerozi et al.
Study of Bacteriological Content and Risk Factors

practices as significant risk factors for stunting in communities[23]. This study aimed to assess bacteriological content and water consumption patterns as risk factors for stunting in toddlers in Temuroso Village, Guntur I Health Center working area, Demak Regency, Indonesia.

MATERIALS AND METHODS

This study employed a quantitative observational approach with a case-control design. The study population included families and children under five residing in Temuroso Village within the Guntur I Community Health Center area, Demak, Indonesia totaling 854 individuals across multiple neighborhoods. A purposive sampling method was used, resulting in a total sample size of 182 participants, with 91 in the case group and 91 in the control group. Data analysis involved the Chi-Square test to examine relationships between each independent and dependent variable. Logistic regression analysis with predictive modeling was then applied, where the Odds Ratio, indicated by Exp(B), demonstrated the predictive influence between variables, specifically the predicted risk factor magnitude for the case group. This study received ethical clearance from the Health Research Ethics Commission of the Faculty of Public Health at Diponegoro University, with Ethical Approval No: 474/EA/KEPK-FKM/2023.

RESULTS

The largest group of respondents comprised children aged 13 to 24 months, totaling 67 individuals (36.8%), while the smallest group was represented by those aged 49 to 60 months, with only 16 individuals (8.8%). Among the respondents, 100 are male (54.9%) and 82 are female (45.1%). Mothers aged 21 to 30 years made up 72.5% of the respondents, totaling 132, whereas those aged 20 or younger represented 12.6% (23 respondents). The majority of the respondents were high school graduates (112 individuals, 61.5%), while college graduates were the least represented group (16 individuals, 8.8%). Most families reported earnings aligned with the regional minimum wage, with 91 respondents (50%) falling into this category, while 38 respondents (20.9%) earned below the minimum wage. The Employment of the respondent were predominantly in the private sector of 78 respondents (42.9%), while the smallest group was civil servants comprising 8 respondents (4.4%) (Table 1).

Table 1 Respondents' Characteristics

Characteristics	f	%
Child Age		
6-12 Months	36	19.8
13-24 Months	67	36.8
25-36 Months	31	17.0
37-48 Months	32	17.6
49-60 Months	16	8.8
Gender		
Man	100	54.9
Woman	82	45.1
Mother's Age		
≤ 20 Years	23	12.6
21-30 Years	132	72.5
> 30 Years	27	14.8
Education		
junior high school	54	29.7
high school	112	61.5
College	16	8.8
Income		
Below UMR	38	20.9
Minimum wage	91	50.0
Above UMR	53	29.1
Work		
Laborer	49	26.9
Farmer	47	25.8
Private / Employees	78	42.9
Civil servants	8	4.4

Regarding the bacteriological content it was found that the bacteriological content in drinking water of most of the

Journal of Community Medicine and Public Health Research
Vol. 05, No. 02, December 2024

Zaerozi et al.
Study of Bacteriological Content and Risk Factors

respondents (121 respondents, (66.5%)) was negative, while positive bacteriological content was found in drinking water of 61 respondents (33.5%) (Table 2).

The research findings identified the patterns in drinking water consumption, with the most prevalent category being adequate, reported by 113 respondents (62.1%). Conversely, the inadequate patterns were noted by 69 respondents (37.9%). Patterns of drinking water consumption related to family habits include the storage, treatment, and serving of drinking water (Table 3). Table 4 shows that stunting incidence was found in 91 of the respondents (50%), while the other 50% of the respondents reported no stunting incidence.

Table 2 Bacteriological Content

Bacteriological Content	f	%
Negative	121	66.5
Positive	61	33.5
Total	**182**	**100.0**

Table 3. Drinking Water Consumption Patterns

Drinking Water Consumption Patterns	f	%
Adequate	113	62.1
Inadequate	69	37.9
Total	**182**	**100.0**

Table 4. Stunting Incidence

Stunting incidence	f	%
No Stunting	91	50.0
Stunting	91	50.0
Total	**182**	**100.0**

Further analysis revealed a significant relationship between bacteriological content and stunting in toddlers in Temuroso Village, as indicated by a p-value of 0.0001, which is below the 0.05 significance level. This suggests that positive bacteriological content is significantly associated with an increased risk of stunting. The odds ratio (OR) of 5.179 (95% CI: 2.599–10.322) indicated that toddlers with positive bacteriological content were 5.179 times more likely to experience stunting than those with negative content. Specifically, 76 respondents (62.8%) with negative bacteriological content experienced no stunting, while 46 respondents (75.4%) with positive content were affected (Table 5).

Table 6 shows the result of analysis on relationship between drinking water consumption patterns and toddler stunting in Temuroso Village, with a p-value of 0.0001, well below the 0.05 significance threshold. This finding suggests that inadequate drinking water consumption is significantly linked to stunting cases. The odds ratio (OR) of 6.538 (95% CI: 3.306–12.928) indicates that inadequate consumption patterns increase the risk of stunting by 6.538 times compared to adequate patterns. Among respondents with adequate consumption, 75 individuals (66.4%) experienced no stunting, while 53 individuals (76.8%) with inadequate consumption showed high stunting rates.

The multivariate analysis assessed the influence of bacteriological content and drinking water consumption patterns on toddler stunting in Temuroso Village, under the Guntur I Health Center in Demak Regency. The study identified bacteriological content (p = 0.000) and drinking water consumption patterns (p = 0.000) as significant risk factors for stunting. Furthermore, the analysis showed that the bacteriological content, represented by an exponential value (B) of 0.199, significantly affected stunting cases. This suggests that effectively managing bacteriological content can reduce the incidence of stunting (Table 7).

Journal of Community Medicine and Public Health Research
Vol. 05, No. 02, December 2024

Zaerozi et al.
Study of Bacteriological Content and Risk Factors

Table 5. Analysis of Bacteriological Content Regarding Stunting Toddler Cases

Bacteriological Content	Stunting Case				Total		p-value	OR
	No Stunting		Stunting					
	F	%	f	%	f	%		
Negative	76	62.8	45	37.2	121	100		5.179 (2.599-10.322)
Positive	15	24.6	46	75.4	61	100	0.0001	
Total	**91**	**50.0**	**91**	**50.0**	**182**	**100**		

Table 6. Analysis of Drinking Water Consumption Patterns Regarding Stunting Toddler Cases

Drinking Water Consumption Patterns	Stunting Case				Total		p-value	OR
	No Stunting		Stunting					
	F	%	f	%	f	%		
Adequate	75	66.4	38	33.6	113	100		6.538 (3.306-12.928)
Inadequate	16	23.2	53	76.8	69	100	0.0001	
Total	**91**	**50.0**	**91**	**50.0**	**182**	**100**		

Table 7. Multivariate Analysis

Variable	B	Wald	df	Sig.	Exp(B)
Bacteriological (1)	-1.613	17.918	1	.000	.199
Drinking_Water Consumption (1)	-1.852	25.248	1	.000	.157
Constant	2.281	29.523	1	.000	9.790

DISCUSSION

Bacteriological Content

The research findings indicated that the majority of respondents, 121 individuals (66.5%), fell into the negative bacteriological category, while 61 respondents (33.5%) were categorized as positive. The bacteriological content in drinking water was assessed using the Most Probable Number (MPN) method, which includes several testing stages: a presumptive test and a confirmation test to validate the presumptive results. The presumptive test utilized seven tubes containing reaction samples, using both Lactose Broth Double Strength and Lactose Broth Single Strength media, with each sample incubated for 24 hours at 37°C. Confirmation testing involved inoculating positive presumptive results into Brilliant Green Lactose Broth tubes, which were then incubated at both 37°C and 44°C for 24 hours.

The quality of drinking water sources is crucial; according to the Regulation of the Minister of Health of the Republic of Indonesia No. 2 of 2023, drinking water must meet physical, microbiological, chemical, and radioactivity standards. Quality indicators for safe drinking water include clarity (no cloudiness), absence of taste and odor, and no coloration[24]. Fecal contamination often occurs when water sources are located near human waste disposal sites or polluted rivers. To mitigate this risk, it is recommended to utilize clean water sources, ensure water is properly boiled, and store it in clean containers before use[19].

Approximately 70% of the community has access to bacteriologically safe drinking water, with more than 50% sourced from dug or drilled wells and rainwater cisterns. However, regular water quality checks are necessary to ensure cleanliness, as these sources can be vulnerable to contamination. Additionally, around 20% of respondents receive water from the Regional Drinking Water Company (PDAM) piping system. The importance of water quality (sanitation) is

Journal of Community Medicine and Public Health Research
Vol. 05, No. 02, December 2024

Zaerozi et al.
Study of Bacteriological Content and Risk Factors

paramount for sustainable development, impacting various sectors including nutrition, health, education, and poverty reduction. For children, access to safe water, sanitation, and hygiene (WASH) is essential for their overall health, survival, and growth[2].

A study by Anggraeni (2022) revealed that the majority of respondents, 122 individuals (67%), reported no infections, while only 9 respondents (4.9%) experienced infections and dehydration. The health status of infants is a direct predictor of stunting problems[25]. Frequent illnesses in toddlers can negatively impact their growth due to reduced appetite and food intake. Diarrhea and acute respiratory infections are the most prevalent illnesses among young children[26]. Picauly's study indicates that children with a history of infections have a higher likelihood of experiencing stunting compared to those without such a history[27].

Infections resulting from poor sanitation practices, such as diarrhea, remain a leading cause of morbidity and mortality in children, largely attributed to inadequate WASH conditions[6]. Poor sanitation is associated with increased rates of stunting and undernutrition in children[28]. The health of infants encompasses the incidence of infections and growth-related issues from birth. According to Picauly's research, children with a history of infections are at a greater risk for stunting compared to their healthy counterparts[27]. Diarrhea can lead to nutritional malabsorption, and prolonged episodes (lasting more than four days) can result in significant nutritional deficits[2].

Drinking Water Consumption Patterns

This study identified drinking water consumption patterns, revealing that 113 respondents (62.1%) had adequate consumption patterns, while 69 respondents (37.9%) had inadequate patterns. Family habits regarding drinking water encompass storage, processing, and serving practices. These consumption patterns are critical factors in determining the prevalence of growth problems in children. Poor water and sanitation facilities, along with inadequate drinking behaviors, can lead to diarrhea, intestinal worms, or enteropathy, adversely affecting a child's nutritional status. Infections can directly impact nutrition by reducing appetite, impairing digestion, causing nutrient malabsorption, triggering chronic immune activation, and diverting nutritional resources and energy due to conditions such as fever[29].

Many households have access to improved sanitation facilities; however, low-quality water sources result in poor drinking habits. Survey findings reveal that nearly 67% of households consume water contaminated with *Escherichia coli* (*E. coli*), a marker of significant waste contamination[30]. The Indonesian government is committed to achieving universal WASH access, as reflected in the National Policy on Community-Based Drinking Water and Sanitation (AMPL-BM)[1].

Inadequate drinking water consumption behaviors contribute to water contamination, resulting in infections such as diarrhea and impaired intestinal absorption. Storage, processing, and availability practices are risk factors for stunting. Contaminated water may harbor microorganisms, pathogens, and harmful chemicals that can lead to diarrhea and Environmental Enteric Dysfunction (EED)[31]. To prevent and reduce stunting in children under five, all stakeholders, particularly families, must prioritize access

Journal of Community Medicine and Public Health Research
Vol. 05, No. 02, December 2024

Zaerozi et al.
Study of Bacteriological Content and Risk Factors

to safe drinking water, ensuring protected sources, sufficient quantity and quality, and proper storage and processing, especially during the critical first thousand days of life[32].

Stunting Incidence

The research findings indicated that stunting was present in 91 respondents (50%) while the remaining 50% were not stunted. Stunting in toddlers significantly affects the growth and health of children aged 0-59 months; however, it can be prevented through daily adequate nutrition, which supports normal growth and development[33]. Stunting also has profound economic implications at the individual, household, and community levels[34]. According to the World Health Organization Child Growth Standards, stunting is defined as a height-for-age index with a z-score of less than -2 standard deviations, indicating impaired growth due to long-term malnutrition[6,7].

Stunting results from chronic nutritional deficiencies and insufficient dietary intake over an extended period. It can begin during fetal development and typically becomes apparent by the age of two[28]. Children classified as short have a low height-for-age index, which may represent normal growth variation or a growth deficit. Stunting reflects a failure to achieve genetic growth potential due to suboptimal health or nutrition conditions[2]. Stunting is a condition resulting from inadequate nutrition. Chronic nutritional deficiencies can lead to long-term health issues, as the effects of poor dietary intake accumulate over time. Stunting can begin during fetal development if the mother does not receive sufficient nutrition, and it typically becomes evident by the time the child reaches two years of age when growth milestones are not met[35].

The causes of stunting are multifaceted and vary across regions. Nutritional deficiencies and infectious diseases are direct contributors to stunting. Indirect factors include inadequate access to nutritious food, poor parenting practices, insufficient attention to children's needs, and unhealthy living conditions due to a lack of clean water and sanitation facilities[36].

Bacteriological Content and Stunting

The analysis results from cross-tabulation reveal a significant relationship, supported by a statistical test yielding a p-value of 0.0001, which is below the 0.05 threshold. This indicates a significant correlation between bacteriological content and cases of stunting in toddlers in Temuroso Village, within the Working Area of Guntur I Health Center, Demak Regency, as the p-value is less than 0.05 at a 95% significance level (p-value: 0.0001). The odds ratio (OR) calculated was 5.179 (2.599-10.322), suggesting that positive bacteriological content in water is associated with a 5.179-fold increase in the risk of stunting compared to negative bacteriological content. Among respondents, 76 (62.8%) with negative bacteriological content experienced no stunting, while 46 (75.4%) with positive bacteriological content reported stunting (Table 5).

Previous studies have established that bacteriological contamination in water contributes to stunting. Inadequate water facilities, poor sanitation, and suboptimal hygiene practices can lead to the presence of harmful bacteria in drinking water. This contamination can result in diarrhea, intestinal worms, enteropathy, and infections, which adversely affect a child's nutritional status. Such infections directly impact nutrition by reducing appetite,

Journal of Community Medicine and Public Health Research
Vol. 05, No. 02, December 2024

Zaerozi et al.
Study of Bacteriological Content and Risk Factors

impairing digestion, causing nutrient malabsorption, activating immune responses, and diverting nutrients and energy for processes like fever[32]. Frequent illnesses in toddlers negatively affect growth, as illness often leads to decreased appetite. The most prevalent infections among toddlers include diarrhea and acute respiratory tract infections[26]. Picauly's study indicates that children with a history of infections are more likely to experience stunting compared to those without such a history[27].

A prior study highlighted health status as a direct factor contributing to stunting, indicating that infections and growth issues since birth play a significant role. A child's health condition serves as a direct predictor of stunting risk[25]. In cases of diarrheal infection, children may experience nutrient malabsorption, with the duration and frequency of diarrhea contributing to nutritional losses[2]. Children with a history of infections are at an increased risk for stunting[37]. Infections arise from bacteria present in drinking water, which can consume essential nutrients necessary for tissue repair and may lead to cellular damage[38]. Intestinal worm infections can also occur due to bacterial contamination in water, presenting another risk factor for stunting. Administering deworming medications can help mitigate this risk[39].

Households that obtain drinking water from tap sources may experience higher rates of stunting in children compared to those using tank or well water, primarily due to the risk of bacterial contamination in tap water. The quality of tap water often fails to meet the required health standards compared to tank or well water. According to the Regulation of the Minister of Health of the Republic of Indonesia No. 2 of 2023, drinking water must be clear, tasteless, odorless, and free from chemical contaminants and microorganisms that could contribute to stunting in children[40]. Insufficient availability of safe drinking water, proximity of water sources to latrines, and inadequate treatment prior to consumption can disrupt nutrition in children[41].

Drinking Water Consumption Patterns and Stunting

The analysis of cross-tabulation demonstrated a significant relationship, supported by statistical testing with a p-value of 0.0001, which is less than the 0.05 threshold. This indicated a strong correlation between drinking water consumption patterns and stunting incidence among toddlers in Temuroso Village, within the Working Area of Guntur I Health Center, Demak Regency, with a significance level of 95% (p-value: 0.0001). The odds ratio (OR) obtained was 6.538 (3.306-12.928), suggesting that inadequate drinking water consumption increased the risk of stunting by 6.538 times compared to adequate consumption patterns. Among respondents, 75 (66.4%) following adequate drinking water consumption patterns experienced no stunting, while 46 (75.4%) with inadequate consumption patterns reported stunting (Table 6).

Poor sanitation and hygiene behaviors are major contributors to infections in children, leading to fluid loss and a deficiency in essential nutrients, which are critical for healthy growth and development. The presence of bacteria can be attributed to inadequate sanitation facilities in residential areas, resulting in poor handwashing practices after defecation and during food preparation, thus increasing the risk of pathogenic

Journal of Community Medicine and Public Health Research
Vol. 05, No. 02, December 2024

Zaerozi et al.
Study of Bacteriological Content and Risk Factors

bacteria entering the child's body and causing illness[32].

Inadequate drinking water can lead to contamination that results in infections such as diarrhea and absorption disorders. Factors related to the storage, processing, and availability of drinking water are significant risk factors for stunting. Contaminated water may contain pathogens and harmful chemicals, contributing to intestinal infections[31]. Behaviors associated with sourcing, storing, processing, and providing clean water serve as predictors of stunting. A research by Otsuka et.al (2019) has linked water quality and quantity, along with proper storage and processing, to stunting in children under five years old. Several factors contributing to childhood malnutrition include limited access to clean or properly processed water, inadequate sanitation facilities, and insufficient distance between water sources and latrines[40].

Multivariate analysis confirmed the influence of bacteriological content and drinking water consumption patterns on cases of toddler stunting in Temuroso Village, with both factors identified as significant risks (p=0.000). The analysis revealed that the impact of bacteriological content and consumption patterns on stunting cases was indicated by an exponential coefficient (B) of 0.199, suggesting that improved bacteriological quality can decrease the incidence of stunting (Table 7).

The drinking water crisis has emerged as a significant issue, exacerbated by poor waste management practices that lead to the pollution of water sources[42]. Access to safe drinking water is a critical factor influencing disease prevalence, which in turn affects a child's growth and development. Insufficient access to clean water increases the risk of stunting among toddlers[11]. Communities lacking adequate drinking water face serious health risks, particularly regarding stunting. Clean water is essential for preventing diseases that, along with proper sanitation and hygiene practices, significantly impact health and nutritional status[12].

Environmental Factors and Stunting

Stunting risk factors are closely linked to environmental conditions, particularly regarding water, sanitation, and hygiene factors, such as water availability, sanitation infrastructure, contaminated water, and inadequate hygiene practices during the storage, processing, and supply of drinking water within families[8]. Families with access to clean water facilities typically exhibit a lower prevalence of stunting in children compared to families lacking such access. Inadequate water supply or contamination hinders the adoption of clean and healthy living practices, leading to various health issues[43].

The home environment plays a crucial role; the presence of water that does not meet clean criteria can lead to diarrhea and digestive infections. Clean water significantly influences nutritional outcomes in individuals and impacts stunting rates. Infections can directly affect nutritional status by causing reduced appetite, impaired digestion, nutrient malabsorption, chronic immune activation, and diversion of nutrients for recovery from infections[44].

The characteristics of clean water can be assessed based on its source and quality. It is also essential to consider the surrounding environment, as pollution from waste can contaminate water sources. Poor hygiene and inadequate sanitation may increase infection risks due to enhanced permeability of the intestines to pathogens,

Journal of Community Medicine and Public Health Research
Vol. 05, No. 02, December 2024

Zaerozi et al.
Study of Bacteriological Content and Risk Factors

resulting in decreased nutrient absorption. Hygiene practices that promote cleanliness are crucial for maintaining good health. Sanitation includes access to facilities for safe disposal of human waste, allowing for proper hygiene through waste management and wastewater treatment[14].

Poor sanitary conditions, including insufficient clean water, inadequate toilet facilities, and poor handwashing practices, significantly contribute to disease and infection prevalence. Many toddlers in rural areas face challenges in accessing safe drinking water[43]. Conditions that hinder linear growth also elevate mortality rates among toddlers. It is imperative for communities throughout Indonesia to achieve proper sanitation. Effective sanitation measures can mitigate stunting, whereas the absence of clean water can lead to infection-related health issues in children[18].

Preventing and controlling stunting among toddlers in Indonesia involves implementing nutrition-sensitive inter-ventions and improving environmental sanitation through the construction of adequate latrines. Increasing health education initiatives can enhance public awareness of proper sanitation practices, such as refraining from open defecation and ensuring safe disposal of children's feces. These efforts aim to break the transmission cycle of diseases like diarrhea and intestinal worms, thereby reducing the incidence of stunting among toddlers in Indonesia[45].

This research offers several advantages, including the direct measurement of E. coli bacteria levels, a known cause of diarrhea, and the identification of drinking water consumption risk factors in stunted toddlers in Temuroso Village within the Guntur I Community Health Center service area,

Demak Regency. These findings can enhance community knowledge, encouraging the adoption of clean and healthy lifestyle practices to reduce disease risks associated with drinking water and environmental factors. However, a limitation of this research was that some potential participants declined observational participation. Additionally, measuring certain toddlers was challenging and time-consuming, and communication barriers occasionally arose between researchers and respondents, particularly regarding question comprehension, which extended the study duration.

CONCLUSION

The research identified that the simultaneous risk factors contributing to toddler stunting in Temuroso Village, within the Working Area of Guntur I Health Center, Demak Regency, Indonesia are bacteriological content and drinking water consumption patterns.

ACKNOWLEDGMENT

CONFLICT OF INTEREST

The case report includes a letter of approval for publication from the patient and his or her guardian.

ETHIC CONSIDERATION

All authors have contributed to the entire process of this research, including preparation, data collection and analysis, preparation and approval for publication of this manuscript. Ethical Approval no. 474/EA/KEPK-FKM/2023 issued on 23

Journal of Community Medicine and Public Health Research
Vol. 05, No. 02, December 2024

Zaerozi et al.
Study of Bacteriological Content and Risk Factors

August 2023 by Diponegoro University Semarang, Indonesia.

AUTHOR CONTRIBUTION

All authors have contributed to all processes in this research, including preparation, data gathering and analysis, drafting and approval for publication of this manuscript.

REFERENCES

1. UNICEF/WHO/WORLD BANK. Levels and trends in child malnutrition UNICEF / WHO / World Bank Group Joint Child Malnutrition Estimates Key findings of the 2021 edition. World Heal Organ [Internet]. 2021;1–32. Available from: https://www.who.int/publications/i/item/9789240025257 http://www.who.int/nuthrowthdb/jme_brochoure2017

2. UNICEF-Indonesia. The State of Children in. State Child Indones p Trends, Oppor Challenges Realiz Child Rights [Internet]. 2020;65. Available from: https://www.unicef.org/indonesia/sites/unicef.org.indonesia/files/2020-06/The-State-of-Children-in-Indonesia-2020.pdf

3. Dinkes Jateng. Tengah Tahun 2023 Jawa Tengah. 2023; https://dinkesjatengprov.go.id/v2018/dokumen/1Profil_Kesehatan_2023/files/downloads/Profil%20Kesehatan%20Jawa%20Tengah%202023.pdf

4. Muna, 2021. Health Profile of Demak Regency 2021. Publication Number: 33210.2225. BPS-Statistic of Demak Regency. Available from: https://web-api.bps.go.id/download.php?f=X6jhm f/qHMAnfmT6pFtYqEhNK3ZPUzFOL0JUN0JMcVpQNXo1dnpEMGcxWlNva2V4d1ZvWk10QnY3NU1wWW5EMWlFV1RGQXliUHJqVE9UOWJPRmNlRXlkK1VSaXV6bGNiUVBMYTRpWmNKRFhIYmFGbFZiUlEzanJlODhsOUVqQzVWZS9Xb2sxemVDbnY1YldxV3JPaWVQbVgvYUsvNTRVQlJ3MlVFV1FUQTdXMGVvbkxTSUhlRWd5WFNZRW5vWVRQYTc4SVovdW5HVUNYbVFvN3oxc29TS2o4MWIyMnZLTTNPbEVMbDNiL0pwSVZ4OWFBNEN3ak43NlRUMmlPUjBmWDZaYU9SY1V0TGh3L0Y5Z0Q=&_gl=1*1uzziig*_ga*MTU0OTU0NDU4OC4xNzI5NDc5MjM0*_ga_XXTTVXWHDB*MTcyOTQ3OTIzNC4xLjAuMTcyOTQ3OTIzNC4wLjAuMA

5. Alamsyah, IE., Republika, Thursday 07 Juny 2022. BKKBN: Stunting Ancam Bonus Demografi Indonesia [BKKBN: Stunting Threatens Indonesia's Demographic Bonus.]. Retrieved: 23 February 2023 of https://ekonomi.republika.co.id/berita/rd46my349/bkkbn-stunting-ancam-bonus-demografi-indonesia#google_vignette

6. Winterfeld A. Improving child nutrition. Vol. 18, NCSL legisbrief. 2010. 1–2 p. https://data.unicef.org/resources/improving-child-nutrition-the-achievable-imperative-for-global-progress/

7. Indonesian Ministry of Health. Causes of Stunting in Children [Internet]. Indonesian Ministry of Health. 2020. Available from: http://www.depkes.go.id. https://www.kemkes.go.id/id/profil-kesehatan-indonesia-2020

8. Rahayuwati L, Ibrahim K, Hendrawati S, Sari CWM, Yani DI, Pertiwi ASP, et al. Pencegahan Stunting melalui Air Bersih, Sanitasi, dan Nutrisi [Stunting Prevention through Clean Water, Sanitation, and Nutrition]. War LPM. 2022;25(3):356–65. https://journals2.ums.ac.id/warta/articl

Journal of Community Medicine and Public Health Research
Vol. 05, No. 02, December 2024

Zaerozi et al.
Study of Bacteriological Content and Risk Factors

e/view/1031

9. Ministry of Health, Republic Health. 2022. Profil Kesehatan Indonesia [Indonesia Health Profile] [Internet]. Pusdatin.Kemenkes.Go.Id. 2023. Kementrian Kesehat. Republik Indones. Available from: https://kemkes.go.id/id/indonesia-health-profile-2022

10. Sekarwati N, Subagiyono H, Wulandari PD, Iii K, Lingkungan S, Wirahusada Y. Analisis Kandungan Bakteri Total Coliform Dalam Air Bersih Dan Escherechia Coli Dalam Air Minum Pada Depot Air Minum Isi Ulang di Wilayah Kerja Puskesmas Kalasan Sleman [Analysis of Total Coliform Bacteria in Clean Water and Escherichia coli in Drinking Water at Refill Water Stations in the Kalasan Health Center Work Area, Sleman]. Kesmas. 2016;10(2):1–12. https://media.neliti.com/media/publications/143657-ID-none.pdf

11. Wulan N, Mofu RM, Amiruddin A. Analisis Karakteristik Ibu, Perilaku Akses Air Minum Dan Sanitasi Layak Terhadap Kejadian Stunting Balita Di Kabupaten Keroom [Analysis of Maternal Characteristics, Drinking Water Access Behavior, and Proper Sanitation on the Incidence of Stunting in Toddlers in Keerom Regency]. J Ilm Obs. 2022;14(3):101–11. https://stikes-nhm.e-journal.id/JOB/article/view/777

12. Ministry of Health, Republic Health. Profil Kesehatan Indonesia 2016. 100 p. https://kemkes.go.id/id/profil-kesehatan-indonesia-2023

13. Zalukhu A, Mariyona K, Andriyani L. Hubungan Sanitasi Lingkungan Dengan Kejadian Stunting Pada Anak Balita (0-59) Bulan Di Nagari Balingka Kecamatan Iv Koto Kabupaten Agam Tahun 2021 [The Relationship Between Environmental Sanitation and the Incidence of Stunting in Children Under Five (0-59 Months) in Nagari Balingka, IV Koto District, Agam Regency, 2021]. J Ners Univ Pahlawan [Internet]. 2022;6(1):52–60. Available from: http://journal.universitaspahlawan.ac.id/index.php/ners/article/view/3867

14. Khoerul ummah. Hubungan Faktor Kesehatan Lingkungan Terhadap Kejadian Stunting Pada Balita di Wilayah Puskesmas Kassi Kassi Kota Makassar Tahun 2021 [The Relationship Between Environmental Health Factors and the Incidence of Stunting in Toddlers in the Kassi-Kassi Health Center Area, Makassar City, 2021]. Skripsi. 2022;(8.5.2017):2003–5. https://jurnal.umj.ac.id/index.php/JKK/article/view/12202

15. Hasan MM, Gerber N. Bacterial contamination of drinking water and food utensils: Impacts of piped water on child health in north-western Bangladesh. Water Resour Rural Dev [Internet]. 2017;10 (September 2016):33–44. Available from: https://doi.org/10.1016/j.wrr.2018.10.001

16. Getachew A, Tadie A, Chercos DH, Guadu T, Alemayehu M, Gizaw Z, et al. Bacteriological quality of household drinking water in North Gondar Zone, Ethiopia; a community-based cross-sectional study. Appl Water Sci [Internet]. 2021;11(12):1–8. Available from: https://doi.org/10.1007/s13201-021-01515-0

17. Ramdaniati SN, Nastiti D. Hubungan Karakteristik Balita, Pengetahuan Ibu Dan Sanitasi Terhadap Kejadian Stunting Pada Balita Di Kecamatan Labuan Kabupaten Pandeglang [The Relationship Between Toddler Characteristics, Maternal Knowledge, and Sanitation with the Incidence of Stunting in Toddlers in Labuan District, Pandeglang Regency]. Hearty. 2019;7(2):47–54. DOI: 10.32832/hearty.v7i2.2877

18. Hartati S, Zulminiati Z. Fakta-Fakta Penerapan Penilaian Otentik di Taman

Journal of Community Medicine and Public Health Research
Vol. 05, No. 02, December 2024

Zaerozi et al.
Study of Bacteriological Content and Risk Factors

Kanak-Kanak Negeri 2 Padang [Facts on the Implementation of Authentic Assessment in State Kindergarten 2 Padang]. J Obs J Pendidik Anak Usia Dini. 2020;5(2):1035–44. DOI: 10.31004/obsesi.v5i2.788

19. Nisa SK, Lustiyati ED, Fitriani A. Sanitasi Penyediaan Air Bersih dengan Kejadian Stunting pada Balita [Sanitation of Clean Water Supply and Its Association with the Incidence of Stunting in Toddlers]. J Penelit dan Pengemb Kesehat Masy Indones. 2021;2(1):17–25. https://journal.unnes.ac.id/sju/index.php/jppkmi/article/view/47243

20. Anwar, SGz, MSi K, Indria Setyani L. The Association Between Drinking Water Management Behavior and the Level of Macronutrient Adequency with Nutritional Status of Toddlers. Amerta Nutr. 2022;6(1SP):306–13. DOI: 10.20473/amnt.v6i1SP.2022.306-313

21. Lilik NIS, Budiono I. Kontribusi Kondisi Fisik Lingkungan Rumah dengan Kejadian Diare dan Hubungannya terhadap Kejadian Stunting [Contribution of Home Physical Environmental Conditions to the Incidence of Diarrhea and Its Association with Stunting]. Indones J Public Heal Nutr [Internet]. 2021;1(1):101–13. Available from: https://journal.unnes.ac.id/sju/IJPHN/article/view/47482

22. Luby SP, Rahman M, Arnold BF, Unicomb L, Ashraf S, Winch PJ, et al. Effects of water quality, sanitation, handwashing, and nutritional interventions on diarrhoea and child growth in rural Bangladesh: a cluster randomised controlled trial. Lancet Glob Heal [Internet]. 2018;6(3):e302–15. Available from: http://dx.doi.org/10.1016/S2214-109X(17)30490-4

23. Nurjazuli N, Budiyono B, Raharjo M, Wahyuningsih N. E. Environmental factors related to

children diagnosed with stunting 3 years ago in Salatiga City, Central Java, Indonesia. Toxicologie Analytique et Clinique. 2023; 35(3), 198-205 DOI: 10.1016/j.toxac.2023.01.003

24. Regulation of the Minister of Health of the Republic of Indonesia No. 492/Menkes/Per/IV/2010 on Drinking Water Quality Standards. Ministry of Health Regulation, Republic of Indonesia. 2010

25. Anggraeni L, Yuria M, Maryuni, Gustina I. Penyebab Langsung Dan Penyebab Tidak Langsung [Direct and Indirect Causes of Stunting in Children Under Five]. J Ilmu Kesehat. 2022;5(2):140–6. https://journal.unhasa.ac.id/index.php/jikes/article/view/358

26. Lestari W, Margawati A, Rahfiludin Z. Risk factors for stunting in children aged 6-24 months in the sub-district of Penanggalan, Subulussalam, Aceh Province. J Gizi Indones (The Indones J Nutr [Internet]. 2014;3(1):37–45. Available from: https://ejournal.undip.ac.id/index.php/jgi/article/view/8752/7081

27. Picauly I, Toy SM. Analisis Determinan Dan Pengaruh Stunting Terhadap Prestasi Belajar Anak Sekolah Di Kupang Dan Sumba Timur, NTT [The Determinant Analysis and the Impact of Stunting for School Children School Performance in Kupang and Sumba Timur, NTT]. J Gizi dan Pangan. 2013;8(1):55. DOI: 10.25182/jgp.2013.8.1.55-62

28. Rokom, Sehat Negeriku, 08 April 2018. Cegah Stunting dengan Perbaikan Pola Makan, Pula Asuh, dan Sanitasi [Prevent Stunting Through Improvements in Dietary Patterns, Parenting Practices, and Sanitation]. Retrieved: 28 June 2023 of https://sehatnegeriku.kemkes.go.id/baca/rilis-media/20180407/1825480/cegah-stunting-dengan-perbaikan-pola-

Journal of Community Medicine and Public Health Research
Vol. 05, No. 02, December 2024

Zaerozi et al.
Study of Bacteriological Content and Risk Factors

makan-pola-asuh-dan-sanitasi-2/

29. Mashar SA, Suhartono S, Budiono B. Faktor-Faktor yang Mempengaruhi Kejadian Stunting pada Anak: Studi Literatur [Factors Influencing the Incidence of Stunting in Children: A Literature Review]. J Serambi Eng. 2021;6(3):2076–84. https://ojs.serambimekkah.ac.id/jse/article/view/3119

30. Ministry of Health, Republic Health. Regulation of the Minister of Health of the Republic of Indonesia No 14 Tahun 2021 About Business Activities and Products in the Implementation of Risk-Based Business Licensing in the Health Sector. Ministry of Health of the Republic of Indonesia. 2021;455. https://www.kemkes.go.id/id/profil-kesehatan-indonesia-2021

31. Rah JH, Cronin AA, Badgaiyan B, Aguayo V, Coates S, Ahmed S. Household sanitation and personal hygiene practices are associated with child stunting in rural India: A cross-sectional analysis of surveys. BMJ Open. 2015;5(2). DOI: 10.1136/bmjopen-2014-005180

32. Nasyidah M, Fajar NA, Najmah N. Tinjauan Faktor Air dan Sanitasi dengan Kejadian Stunting pada Balita [A Review of Water and Sanitation Factors with child Stunting Incidence]. J Kesehat Komunitas. 2023;8(3):597–606. DOI:10.25311/keskom.Vol8.Iss3.1338

33. Rahmawati LA, Ranggauni Hardy F, Anggraeni A. Faktor-Faktor yang Berhubungan dengan Stunting Sangat Pendek dan Pendek pada Anak Usia 24-59 Bulan di Kecamatan Sawah Besar[Factors Associated with Short Stunting and Very Short Stunting in Children Aged 24-59 Months in Sawah Besar District]. J Ilm Kesehat Masy Media Komun Komunitas Kesehat Masy. 2020;12(2):68–78. DOI: 10.52022/jikm.v12i2.36

34. Minsarnawati M. Variasi Spasial dan Determinan Stunting pada Balita di Indonesia [Spatial Variation and Determinants of Stunting in Toddlers in Indonesia]. C H O R T S [Internet]. 2020;163(2):549–54. Available from: http://repository.unhas.ac.id/id/eprint/855/

35. Gani A, Budiharsana MP. The Consolidated Report on Indonesia Health Sector Review 2018. Minist Natl Dev Plan Repub Indones. 2019;56. https://www.unicef.org/indonesia/media/621/file/Health%20Sector%20Review%202019-ENG.pdf%20.pdf

36. Headey D, Palloni G. Water, Sanitation, and Child Health: Evidence From Subnational Panel Data in 59 Countries. Demography. 2019;56(2):729–52. DOI: 10.1007/s13524-019-00760-y

37. Uliyanti, Tamtomo DG., Anantanyu, S,. Faktor Yang Berhubungan Dengan Kejadian Stunting Pada Balita Usia 24-59 Bulan [Factors Associated with the Incidence of Stunting in Toddlers Aged 24-59 Months]. J Ilmu Kesehat. 2023;11(2):148. DOI: 10.30602/jvk.v3i2.107

38. Kesehatan JI, Husada S, Pratama B, Angraini DI, Nisa K. Literatur Review : Penyebab Langsung (Immediate Cause) yang Mempengaruhi Kejadian Stunting pada Anak [Literature Review: Immediate Causes Influencing the Incidence of Stunting in Children]. Jiksh [Internet]. 2019;10(2):299–303. Available from: https://akper-sandikarsa.e-journal.id/JIKSH https://jurnalsandihusada.polsaka.ac.id/JIKSH/article/view/167

39. Pratama IS, Aini SR, Maharani BF. Implementasi Gasing (Gerakan Anti Stunting) Melalui Phbs Dan Pemeriksaan Cacing [Implementation of Gasing (Anti-Stunting Movement) Through Healthy Living Behaviors and Deworming Checks]. J Pendidik dan

Journal of Community Medicine and Public Health Research
Vol. 05, No. 02, December 2024

Zaerozi et al.
Study of Bacteriological Content and Risk Factors

Pengabdi Masy. 2019;2(1):80–3. DOI: 10.29303/jppm.v2i1.1019

40. Otsuka Y, Agestika L, Widyarani, Sintawardani N, Yamauchi T. Risk factors for undernutrition and diarrhea prevalence in an urban slum in Indonesia: Focus on water, sanitation, and hygiene. Am J Trop Med Hyg. 2019;100(3):727–32.
DOI: 10.4269/ajtmh.18-0063

41. Kuewa Y, Herawati H, Sattu M, Otoluwa AS, Lalusu EY, Dwicahya B. The relationship between environmental sanitation and the incidence of stunting in toddlers in Jayabakti village in 2021. Public Heal J [Internet]. 2021;12(2):112–8. Available DOI: 10.51888/phj.v12i2.73

42. Ferronato N, Ragazzi M, Torrez Elias MS, Gorritty Portillo MA, Guisbert Lizarazu EG, Torretta V. Application of healthcare waste indicators for assessing infectious waste management in Bolivia. Waste Manag Res. 2020;38(1):4–18. DOI: 10.1177/0734242X19883690

43. Ihsan A, Riviwanto M, Darwel D. Pengaruh Sumber Air Bersih, Jamban, Dan Pola Asuh Terhadap Stunting Pada Balita Dengan Diare Sebagai Variabel Intervening [The Influence of Clean Water Sources, Sanitation Facilities, and Parenting Practices on Stunting in Toddlers with Diarrhea as an Intervening Variable]. Bul Keslingmas. 2020;39(1):1–5. https://ejournal.poltekkes-smg.ac.id/ojs/index.php/keslingmas/article/view/5619/1538

44. Hasan A, Kadarusman H, Sutopo A. Air Minum, Sanitasi, dan Hygiene sebagai Faktor Risiko Stunting di Wilayah Pedesaan [Drinking Water, Sanitation, and Hygiene as Stunting Risk Factors in a Rural Area]. J Kesehat. 2022;13(2):299–307. DOI: 10.26630/jk.v13i2.2984

45. Sema B, Azage M, Tirfie M. Childhood stunting and associated factors among irrigation and non-irrigation user northwest, Ethiopia: a comparative cross-sectional study. Ital J Pediatr. 2021;47(1):1–11. https://ijponline.biomedcentral.com/articles/10.1186/s13052-021-01048-x