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Analysis of Sensitive Interventions through Drinking Water Supply and Access to Sanitation in Accelerating the Reduction of Stunting in Sempung Polling Village, Lae Parira Subdistrict, Dairi Regency, 2023

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ABSTRAK

Kualitas air bersih dan sanitasi yang buruk merupakan faktor risiko signifikan untuk stunting, suatu kondisi di mana tinggi badan anak tidak sesuai dengan usianya. Secara global, 149,2 juta anak (22%) mengalami stunting pada tahun 2020, dengan Asia menyumbang jumlah kasus tertinggi (79 juta). Asia Tenggara memiliki prevalensi tertinggi kedua (27,4%) setelah Asia Selatan. Menurut Asian Development Bank (ADB), Indonesia menempati urutan kedua di Asia Tenggara untuk prevalensi stunting (31,8%). Kementerian Kesehatan Indonesia melaporkan bahwa pada November 2018, cakupan sanitasi di Indonesia sebesar 73,9%, dan pada tahun 2020, 94% fasilitas air minum telah dipantau. Di Kabupaten Dairi, prevalensi stunting pada tahun 2022 sebesar 13,53%, dengan 3.025 anak yang mengalami stunting. Tujuan Penelitian ini adalah untuk menganalisis faktor risiko yang terkait dengan akses air dan sanitasi. Penelitian ini menggunakan metode cross-sectional, dengan teknik purposive sampling, yang melibatkan sampel penelitian sebanyak 60 balita. Analisis bivariat dilakukan menggunakan uji chi-square dengan ȧ=0,05, dan analisis multivariat dilakukan menggunakan regresi logistik. Variabel yang paling signifikan berkontribusi terhadap kejadian stunting di Desa Sempung Polling, Kabupaten Dairi, adalah pengelolaan air minum yang buruk. Kontribusi koefisien beta (β) positif sebesar 3,115 dengan Exp (β) sebesar 3,627 menunjukkan bahwa pengelolaan air minum yang buruk di tingkat rumah tangga meningkatkan risiko stunting pada balita sebesar 3,7 kali.

Kata kunci: Intervensi Sensitif, Penyediaan air minum, Penyediaan akses sanitasi, Stunting

ABSTRACT

Poor water quality and sanitation are significant risk factors for stunting, a condition in which a child's height is not appropriate for his or her age. Globally, 149.2 million children (22%) were stunted in 2020, with Asia accounting for the highest number of cases (79 million). Southeast Asia has the second highest prevalence (27.4%) after South Asia. According to the Asian Development Bank (ADB), Indonesia ranks second in Southeast Asia for stunting prevalence (31.8%). Indonesia's Ministry of Health reported that in November 2018, sanitation coverage in Indonesia was 73.9%, and in 2020, 94% of drinking water facilities had been monitored. In Dairi Regency, the prevalence of stunting in 2022 was 13.53%, with 3,025 children experiencing stunting. The purpose of this study is to analyze the risk factors associated with water access and sanitation. This study uses a cross-sectional method, with a purposive sampling technique, which involves a research sample of 60 toddlers. Bivariate analysis was carried out using the chi-square test with ȧ=0.05, and multivariate analysis was carried out using logistic regression. The most significant variable contributing to the incidence of stunting in Sempung Polling Village, Dairi Regency, is poor drinking water management. The contribution of a positive beta coefficient (β) of 3.115 with an Exp (β) of 3.627 shows that poor drinking water management at the household level increases the risk of stunting in children under five by 3.7 times.

Keywords: Sensitive Interventions, Provision of drinking water, Provision of sanitation access, Stunting

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Introduction

Global data shows that 149.2 million children under five (22%) were affected by stunting in 2020, with Asia accounting for 79 million cases. Southeast Asia has a stunting prevalence of 27.4%, with Indonesia ranking second highest at 31.8%. According to the Ministry of Health of the Republic of Indonesia,

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the national prevalence of stunting reached 27.67%, placing Indonesia fifth globally. In 2020, only 57.8% of drinking water facilities in Indonesia were monitored, while access to safe drinking water was only 18.1%. Proper sanitation was available to 87.5% of households, but 9.36% of the 265 million population still practiced open defecation (OD). In Dairi Regency, the stunting prevalence in 2022 reached 13.53%, with 3,025 children under five affected. In Sempung Polling Village, which has 575 households, there were 30 stunted children, and 54 families still practiced open defecation.

This research aims to identify the risk factors for stunting related to clean water and sanitation in the village. The results of this study are expected to support the acceleration of stunting reduction efforts through the ITING ASI Movement, an innovative sensitive intervention in line with Presidential Regulation No. 72/2021 and Dairi Regent Regulation No. 1/2023. This research seeks to evaluate the relationship between drinking water supply, access to sanitation, and stunting among children under five in Sempung Polling Village, Lae Parira Subdistrict, Dairi Regency, and to design the ITING ASI Movement as an innovation in reducing stunting. The primary focus is to identify the risk factors for stunting related to drinking water treatment, bacteriological test results, physical water quality, ownership of toilets, as well as waste and garbage management.

This study uses a quantitative method with a cross-sectional approach and a total sampling technique, along with chi-square and logistic regression statistical analysis. By involving 30 stunted children, the results are expected to accelerate the reduction of stunting and develop the ITING ASI strategy, which can be adopted by the local government to improve the Stunting Management Index.

Methods

This study uses a cross-sectional design and was conducted in Sempung Polling Village, Dairi Regency, with a population of 200 children aged 1-5 years and a sample of 60 children (30%) selected using purposive sampling. The research took place from June to July 2024, with data collected through questionnaires, literature review, and observation. The collected data were processed through the stages of editing, coding, and data entry. The analysis was carried out univariately to describe the frequency distribution of variables, bivariately using the chi-square test to identify significant relationships between independent and dependent variables, and multivariately using logistic regression to analyze multiple variables simultaneously. The chi-square test was conducted at a significance level of $p>0.05$, and multivariate analysis used multiple logistic regression at a 95% confidence level to determine the influence of risk factors on stunting in children under five.

Result and Discussion

Administratively, Sempung Polling Village is located in Lae Parira Subdistrict, Dairi Regency, and is led by Mr. Juanda Saraan as the village head. Sempung Polling Village is one of the villages in Lae Parira Subdistrict, situated between Buluduri Village and Lumban Sihite Village. It consists of seven hamlets: Hamlet I Polling, Hamlet II Simaro, Hamlet III Sidumpe, Hamlet IV Batu Gualan, Hamlet V Takal Lae, Hamlet VI Sikapal-Kapal, and Hamlet VII Batu Marambit. The distance from Sempung Polling Village to the Subdistrict Government Center is 4 kilometers, while the distance to the capital of Dairi Regency is also 4 kilometers.

According to the Central Statistics Agency of Dairi Regency, the population of Sempung Polling Village in 2014 was 2,002 people. Most of the residents of Sempung Polling Village work as farmers.

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Table 1. Results Univariate Analysis of General Data on Stunting Incidents in Sempung Polling Village in 2023

Table 1
Univariate Analysis of General Data on Stunting Incidents in Sempung Polling Village in 2023

No	Variable	Amount	
		n	%
	Respondent		
1	Stunting	30	50.00
	Non-Stunting	30	50.00
	Age		
	20-30 Years	6	10.00
2	31-40 Years	37	61.70
	41-50 Years	12	20.00
	51-60 Years	5	8.30
	Number of Family Members		
3	2-3 Person	7	11.70
	4-5 Person	32	53.30
	>= 5 Person	21	35.00
4	**Income**		
	< 2500000	60	100.00
	Last Education		
5	SD	5	8.30
	SLTP	11	18.30
	SLTA	44	73.30
	Job		
6	Farmer	58	96.70
	Self-employed	2	3.30

Based on Table 1, the majority of respondents were aged 31-40 years (61.7%). Most families had 4-5 members (53.3%). Respondents' income was homogeneous, with the majority earning less than Rp. 2,500,000. The highest level of education among respondents was high school (73.3%), and the majority of respondents worked as farmers (96.7%).

Table 2. Results Univariate Analysis of Risk Factors for Stunting Incidence in Sempung Village Polling in 2023

Table 2
Univariate Analysis of Risk Factors for Stunting Incidence in Sempung Village Polling in 2023

No	Variable	Amount	
		n	%
1	**Physical Quality of Drinking Water**		
	Bad	21	35.00
	Good	39	65.00
2	**Drinking Water Treatment**		
	Bad	41	68.30
	Good	19	31.70
3	**Waste Processing**		
	Bad	45	75.00
	Good	15	25.00
4	**Wastewater Processing**		
	Bad	46	76.70
	Good	14	23.30
5	**Toilet Ownership**		
	Bad	45	75.00
	Good	15	25.00

Based on Table 2, 65% of respondents had drinking water with good physical quality, while 68.3% of respondents had poor drinking water treatment practices. As many as 75% of respondents had poor waste management practices. Additionally, 76.7% of respondents had poor wastewater management, and 75% of respondents had inadequate toilet facilities.

Table 3. Results Bivariate Analysis of Risk Factors for Stunting Incidence in Sempung Village Polling in 2023

Variable	Amount				Total		*p-value*	PR
	Stunting (n)	%	Non-Stunting (n)	%	n	%		
Physical Quality of Drinking Water								
Bad	16	76.2%	5	23.8%	21	100%		2.1
Good	14	35.9%	25	64.1%	39	100%	0.003	
Drinking Water Treatment								
Bad	28	68.3%	13	31.7%	41	100%		6.5
Good	2	10.5%	17	89.5%	19	100%	0.000	
Waste Processing								
Bad	15	33.3%	30	66.7%	45	100%		0.3
Good	15	100%	0	0%	15	100%	0.000	
Wastewater Processing								
Bad	28	60.9%	18	39.1%	46	100%		4.3
Good	2	14.3%	12	85.7%	14	100%	0.002	
Toilet Ownership								
Bad	21	46.7%	24	53.3%	45	100%	0.371	0.8
Good	9	60.0%	6	40.0%	15	100%		

a. Physical Quality of Drinking Water

Based on Table 3, the p-value is (0.003) < 0.05, which means there is a significant relationship between the physical quality of drinking water and the incidence of stunting in children. The prevalence of stunting in children with poor drinking water quality is 2.1 times higher compared to children with good drinking water quality.

b. Drinking Water Treatment

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Based on Table 3, the p-value is (0.000) < 0.05, which indicates a significant relationship between drinking water treatment and the incidence of stunting in children. The prevalence of stunting in children with poor drinking water treatment is 6.5 times higher compared to those with good drinking water treatment.

c. Waste Management

Based on Table 3, the p-value is (0.000) < 0.05, which indicates a significant relationship between waste management and the incidence of stunting in children. The prevalence of stunting in children with poor waste management is 0.3 times higher compared to those with good waste management.

d. Wastewater Management

Based on Table 3, the p-value is (0.002) < 0.05, which means there is a significant relationship between wastewater management and the incidence of stunting in children. The prevalence of stunting in children with poor wastewater management is 43 times higher compared to those with good wastewater management.

e. Toilet Ownership

Based on Table 3, the p-value is (0.371) > 0.05, which means there is no significant relationship between toilet ownership and the incidence of stunting in children.

Table 4. Results Microbiology Examination Results of Water In Sempung Village Polling 2023

Tabel 3
Microbiology Examination Results of Water In Sempung Village Polling 2023

No	Variable	Hasil		
		Maximum Level	Examination Result	
			MS	TMS
	Parameter			
1	E.Coli (CFU/100 ml)	0	0	30
2	Total Coliform CFU/100 ml)	0	0	30

Based on Table 4., the microbiological examination results of water from 30 respondents with stunted children in Sempung Polling Village, Dairi Regency, showed that the water did not meet the required standards. The levels of E. Coli (CFU/100 ml) and Total Coliform (CFU/100 ml) exceeded the maximum permissible limit, which is 0 (zero).

Table 5. Results Multivariate Analysis of Risk Factors for Stunting Incidence in Sempung Village Polling in 2023

Tabel 4
Multivariate Analysis of Risk Factors for Stunting Incidence in Sempung Village Polling in 2023

	Variabel	B	S.E.	Wald	df	Sig.	Exp (B)	95% C.I for EXP (B)	
								Lower	Upper
STEP 1a	Physical Quality of Drinking Water	1.769	.814	4.727	1	.030	5.864	1.190	28.884
	Drinking Water Treatment	3.115	.932	11.172	1	.001	22.534	3.627	140.000
	Wastewater Management	2.480	.971	6.522	1	.011	11.937	1.780	80.045
	Constant	9.877	2.495	15.669	1	.000	.000		

Based on table 5, a multivariate analysis was obtained which showed that poor drinking water treatment with stunting incidents gave the highest positive contribution to the incidence of Stunting. The positive beta coefficient (β) contribution was 3.115 with Exp (β) of 3.627. The results of this analysis indicate that poor drinking water treatment methods in households have a 3.7 times risk of toddlers experiencing Stunting.

Discussion

Bivariat Analysis

1. Physical Water Quality and Stunting Incidence

Research shows a significant relationship between poor physical water quality and stunting in children, with a p-value of 0.003 (< 0.05). The prevalence of stunting among children consuming water with poor physical quality is 2.1 times higher than those consuming good quality water. This aligns with the study by Nisa et al. (2021), which found a significant link between drinking water's physical quality and stunting incidence, with a p-value of 0.047. The main factors affecting water quality include murky and bad-tasting water (Khoirun Nisa & Sukesi, 2022).

However, contrary results were reported by Sulung et al. (2024), with a p-value of 0.264, indicating no significant relationship between physical water quality and stunting. Similarly, Wasila Datunsolang et al. found that 53.8% of stunted children used water that met physical

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quality standards, while 14.6% of non-stunted children used water that did not meet the standards. Their chi-square test yielded a p-value of 0.002 (< 0.05), indicating a significant relationship between clean water and stunting.

2. Water Treatment and Stunting Incidence

There is a significant relationship between water treatment and stunting, with a p-value of 0.000 (< 0.05). Poor water treatment practices lead to a 6.5 times higher risk of stunting in children. This finding is consistent with a study by Nurpatwa Wilda Ningsi et al., where a p-value of 0.018 confirmed a significant correlation between water treatment and stunting incidence. Research by Sarnili et al. also highlighted that 60.4% of children with untreated water were stunted compared to 14.6% of children whose water was treated, with a p-value of 0.000.

3. Waste Management and Stunting Incidence

Waste management practices also significantly correlate with stunting, with 75% of respondents reporting poor waste management practices and a p-value of 0.000. Poor waste management practices lead to a 0.3 times higher risk of stunting compared to good practices. This is supported by research from Yuliani Soeracmad et al. (2019), which found a significant relationship between household waste management and stunting, with a p-value of 0.000. Junanda et al. (2022) also found a similar relationship, with poor waste management linked to stunting risk in Samarinda (p=0.000).

4. Wastewater Management and Stunting Incidence

Poor wastewater management was reported by 76.6% of respondents, with a p-value of 0.002, indicating a significant relationship between wastewater management and stunting incidence. Soeracmad et al. (2019) also reported a significant link between poor household wastewater systems and stunting (p=0.000). Junanda et al. (2022) found that poor wastewater management was more dominant in stunted children (92.1%), with a significant relationship (p=0.000). This is consistent with Sukmawati et al. (2021), who noted that improper wastewater management contaminates clean water sources and increases infection risks, leading to stunting.

5.Microbiological Water Examination

Among 30 respondents with stunted children, water samples tested from Desa Sempung Polling, Kabupaten Dairi, did not meet microbiological standards, as both E. coli and Total Coliform levels exceeded the permissible limit (0 CFU/100 ml). Contamination by E. coli can lead to gastrointestinal diseases like diarrhea, which in turn can impair nutrient absorption and contribute to growth failure, potentially causing stunting. Water Treatment Methods to Address Microbiological Contamination:

- Chlorination: Adding chlorine to water to kill bacteria and pathogens. This method is effective, low-cost, and easy to implement, but requires regular monitoring.
- Ozonization: Using ozone gas (O_3) to disinfect water. It is highly effective against various pathogens without leaving harmful residues but requires specialized equipment.
- UV Treatment: Ultraviolet light is used to damage microbial DNA, preventing reproduction. It is effective without chemicals but requires clear water for optimal performance.
- Membrane Filtration: Physically removing bacteria using microfiltration or ultrafiltration membranes. This method is chemical-free but requires regular maintenance.
- Reverse Osmosis (RO): Uses a semi-permeable membrane to remove most contaminants, including bacteria. It is effective but costly and produces wastewater.
- Distillation: Involves heating water to produce steam and condensing it, leaving contaminants behind. It removes most contaminants but is slow and energy-intensive.

Multivariate Analysis

The results of the multivariate analysis indicate that poor drinking water treatment in households increases the risk of stunting in children under five by 3.7 times. This finding is consistent with the research conducted by Khairul Anwar et al., 2022, where a p-value of 0.026 was obtained. Before drinking water is consumed, it must be ensured that it is safe and has undergone proper

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treatment to prevent diseases, one of which is by boiling the water until it reaches a rolling boil. Boiling water serves to kill pathogens that contaminate the water. The temperature required for boiling to remove contamination is 100˚C.

The recommended boiling time is 5 minutes to ensure its effectiveness in killing pathogens. After the water has been treated, it should be stored in a covered container with a narrow neck, placed in a clean area, and kept out of the reach of animals. It is advisable to clean the drinking water container when the water runs out or after three days, with the final rinse using treated water (Anwar, SGz, MSi & Indria Setyani, 2022).

Based on research findings, boiling household drinking water until it reaches a full boil has been proven to kill microorganisms present in the water. Boiling water is a simple and affordable method that can improve the microbiological quality of drinking water and reduce the incidence of diarrhea. Water treatment through filtration and disinfection is usually performed in the processing of refillable water (Directorate of Health Care and Rehabilitation, Kemenkumham RI, 2018). The filtration process aims to separate water from solid and colloidal mixtures, including microorganisms in the water, while the disinfection process aims to kill microorganisms that are not filtered out. This ensures that pathogenic bacteria in drinking water are eliminated before consumption (Kemenperin, 2011).

Conclusion

The risk factors for stunting in Desa Sempung Polling, Kabupaten Dairi, can be summarized as the consumption of untreated or inadequately treated drinking water by infants. It is hoped that the Health Department of Kabupaten Dairi, through Puskesmas Kentara, in collaboration with the Head of Desa Sempung Polling, assisted by environmental health cadres, can enhance education for mothers of infants through a workshop aimed at increasing the capacity of cadres. The goal is to monitor the community's consumption of drinking water, ensuring that it is stored in closed containers and boiled before consumption. To address the issue of water quality inspection results exceeding the maximum permissible level, the method of choice is chlorination by adding chlorine (in the form of chlorine gas, sodium hypochlorite, or calcium hypochlorite) to the water to kill pathogenic bacteria and microorganisms. This method is highly effective, relatively inexpensive, and easy to implement.

Conflict of Interest

There was no conflict of interest in this research.

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