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Association Between Basic Environmental Sanitation and Diarrhea Incidence Among Children Under Five in Kamonji Health Center Area, Palu

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Article Info	ABSTRACT
Keywords: Children under five, Diarrhea, Environment, Basic Sanitation.	Based on the 2024 World Health Organization (WHO) report, diarrheal disease affected approximately 1.7 billion children globally and remains a major contributor to mortality among those under five years old. This research investigated the association between basic sanitation conditions and diarrhea incidence among children under five in the Kamonji Health Center area, Palu City. A quantitative design with a cross-sectional approach was applied. The total population included 2,926 children under five, from which 100 participants were selected using the Slovin formula and stratified random sampling. Respondents were distributed across four sub-districts: Ujuna (31), Kamonji (28), Siranindi (19), and Baru (19). Statistical analysis using the Chi-Square test indicated p-values of 1.000 for clean water quantity, 0.000 for latrine ownership, 0.000 for waste bin availability, and 0.574 for wastewater drainage. The results demonstrated significant relationships between latrine ownership and waste bin availability with diarrhea occurrence, while no significant relationship was identified for clean water quantity and wastewater drainage. These findings suggest that environmental health programs should focus on improving household sanitation facilities and promoting routine health education to enhance community understanding of proper sanitation practices and diarrhea prevention strategies.
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INTRODUCTION

Infectious diseases have consistently posed a significant public health concern, contributing to high global morbidity. Environmental factors are instrumental in enabling the spread of communicable diseases within a community. A healthy environment is strongly influenced by adequate sanitation, which is vital in improving the overall level of public health. Sanitation practices aim to minimize environmental pathogens to safeguard human well-being (Annisa et al., 2020). Poor sanitation conditions can degrade environmental quality and promote disease proliferation. Therefore, the provision of fundamental sanitation facilities—such as clean water supply, proper latrine use, adequate wastewater management, waste disposal, and the adoption of hygienic lifestyles—is crucial in preventing disease transmission (Annisa & Susilawati, 2022).

Failure to maintain basic sanitation increases contamination risks and disease prevalence, especially among vulnerable populations like young children and the elderly. Poor sanitation perpetuates the contamination cycle between humans, the environment, and water sources. Diarrhea transmission commonly occurs via the fecal–oral route due to unsafe fecal management, insufficient clean water access, and poor hygiene practices (WHO, 2023; Ministry of Health RI, 2022).

Clinically, diarrhea involves the passage of watery or loose stools exceeding three times within 24 hours, typically lasting less than 14 days, caused by excess intestinal water (>10 ml/kg/day). Recurrent diarrhea is known to hinder child growth through nutrient loss, malabsorption, and chronic gut inflammation (Checkley et al., 2023).

The Kamonji Public Health Center recorded the highest diarrhea incidence in Palu City, with 305 under-five cases across four sub-districts: Ujuna (87), Kamonji (82), Baru (73), and Siranindi (63) (Laporan Kejadian Diare Di Wilayah Kerja Puskesmas Kamonji Tahun 2024, 2024). Sanitation issues across Indonesian cities commonly relate to latrine provision, clean water access, housing conditions, solid waste management, and wastewater disposal. Consistent with Bloom's theory, public health status is determined by environmental, behavioral, healthcare, and genetic factors (Kriswanto K. et al., 2021).

This study emphasizes the importance of basic sanitation components in relation to diarrhea incidence within urban settings, in contrast to previous research that has primarily focused on rural and peri-urban areas. Despite the relatively better access to healthcare and higher health standards in cities, the fulfillment of adequate basic sanitation components is not always guaranteed. Primary healthcare facilities, such as the Kamonji Public Health Center, serve as the frontline institutions for monitoring and evaluating environmental health conditions within their service areas. Therefore, this study aims to analyze the relationship between basic sanitation and the incidence of diarrhea among children under five in the Kamonji Health Center area, Palu City.

METHODS

A quantitative research design with a cross-sectional approach was adopted in this study. The research took place within the operational area of the Kamonji Public Health Center, covering four sub-districts: Ujuna, Kamonji, Siranindi, and Baru. The population consisted of all under-five children, both with and without diarrhea, amounting to 2,926 individuals. The sample size, determined using the Slovin formula, yielded 100 respondents proportionally allocated across the four sub-districts. Sampling was conducted using a stratified random sampling technique. Data were collected through structured interviews utilizing a questionnaire and supported by direct observation. Statistical analyses were performed using SPSS software.

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Data analysis comprised both univariate and bivariate techniques. Hypothesis testing applied the Chi-Square non-parametric test at a 95% confidence level with a significance criterion of $\alpha < 0.05$. Accordingly, a p-value less than 0.05 indicated a statistically significant relationship between variables, whereas a p-value equal to or greater than 0.05 denoted the absence of a significant association.

RESULTS AND DISCUSSION

The respondent profile revealed that the majority of mothers were in the younger age group, specifically between 18 and 28 years old, comprising 48 individuals (48%). Regarding education, most respondents had completed senior high school, representing 75 participants (75%). In terms of occupation, housewives formed the largest group with 83 respondents (83%). Concerning family size, the majority fell into the moderate category, consisting of four household members (63%). Among the participating children under five, half were aged between 21 and 40 months (50%). Additionally, 71 respondents (71%) reported that their under-five children had experienced diarrhea.

Bivariate Analysis of the Relationship Between the Quantity of Clean Water and the Incidence of Diarrhea in Children Under Five in the Working Area of Kamonji Public Health Center

Table 1. Analysis of the Relationship Between clean water quantity and the Incidence of Diarrhea in the Working Area of Kamonji Public Health Center, 2024

Water Quantity	Diarrhea Incidence						*P* Value
	Suffering from Diarrhea		Not Suffering from Diarrhea		Total		
	N	%	n	%	N	%	
Does Not Meet Requirements	42	71,2	17	28,8	59	100	1,000
Meets Requirements	29	70,7	12	29,3	41	100	
Total	71		29		100	100	

Source: Primary Data, 2025

Table 1 shows that out of 100 respondents, 42 individuals (71.2%) who had access to an insufficient quantity of clean water suffered from diarrhea, while 17 individuals (28.8%) did not. Meanwhile, among respondents with an adequate quantity of clean water, 29 individuals (70.7%) experienced diarrhea, and 12 individuals (29.3%) did not. The statistical test yielded a p-value of 1.000 (≥ 0.05), indicating that there was no significant association between water quantity and the incidence of diarrhea in the working area of Kamonji Public Health Center.

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Bivariate Analysis of the Relationship Between Latrine Ownership and the Incidence of Diarrhea Among Children Under Five in the Working Area of Kamonji Public Health Center

Table 2. Analysis of the Relationship Between Latrine Ownership and the Incidence of Diarrhea in the Working Area of Kamonji Public Health Center, 2024

Latrine Ownership	Diarrhea Incidence						*P* Value
	Suffering from Diarrhea		Not Suffering from Diarrhea		Total		
	n	%	n	%	N	%	
Does Not Meet Requirements	26	100	0	0	26	100	0,000
Meets Requirements	45	60,8	29	39,2	74	100	
Total	71		29		100	100	

Source: Primary Data, 2025

Table 2 shows that out of 100 respondents, 26 individuals (100%) who did not meet the requirements for proper latrine ownership experienced diarrhea, while none (0%) did not experience diarrhea. Meanwhile, among respondents who met the criteria for adequate latrine ownership, 45 individuals (60.8%) suffered from diarrhea and 29 individuals (39.2%) did not. The statistical test yielded a p-value of 0.000 (≤0.05), indicating a significant association between latrine ownership and the incidence of diarrhea in the working area of Kamonji Public Health Center.

Bivariate Analysis of the Relationship Between the Availability of Waste Disposal Facilities and the Incidence of Diarrhea in Children Under Five in the Working Area of Kamonji Public Health Center

Table 3 Analysis of the Relationship Between Waste Disposal Availability and the Incidence of Diarrhea in the Working Area of Kamonji Public Health Center, 2024

Availability of Waste Disposal Facilities	Diarrhea Incidence						*P* Value
	Suffering from Diarrhea		Not Suffering from Diarrhea		Total		
	n	%	n	%	N	%	
Does Not Meet Requirements	38	97,4	1	2,6	39	100	0,000
Meets Requirements	33	54,1	28	45,9	61	100	
Total	71		29		100	100	

Source: Primary Data, 2025

Table 3 showed that out of 100 respondents, 38 individuals (97.4%) who lacked adequate waste disposal facilities experienced diarrhea, while only 1 person (2.6%) did not. In contrast, among those with proper waste disposal facilities, 33 respondents (54.1%) suffered from diarrhea, whereas 28 respondents (45.9%) did not. The statistical test yielded a p-value of 0.000 (≤0.05), indicating a significant association between the availability of waste disposal facilities and the incidence of diarrhea in children under five in the working area of Kamonji Public Health Center.

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Bivariate Analysis of the Relationship Between the Availability of Wastewater Drainage Systems (SPAL) and the Incidence of Diarrhea Among Children Under Five in the Working Area of Kamonji Public Health Center

Table 4 Analysis of the Relationship Between the Availability of Waste Disposal Facilities and the Incidence of Diarrhea in the Working Area of Kamonji Public Health Center in 2024

Availability of Wastewater Drainage Systems (SPAL)	Diarrhea Incidence						*P* Value
	Suffering from Diarrhea		Not Suffering from Diarrhea		Total		
	n	%	n	%	N	%	
Does Not Meet Requirements	43	68,3	20	31,7	63	100	0,574
Meets Requirements	28	75,7	9	24,3	37	100	
Total	71		29		100	100	

Source: Primary Data, 2025

Table 4, among 100 respondents, 43 participants (68.3%) who suffered from diarrhea had non-compliant wastewater disposal systems (SPAL), while 20 participants (31.7%) without diarrhea were also found in this category. In contrast, 28 participants (75.7%) with diarrhea had compliant SPAL, and 9 participants (24.3%) without diarrhea had adequate SPAL. The statistical test produced a p-value of 0.574 (≥0.05), suggesting that the association between the availability of wastewater disposal facilities and the occurrence of diarrhea in the Kamonji Health Center area was not statistically significant.

Univariate analysis revealed that most mothers were within the productive age range and typically had one or two young children, a factor that may affect parenting behavior. The majority of respondents had completed senior high school, a level at which individuals generally possess fundamental knowledge about hygiene and health; nevertheless, this understanding is often limited and not consistently translated into daily hygienic practices. Households with a moderate number of members (four to six persons) posed unique challenges, as larger family sizes increase the demand for clean water, the volume of household waste, the frequency of latrine use, and the amount of wastewater produced. In terms of child characteristics, Children Under Five aged 12–35 months constituted the largest group in this research. This age stage is widely recognized as a high-risk period for diarrhea because children become increasingly active and engage more frequently with their environment.

According to the study findings, the Kamonji Health Center area demonstrates an adequate supply of clean water. The majority of residents access clean water from dug and bore wells, while some rely on the public water utility (PDAM). This reflects that the clean water quantity in the community is generally sufficient to meet household needs. Statistical analysis revealed a p-value of 1.000 (≥0.05) for the association between clean water quantity and diarrhea incidence, indicating that no significant correlation exists between these variables. This outcome aligns with research conducted by Auma et al. (2024) in Lira City, Uganda, which assessed household daily water usage and its relationship with diarrhea among children under five, reporting a non-significant result (p-value = 0.751) (Auma et al., 2024). Conversely, findings from Haryanti and Rini Camelia (2024) demonstrated a statistically significant relationship (p-value = 0.000 ≤ 0.05) between clean water availability and diarrhea incidence in children under five in the Tanjung Baru Health Center area, suggesting that variations in water availability may influence disease occurrence depending on local conditions (Haryanti & Rini Camelia, 2024).

The Chi-Square test results for the variable assessing the association between household latrine ownership and diarrhea incidence among children under five in the Kamonji Health Center area revealed a p-value of 0.000 (≤0.05), indicating a statistically significant relationship. Observations in the field demonstrated that a portion of residents still lack personal latrine facilities, often due to economic limitations or insufficient land availability for construction. Moreover, some community members continue to rely on neighbors' latrines or public sanitation facilities, perceiving no urgent need to build their own. This outcome aligns with findings from Parker et al. (2022) in Ethiopia, who identified a significant correlation (p-value = 0.021 ≤ 0.05) between latrine ownership and diarrhea occurrence, emphasizing that adequate sanitation facilities can lower diarrhea risk among children under five (Parker et al., 2022). Conversely, Barrow et al. (2024) reported differing results, noting no significant relationship (p-value = 0.067 ≥ 0.05) between latrine ownership and diarrhea, implying that sanitation access alone may not directly determine diarrhea prevalence without accompanying hygiene practices and water management (Barrow et al., 2024).

Inadequate waste management contributes to a high risk of disease transmission, beginning with environmental pollution and extending to infections spread through vectors. Flies, in particular, can transfer pathogens from accumulated waste to human food, thereby increasing the likelihood of diarrheal diseases (Riski et al., 2024). The Chi-Square test produced a p-value of 0.000 (≤0.05), signifying a statistically significant relationship between the availability of waste bins and the incidence of diarrhea among toddlers in the Kamonji Health Center area. These findings corroborate those of Alfianur et al. (2021), who reported a p-value of 0.01 (≤0.05), confirming that inadequate or non-compliant garbage containers—especially those without lids—serve as breeding and resting sites for disease vectors such as flies. These flies can then land on food and transmit pathogens responsible for diarrhea (Alfianur et al., 2021). Conversely, Rokhayati et al. (2024) found a p-value of 0.425 (≥0.05), indicating no significant relationship between garbage bin availability and diarrhea incidence. This suggests that waste only contributes indirectly to diarrhea transmission when it contaminates consumables; when waste is properly managed and containers are tightly closed, vector contact is minimized, reducing the likelihood of disease spread (Rokhayati et al., 2024).

Domestic wastewater, including that from bathing, dishwashing, and laundry, contains various contaminants such as soap residues, detergents, and microorganisms. Improper management of this wastewater can have detrimental effects on both environmental quality and public health, functioning as a transmission route for diseases such as diarrhea (Falita et al., 2023). The Chi-Square analysis produced a p-value of 0.574 (≥0.05), suggesting that there is no statistically significant relationship between the availability of wastewater disposal facilities (SPAL) and diarrhea incidence among children under five in the Kamonji Health

Center area. This finding implies that the community's wastewater systems are largely compliant with sanitation standards—most are connected to drainage channels and are properly covered. Consistent results were reported by Simaremare et al. (2024), who found a p-value of 0.138 (≥0.05), confirming the absence of a significant correlation between wastewater drainage infrastructure and diarrhea among toddlers. These findings suggest that the presence of SPAL facilities alone does not necessarily determine diarrhea incidence, as the condition is also influenced by multiple environmental and behavioral factors, including clean water quality and latrine availability (Simaremare et al., 2024).

CONCLUSION

This study identified a significant link between basic environmental sanitation and the incidence of diarrhea among children under five in the Kamonji Health Center area, Palu City. While access to clean water was generally adequate due to multiple available sources, deficiencies were observed in latrine ownership and waste container compliance, both of which increase the potential for disease transmission. In contrast, domestic wastewater management was relatively effective, as most systems were connected to drainage channels and located safely away from clean water sources, thereby minimizing contamination risks. To enhance community health outcomes, the promotion of the Clean and Healthy Living Behavior (PHBS) program should be intensified, accompanied by regular environmental health education and sanitation awareness campaigns. Continuous monitoring of sanitation indicators—such as water quality, latrine functionality, waste bin adequacy, and household waste disposal practices—is essential to ensure sustainable improvements. Nevertheless, this study acknowledges certain limitations, including its cross-sectional nature and restricted study area. Future research should adopt longitudinal or mixed-method designs and broaden the geographical coverage to better understand the multifactorial relationship between sanitation conditions, hygiene behavior, and diarrheal disease patterns in diverse urban contexts.

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