

Relationship between Environmental Sanitation and Incidence of Diarrhea among Children Under Five in Alak Health Center, Kupang, East Nusa Tenggara

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ABSTRACT

Background: Diarrhea is an occurrence of mushy to liquid bowel movements, with a frequency of 3 times or more in a day. Diarrhea is influenced by several factors that directly or indirectly include agent, host, and environmental factors. Environmental sanitation factors are the most dominant factors causing diarrhea, namely drinking water sources, latrine conditions, garbage disposal conditions, and waste drain conditions. Alak Community Health Center is one of the community health centers with the highest cases of diarrhea with a total of 557 cases in 2018, 428 cases in 2019, and 296 cases in 2020. This study aims to determine the correlation between environmental sanitation and the incidence of diarrhea in children under five in the working area of the Alak Community Health Center, Kupang City.

Subjects and Method: A quantitative study with a cross-sectional design conducted in the working area of the Alak community health center, Kupang, East Nusa Tenggara in November-December 2022. A total of 93 children under five were selected by simple random sampling. The dependent variable was the incidence of diarrhea in children under five. The independent variables were raw water sources, latrine conditions, garbage disposal conditions, and wastewater disposal conditions. The data were collected using questionnaires and analyzed using chi-square tests.

Results: There was a significant association between raw water sources ($p < 0.001$), latrine conditions ($p < 0.001$), landfills ($p < 0.001$), and wastewater disposal ($p = 0.001$) to the incidence of diarrhea in children under five.

Conclusion: There is a correlation between raw water sources, latrine conditions, garbage disposal, and wastewater disposal to the incidence of diarrhea in children under five.

Keywords: diarrhea, environmental sanitation, children under five.

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BACKGROUND

Diarrhea is an occurrence of mushy to liquid bowel movements, with a frequency of 3 times or more in a day. Diarrheal

disease is an endemic disease in Indonesia and is also a potential disease of Extraordinary Events (KLB) that can cause death with a percentage of deaths in children

under five in 2020 of 4.55% (Ministry of Health Indonesia, 2020). The handling and management of sanitation (preventive effort) is becoming increasingly complex with the increasing population and the scarcity of consumable water. Population growth has led to the development of settlements, the narrowing of land available for housing, limited land for the establishment of sanitation facilities such as public bathing, washing, and toilet facilities, pit privy, septic tanks, and their absorption area as well as domestic waste management. On the other hand, health services by the government have so far prioritized curative efforts (treatment) (Ministry of Health Indonesia, 2020).

According to the health profile of East Nusa Tenggara, there has been an increase in diarrhea cases in children under five over the past three years, with the number of cases is 110,122 cases in 2018, 147,510 cases in 2019, and decreasing to 83,574 cases in 2020 (East Nusa Tenggara Health Office, 2020). The number of cases discovered in Alak Community Health Center is 557 cases in 2018, 428 cases in 2019, and 296 cases in 2020 (Kupang Health Office, 2020).

Alak Community Health Center has a service area that includes 6 villages, with the highest number of diarrhea cases in children under five found in Alak Village in 2021 as many as 59 cases, followed by Namosain Village as many as 41 cases, Nunbaun Dela Village as many as 18 cases, Nunbaun Sabu Village as many as 15 cases, Penkase Village as many as 12 cases, and Nunhila Village as many as 7 cases (Alak Health Center, 2021).

Diarrhea is influenced by several factors that directly or indirectly include agent, host, and environmental factors. Environmental sanitation factors are the most dominant factors causing diarrhea, namely raw water sources, latrine condi-

tion, garbage disposal condition, and wastewater sewer conditions (Siregar, 2021).

A previous study conducted by (Dhone, 2015) reveals that there is a correlation between drinking water sources and the incidence of diarrhea in children under five in the Bajawa City Community Health Center Working Area. A study conducted by (Boa, 2016) shows that there is a correlation between the condition of family latrines and the incidence of diarrhea in children under five in Tendakinde Village, Wolowae Sub-District, Nagekeo Regency. A previous study conducted by (Rizki, 2019) conveys that there is a significant correlation between the condition of garbage disposal and wastewater disposal with the incidence of diarrhea in children under five in Hutaimbaru Village, Padangsidempuan City.

Based on the results of preliminary observations of 10 respondents in the Alak Community Health Center work area, several houses have not met good environmental sanitation, for drinking water sources 30% use well water, 60% use bottled water/water from the public water system and 10% use well water and bottled water/tap water (water from public water system), a source of drinking water derived from open wells. 60% of the latrine's conditions were qualified, some others were in a dirty and smelly condition. 40% of the garbage disposal conditions were qualified, and some others dispose their garbage in the river and on the land next to their houses, and 60% of the wastewater disposal conditions were qualified, some others directly discharged into rivers and sewers on the side of the road.

The result of interviews with officers at the Alak community health center was that the cause of diarrhea was largely due to poor environmental sanitation. This study aims to analyze the correlation between

environmental sanitation and the incidence of diarrhea in children under five in the Alak community health center Working Area, Kupang City.

SUBJECTS AND METHOD

1. Study Design

It was a quantitative study using analytical survey study methods with cross-sectional research designs. The study was located in Alak Community Health Center Working Area and was conducted in November-December 2022.

2. Population and Sample

The population in this study was all children under five in Alak Community Health Center working area, with a total of 2,856 children in 2022. The sample in this study was 93 respondents. The study used a simple random sampling technique.

3. Study Variables

The dependent variable is the incidence of diarrhea in children under five. The independent variables were raw water sources, latrine conditions, garbage disposal conditions, and wastewater disposal conditions.

4. Operational Definition of Variables

The incidence of diarrhea in children under five is children under five who suffer from diarrhea with liquid defecation and is even possible in the form of merely water for more than three times a day in the last 3 months.

Raw water source is a source of water that is used for daily consumption by previously conducting the treatment process, including filtered bottled water, and tap water (public water system).

Latrine condition is a latrine building qualified as a healthy latrine. Such as its distance from the clean water source, inaccessible by vectors, easy to use and clean, odorless, and not polluting the surface.

Garbage disposal condition is the state of a household garbage disposal that is

qualified such as having a trash can, a trash can with a lid, easy to clean, inaccessible by vectors, and waterproof.

Wastewater disposal condition is the condition of the building used to dispose of wastewater in bathrooms, washing stations, kitchens, and others excluding latrines or toilets, that is qualified such as having a wastewater treatment system, with a lid, flowing smoothly, not causing odor.

5. Study Instruments

The instruments used in this study included: questionnaires to measure the incidence of diarrhea in children under five, observations, checklist sheets, and a camera to document the study process.

6. Data Analysis

The data analysis used were univariate and bivariate analysis using statistical tests assisted by SPSS 16.0. The hypothesis test used was the Chi-Square test with $\alpha = 0.05$.

RESULTS

1. Sample Characteristic

Table 1 showed that most respondents had raw water sources from tap water/public water systems (45.2%), unqualified latrine conditions (86.0%), unqualified garbage disposal conditions (88.2%), and unqualified wastewater disposal conditions (89.2%).

The distribution of respondents was based on the incidence of diarrhea in children under five, who experienced diarrhea events with a total of (62.4%).

Based on table 2, the results of bivariate analysis using the Chi-square test obtained results that there was a significant correlation between raw water sources ($p < 0.001$), the conditions of latrines ($p < 0.001$), garbage disposals ($p < 0.001$), and wastewater disposals ($p = 0.001$) and the incidence of diarrhea in children under five.

Table 1. Distribution of Respondents Based on Raw Water Sources, Latrine Conditions, Garbage Disposal Conditions, Wastewater Disposal Conditions, and Diarrhea Incidence in Children under five.

Study Variables	Categories	Frequency (n)	Percentage (%)
Raw Water Source	Bottled Water	30	32.3
	Tap Water	42	45.2
	Dug-well Water	21	22.6
Latrine Condition	Unqualified	80	86
	Qualified	13	14
Garbage Disposal	Unqualified	82	88.2
	Qualified	11	11.8
Wastewater Disposal	Unqualified	83	89.2
	Qualified	10	10.8
Diarrhea Incidence	Diarrhea	58	62,4
	Non-Diarrhea	35	37,6

2. Bivariate Analysis

Table 2. Correlation of Raw Water Sources, Latrine Conditions, Garbage Disposal Conditions, Wastewater disposal Conditions, and the Incidence of Diarrhea.

Variables	Diarrhea		Non-Diarrhea		p
	(n)	(%)	(n)	(%)	
Raw Water Sources					<0.001
Bottled Water	14	46.7	16	53.3	
Tap Water	23	54.8	19	45.2	
Dug-well Water	21	100	0	0	
Latrine Conditions					<0.001
Unqualified	57	71.3	23	28.7	
Qualified	1	7.7	12	92.3	
Garbage Disposal Conditions					<0.001
Unqualified	57	69.5	25	30.5	
Qualified	1	9.1	10	90.9	
Wastewater Disposal Conditions					0.001
Unqualified	57	68.7	26	31.3	
Qualified	1	10	9	90	

DISCUSSION

1. Raw Water Sources

Based on the results of the Chi-Square test analysis of raw water sources with the incidence of diarrhea in children under five indicating a $p < 0.001$, thus it can be concluded that there was a significant correlation between raw water sources and the incidence of diarrhea in children under five in Alak Health Center working area of Kupang City. The results of this study showed that most respondents used raw water sources from public water sys-

tems/tap water, with a total of 42 respondents (45. 2%). Based on the results of the interview, some respondents had the habit of cooking water to boil and storing it in a clean and closed container. However, most respondents claimed that they did not cook the raw water they took from dug wells and public water system/water before drinking (38. 1%), and the distance between the well and the raw water source was also less than 10m (3303%) and respondents who used water from bottled water usually stored their drinking water containers in open

places, therefore surface water was easily polluted, both by soil, garbage, and others that generate diarrhea.

The results of the observations and interview indicated that the incidence of diarrhea in children under five with respondents who had water from bottled water, public water system/tap water, and dug wells was 58 respondents (62.4%). Pollution that comes from both garbage, and household wastewater that enters through groundwater will affect the condition of the water to be consumed. People were suggested to pay attention to the source of raw water to be used for daily needs, however only some of them followed it, and some others did not.

The results of this study are in line with research conducted by (Izati, 2017) showing that there is a correlation between raw water sources and the incidence of diarrhea in children under five in the Kedaton Community Health Center working area of Bandar Lampung City in 2017 where the $p = 0.003$. This study explains that the distance between the well and the source of raw water is less than 10m and it is polluted by the waste from factory and domestic waste in the form of fecal waste, washing water, and garbage that permeate through groundwater that can affect the quality of the water to be consumed. Water is a means to improve public health rates because water is part of the transmission media of various kinds of diseases. Therefore, the physical quality of water is very influential in the incidence of diarrhea in children under five in the working area of the Kedaton Health Center, Bandar Lampung City.

2. Latrine Conditions

The results of the Chi-Square test analysis regarding the condition of the latrine with the incidence of diarrhea in children under five showed $p < 0.001$, thus it can be con-

cluded that there is a significant correlation between the condition of the latrine and the incidence of diarrhea in children under five in Alak Community Health Center working area, Kupang City. The results of this study showed that some respondents (86.0%) had the unqualified condition of the latrines. This is because some respondents had latrines with conditions of the latrine that generated an unpleasant odor, it was very likely that the latrines were contaminated with bacteria that cause diarrhea and some of the respondents' latrines were still accessible by vectors such as insects (flies, cockroaches) and rats.

Based on the results of observations and interviews, it was revealed that the incidence of diarrhea in children under five was most discovered among respondents who had an unqualified category of latrines, namely 57 respondents (71.3%). The dirty condition of the latrine building was accessible by vectors of diarrheal disease which would then indirectly contaminate food and drink. In addition, the distance between the pit privy and a clean water source or well was less than 10 meters (18.8%), and it would cause diarrheal disease germs from feces to contaminate the source of clean water daily used by people.

The community-based total sanitation program from Alak Community Health Center suggested the community to make qualified latrines, to always pay attention to the cleanliness of the latrines to avoid unpleasant odors and the surface of the soil that is polluted by human waste. What happened was that people only made latrines but did not pay attention to health requirements, the distance between the latrine and the water source was less than 10 meters, and the latrine was difficult to clean, causing an unpleasant odor. It happened due to the respondents' occupation that mostly were housewives (64.5%) and

also considering the last education, most respondents were high school graduates (54.8%) letting people unable to pay attention to what qualified latrine conditions is like.

The results of this study are in line with a study conducted by (Dama, 2018) that there is a significant correlation between latrine, work, and education conditions with the incidence of acute diarrhea in children under five in the Batutua Community Health Center working area where the $p = 0.013$. This study explains that work and education level can influence a person to think further in paying attention to the hygiene conditions of the latrine and it can also cause environmental-based diseases such as acute diarrhea.

3. Garbage Disposal Conditions

The results of the Chi-Square test analysis regarding the condition of the garbage disposal with the incidence of diarrhea in children under five in the working area revealed a value of $p < 0.001$, thus it can be concluded that there was a significant correlation between the condition of the garbage disposal and the incidence of diarrhea in children under five in Alak Community Health Center, working area, Kupang City. The results of this study showed that some respondents (88.2%) had unqualified garbage disposal conditions. It was because some respondents had unqualified garbage cans such as without lids, non-waterproof, and some respondents did not have garbage cans, so it was a good place for the development of disease-causing vectors.

Based on the results of observations and interviews, it was indicated that the incidence of diarrhea in children under five was most found in respondents who had garbage disposal conditions with the category of unqualified, with a total of 57 respondents (69.5%). Some respondents did

not have a garbage can, and some had non-waterproof and unlined garbage cans and were located not far from the place to eat and food storage. The condition of the landfill has a biological effect, especially organic waste that is easy to rot, which is a place for microorganism's breeding nest and causes odors that attract some vectors of diseases and pests. The generated impact in diseases such as diarrhea, cholera, and typhus due to uncontrolled garbage can conditions.

The condition of the garbage disposal owned by some respondents did not meet the health requirements. Based on the findings in Alak Health Center working area, the community has made health promotion efforts concerning diarrheal diseases, one of which was by not littering, also always providing qualified garbage cans in every house, but these efforts were only applied by some people, while others continued to litter around their houses, on the beach, and in the brooks.

The results of a study conducted by (Aina & Desi, 2018) showed that as many as 60% of children under five affected by diarrhea did not have a qualified garbage disposal. This study explained that respondents still did not have qualified garbage cans, where the requirement for good garbage disposal is a lined and waterproof garbage can.

4. Wastewater Conditions

The results of this study showed the correlation of wastewater disposal with the incidence of diarrhea in children under five $p = 0.001$. These results discovered that most households had unqualified wastewater disposal. It was because some of the sewers were still open. Wastewater is directly disposed through the sewers around the house and causes an unpleasant odor and becomes a breeding nest for disease-causing vectors. In addition, the large amount

of garbage piling in the wastewater sewer also resulted in a clogged sewer.

Based on the results of observations and interviews, it was discovered that the incidence of diarrhea in children under five was most commonly found in respondents who had unqualified wastewater disposal conditions, with a total of 57 respondents (68.7%). Unqualified wastewater disposal conditions such as polluting clean water sources, causing puddles that can be used for mosquito nests (should be equipped with a fairly tight lid), generating odors (should be equipped with a fairly tight lid), causing muddy or unpleasant views (not leaking until overflowing) which could worsen the quality of the discharged water that will pollute water bodies. This can make it easier to place vectors that can cause diarrheal diseases.

People have been suggested to have wastewater sewerage to manage the waste generated in daily life so as not to cause puddles, not generate unpleasant odors, and avoid disease-causing vectors. Unfortunately, community participation in creating wastewater sewers for daily life was low. Based on the results of the investigation conducted by the researchers in Alak health center working area, information, and education about the good and proper type of wastewater sewer had been carried out but were not running properly.

The results of this study are in line with a study conducted by (Ibrahim, 2020) that there is a correlation between the condition of wastewater disposal and the incidence of diarrhea in children under five. The condition of wastewater disposal is one of the pollution media and is also a breeding nest for vectors that cause diarrhea. Another study conducted by (Langit, 2016). Reveals that there is a correlation between the condition of wastewater disposal and the incidence of diarrhea in children under

five in the working area of Rembang 2 Community Health Center. This study explains that respondents still use the land around the house to dispose of wastewater and the sewer they have does not smoothly flow, is still open, and generates odors.

AUTHOR CONTRIBUTION

Dahniar Salsabiella Djaba was the main researcher, Johny A. R Salmun, Amelya Betsalonia Sirini contributed to giving feedback dan mentoring in data collection, data analysis, and the writing of the manuscript for publication.

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CONFLICT OF INTEREST

There is no conflict of interest in this study.

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