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Analysis of Environmental and Behavioral Factors Affecting the Incident of Diarrhea in Children Under Five

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Abstract

Background : Diarrhea remains a common health problems among children under five years of Its age occurrence is associated with environmental and family behavioral factors , particularly water quality , sanitation , waste management , hand hygiene , and childcare hygiene practices . Young children are particularly important vulnerable to the effects of diarrhea because fluid loss can occur rapidly . Objective : To analyze environmental and behavioral factors associated with diarrhea among children under five years of age . Methods : This analytical quantitative study used a cross-sectional design . A total of 115 mothers or primary caregivers of children under five were selected using purposive sampling. Independent variables included water quality , latrine conditions , waste management , hand hygiene , and family hygiene behavior . The dependent variable was the occurrence of diarrhea within the previous month . Data were collected using questionnaires and environmental observation sheets . Data were analyzed using univariate and bivariate analyses with the Chi- square test . Results : Thirty-eight children (33.0%) had experienced diarrhea within the previous month . Poor water quality was found among 35 respondents (30.4%), inadequate latrine conditions among 31 respondents (27.0%), poor waste management among 43 respondents (37.4%), inadequate hand hygiene among 40 respondents (34.8%), and poor family hygiene behavior among 36 respondents (31.3%). Significant associations were found between water quality ($p = 0.008$), latrine conditions ($p = 0.014$), waste management ($p = 0.021$), hand hygiene ($p = 0.003$), and family hygiene behavior ($p = 0.001$) and diarrhea occurrence among children under five . Conclusion : Environmental and behavioral factors are associated with diarrhea among children under five . Prevention efforts should focus on improving access to safe water and sanitation and strengthening family hygiene practices .

Keywords : Children Under Five , Diarrhea , Environment , Hygiene , Sanitation .

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1. Introduction

Diarrhea is a health problem that is still common in children, especially toddlers. Diarrhea is characterized by increased bowel movement frequency and changes in stool consistency, which can lead to fluid and electrolyte loss (World Health Organization [WHO], 2024; UNICEF & WHO, 2009). Toddlers are a vulnerable group to complications from diarrhea. Significant fluid loss can lead to dehydration, which, if not treated appropriately, can lead to more serious conditions (Lamberti et al., 2012; Lanata et al., 2013).

The incidence of diarrhea in toddlers is not only related to individual factors, but also influenced by the living environment and family behavior. An environment that does not meet health principles can increase the risk of contamination by disease-causing microorganisms (Prüss-Ustün et al., 2014; WHO, 2018). Water is a crucial factor in preventing environmental-based diseases. Water used for drinking, cooking, and cleaning dishes must be of safe quality. Contaminated water can transmit various microorganisms that cause diarrhea (Ashbolt, 2004; Fewtrell et al., 2005; WHO & UNICEF, 2023).

Toilet sanitation also plays a role in breaking the chain of disease transmission. Open defecation can lead to soil and water source contamination, increasing the risk of pathogen transmission via the fecal-oral route (Clasen et al., 2014; WHO, 2018). Poor household waste management can also create an environment conducive to the growth of flies and disease-carrying organisms. Poorly managed waste can increase the risk of food and environmental contamination (Prüss-Ustün et al., 2014; WHO, 2018).

In addition to environmental factors, family behavior is also crucial. The habit of washing hands with soap at key times, such as before preparing food, before feeding children, after defecating, and after cleaning up after a child has defecated, is one behavior that can help reduce disease transmission (Freeman et al., 2014; Pickering et al., 2011; WHO & UNICEF, 2021). Hygiene practices in toddler care also have an impact. Cleanliness of eating utensils, food hygiene, food storage, and personal hygiene are all important behaviors to consider (Strina et al., 2003; Freeman et al., 2014).

Preventing diarrhea in toddlers thus requires a comprehensive approach. Environmental improvements without behavioral changes may be suboptimal, and behavioral changes will be difficult to sustain if the environment is not supportive (Fewtrell et al., 2005; Prüss-Ustün et al., 2014). Based on this description, this study aims to analyze environmental and behavioral factors related to the incidence of diarrhea in toddlers..

2. Research Methods

The study used a quantitative analytical design with a *cross-sectional approach* . Measurements of environmental factors, behavior, and diarrhea incidence were conducted during the same study period. The research was conducted in the working area of a community health center with a large toddler population. Data collection was conducted after obtaining permission from the relevant parties and complying with research ethics requirements.

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The research population was mothers or primary caregivers of toddlers living in the research area. The sample size was 115 mothers/carers of toddlers . The sampling technique used was *purposive sampling* .

Research Instruments use of questionnaires and observation sheets. Data collection was carried out through interviews with mothers/caregivers and observations of home environmental conditions. The researcher first explained the research objectives. Respondents who agreed to participate in the study provided consent before data collection.

Data analysis using the Chi- square test. Variables with a *p -value* <0.25 can be considered for multivariate analysis using logistic regression. significance level was set at $p < 0.05$. The research pays attention to the principles of informed consent, confidentiality of identity, anonymity, freedom of respondents to refuse, and use of data only for research purposes.

3. Result and Discussion

a. Result

Table 1. Characteristics of Toddlers And Caregivers (n=115)

Characteristics	Frequency	Percentage (%)
Toddler age		
12–23 months	38	33.0
24–35 months	41	35.7
36–47 months	22	19.1
48–59 months	14	12.2
Gender		
Man	59	51.3
Woman	56	48.7
Caregiver education		
Base	31	27.0
Intermediate	67	58.3
Tall	17	14.8

The majority of toddlers aged 24–35 months, 41 children (35.7%), were male. Based on gender, 59 toddlers (51.3%) were male.

Table 2. Distribution Of Environmental And Behavioral Factors

Variables	Category	n	%
Water quality	Good	80	69.6
	Not enough	35	30.4
Toilet conditions	Good	84	73.0
	Not enough	31	27.0
Waste management	Good	72	62.6
	Not enough	43	37.4
Hand hygiene	Good	75	65.2
	Not enough	40	34.8
Hygiene behavior	Good	79	68.7
	Not enough	36	31.3

The factor that was most often in the less category was waste management, namely 43 respondents (37.4%).

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Table 3. Distribution of diarrhea incidence in toddlers

Diarrhea incident	n	%
Diarrhea	38	33.0
No diarrhea	77	67.0
Total	115	100.0

A total of 38 toddlers (33.0%) were reported to have experienced diarrhea in the last month.

Table 4. Relationship Between Water Quality And Diarrhea Incidence

Water quality	Diarrhea	No diarrhea	Total	*p*
Good	20 (25.0%)	60 (75.0%)	80	0.008
Not enough	18 (51.4%)	17 (48.6%)	35	

There is a significant relationship between water quality and the incidence of diarrhea ($p = 0.008$).

Table 5. Relationship Between Toilet Conditions And Diarrhea Incidence

Toilet conditions	Diarrhea	No diarrhea	Total	*p*
Good	24 (28.6%)	60 (71.4%)	84	0.014
Not enough	14 (45.2%)	17 (54.8%)	31	

There was a significant relationship between latrine conditions and the incidence of diarrhea ($p = 0.014$).

Table 6. Relationship Between Waste Management And Diarrhea Incidence

Waste management	Diarrhea	No diarrhea	Total	*p*
Good	19 (26.4%)	53 (73.6%)	72	0.021
Not enough	19 (44.2%)	24 (55.8%)	43	

There is a significant relationship between waste management and the incidence of diarrhea ($p = 0.021$).

Table 7. Relationship Between Hand Hygiene And The Incidence Of Diarrhea

Hand hygiene	Diarrhea	No diarrhea	Total	*p*
Good	18 (24.0%)	57 (76.0%)	75	0.003
Not enough	20 (50.0%)	20 (50.0%)	40	

There was a significant relationship between hand hygiene and the incidence of diarrhea ($p = 0.003$).

Table 8. Relationship Between Hygiene Behavior And Diarrhea Incidence

Hygiene behavior	Diarrhea	No diarrhea	Total	*p*
Good	17 (21.5%)	62 (78.5%)	79	0.001
Not enough	21 (58.3%)	15 (41.7%)	36	

There is a significant relationship between family hygiene behavior and the incidence of diarrhea ($p = 0.001$).

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b. Discussion

The study results showed that 33.0% of toddlers experienced diarrhea in the past month. This indicates that diarrhea remains a problem that requires attention within the family environment. Toddlers are more susceptible to fluid loss (Lamberti et al., 2012; Lanata et al., 2013). Therefore, diarrhea prevention and treatment should be initiated as early as possible, including ensuring adequate fluid intake and seeking help if any warning signs appear (WHO, 2024; UNICEF & WHO, 2009; Walker & Black, 2010).

The study results showed a link between water quality and diarrhea incidence. The prevalence of diarrhea was higher in toddlers from households with poor water quality. Contaminated water can be a medium for microorganisms to enter the body through direct consumption or through food and eating utensils (Ashbolt, 2004; Fewtrell et al., 2005). Besides the water source, storage methods are also important. Water that was originally clean can become recontaminated if stored in open containers, collected with unclean hands or tools, or placed in an environment prone to contamination (WHO & UNICEF, 2018; WHO & UNICEF, 2023). Diarrhea prevention interventions need to pay attention not only to the availability of water, but also to the safety of its management and storage.

Toilet conditions are associated with diarrheal events. Toilets that do not meet sanitation requirements can increase the risk of environmental contamination by feces. Unsafe defecation practices can cause microorganisms to be transferred through soil, water, hands, food, and objects around the child (Clasen et al., 2014; Prüss-Ustün et al., 2014; WHO, 2018). Sanitation improvements need to be accompanied by the habit of consistently using toilets and maintaining the cleanliness of these facilities.

The results of the study showed a relationship between waste management and the incidence of diarrhea. Poorly managed household waste can become a breeding ground for insects and create an unhygienic environment. Open waste can also increase the risk of environmental and food contamination (Prüss-Ustün et al., 2014; WHO, 2018). Good waste management includes the use of closed trash bins, regular disposal, and management according to the systems available in the community. Community-based environmental risk mapping can also support the identification of sanitation problems and the planning of appropriate prevention activities (Yermi & Rizki, 2026).

Hand hygiene is an important factor in breaking the chain of disease transmission. Hands can transmit microorganisms from feces, the environment, objects, or contaminated surfaces to food and the mouth (Freeman et al., 2014; Pickering et al., 2011). This is especially relevant for families with toddlers, as children frequently touch various objects and put their hands or objects in their mouths. Washing hands with soap at the right time can be a simple but important action in preventing diarrhea (Strina et al., 2003; WHO & UNICEF, 2021).

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The results of the study showed that family hygiene behavior was related to the incidence of diarrhea in toddlers. Hygiene behavior includes various interrelated actions, such as hand hygiene, food hygiene, eating utensil hygiene, food storage, children's body hygiene, and environmental hygiene. Poor behavior can increase the chance of contamination. Conversely, consistent hygiene practices can help reduce a toddler's exposure to sources of infection (Freeman et al., 2014; Pickering et al., 2011; Strina et al., 2003). The interaction between diarrhea, nutritional status, and other health problems also emphasizes the importance of comprehensive prevention during early childhood (Guerrant et al., 2013).

Diarrhea is not caused by a single factor. Environmental and behavioral factors can interact. A household may have a good water source, but risks can still arise if the water is stored unhygienically. Conversely, families with good hygiene practices may face difficulties if access to safe water and sanitation is limited (Fewtrell et al., 2005; Prüss-Ustün et al., 2014; WHO & UNICEF, 2023). Programs should not only focus on behavioral education, but also on improving environmental conditions and access to sanitation facilities. Community participation and environmental risk identification are also important in supporting sustainable disease prevention efforts (Yermi & Rizki, 2026).

Community health centers and health cadres can improve diarrhea prevention efforts through practice-oriented education, including handwashing with soap, safe drinking water management, the use of healthy toilets, household waste management, food processing safety, maintaining the cleanliness of toddler eating utensils, recognizing signs of dehydration, providing appropriate fluids when toddlers experience diarrhea, and seeking medical help when danger signs appear (Freeman et al., 2014; WHO, 2024; WHO & UNICEF, 2021)..

4. Conclusion

Based on the research results, it can be concluded that 33.0% of toddlers experienced diarrhea in the last month, while some households still faced problems related to water quality, toilet conditions, waste management, hand hygiene, and hygiene behavior. The findings also indicate a relationship between water quality, toilet conditions, waste management, hand hygiene, and family hygiene behavior with the incidence of diarrhea in toddlers. Therefore, diarrhea prevention in toddlers needs to be carried out in an integrated manner through improvements in environmental quality and continuous efforts to promote healthy and hygienic behaviors within families.

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