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ORIGINAL ARTICLE

Clean and healthy living behavior and diarrhea among children: A cross-sectional study in Duria Village, West Nias

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ABSTRACT

Diarrheal disease remains a critical public health concern, especially in developing countries like Indonesia, where it significantly contributes to morbidity and mortality among young children. This study aimed to analyze the relationship between Clean and Healthy Living Behaviors (CHLB) and the incidence of diarrhea among children aged 7-10 years in Duria Village, West Nias. A cross-sectional study was conducted from January to February 2024, involving 35 mothers of children aged 7–10 years with diarrhea, selected through purposive sampling. Data were collected using questionnaires to assess handwashing behavior, access to clean water, latrine conditions, and garbage disposal practices. The results indicated that while handwashing habits, latrine conditions, and garbage disposal practices did not show statistically significant associations with diarrhea prevalence, access to clean water had a highly significant association ($p < 0.001$), albeit counterintuitively suggesting that access to clean water is associated with increased diarrhea. These unexpected findings warrant further investigation to understand potential confounding factors. The study underscores the complex interplay between CHLB and diarrheal disease, highlighting the need for targeted interventions to improve sanitation and hygiene practices in Duria Village.

Keywords: diarrhea, clean and healthy living behavior, children, sanitation, hygiene

Introduction

Diarrheal disease is a significant public health problem, particularly in developing countries.[1] Diarrhea, characterized by loose stools occurring at least three times within 24 hours, can lead to dehydration, loss of appetite, abdominal pain, fatigue, and weight loss.[2] This condition is often associated with poor personal and environmental hygiene.[3] Diarrheal disease is a major global health issue, especially for young children. It causes approximately 443,832 deaths annually in children under 5 years old, and another 50,851 deaths in children aged 5 to 9. Worldwide, there are about 1.7 billion cases of diarrheal illness in children each year.[1]

In Indonesia, diarrhea is the second leading cause of death in children under the age of 5.[4] Across five Southeast Asian countries, the prevalence of diarrhea ranges from 8.39% in the Philippines to 18.21% in Indonesia.[5] A study in Central Indonesia found that 16.8% of children under five experienced diarrhea, with the highest percentage (17.75%) in West Nusa Tenggara.[6] According to the Basic Health Research (Riskesdas) in 2018, the prevalence of diarrhea in Indonesia decreased by 6.2% from the 2013 survey,

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reaching 12.3%. Despite this decline, diarrhea remains the leading cause of mortality in children under five.[7,8] Data from the North Sumatra Provincial Health Profile in 2020 indicated 70,243 cases of diarrhea in toddlers. While this figure reflects a 27.74% decrease compared to the 86,442 cases reported in 2018, diarrhea continues to be a health problem that needs to be addressed. The highest number of diarrhea cases in North Sumatra was found in West Nias Regency, with 1,639 cases (93.95%), while in South Nias Regency, 11.18% of children suffered from diarrhea.[9]

Clean and Healthy Living Behaviors (CHLB) are crucial for preventing and controlling diarrhea, as they include personal hygiene, environmental sanitation, and safe food handling. CHLB refers to conscious health practices that enable families or individuals to care for their health and actively participate in community health initiatives.[10,11] Key indicators of CHLB include washing hands with soap and running water, consuming healthy food in school cafeterias, using clean and healthy toilets, regular exercise, mosquito eradication, non-smoking, weighing and measuring height every six months, and proper waste disposal.[11,12] CHLB is vital in reducing the incidence of diarrhea, especially among toddlers.[13] CHLB programs prevent diarrhea through breastfeeding, sufficient clean water use, handwashing, using healthy latrines, and properly disposing of infant feces.[14] Research indicates a correlation between CHLB and the incidence of diarrhea in toddlers. Mothers who practice CHLB are less likely to have toddlers with diarrhea.[13,15]

Surveys and data from Duria Village, West Nias, indicated that there were 378 children aged 7-10 years. In 2024, 116 of these children experienced diarrhea, potentially due to factors such as improper handwashing with soap, limited access to clean water, a shortage of trash cans, and inadequate latrine conditions. A preliminary survey involving interviews with 10 mothers of children aged 7-10 years in Duria Village revealed that many respondents did not fully understand the correct way to wash their hands, often washing only when hands appeared dirty. Some respondents also noted that open defecation remains common. Furthermore, improper waste disposal is prevalent, and latrine facilities in the village are substandard. Therefore, this study aims to analyze the relationship between CHLB and the incidence of diarrhea among children in Duria Village, West Nias.

Method

This quantitative research study employs an observational approach with a cross-sectional design to determine the relationship between handwashing behavior and the incidence of diarrhea in children in Duria Village, West Nias, in 2024. The study will be conducted over two months, from January to February 2024. The study population consists of 116 mothers of children aged 7–10 years, where the children have had diarrhea. Based on calculations, a minimum sample size of 34.65 was obtained and rounded up to 35 respondents. Purposive sampling was used in this study. Inclusion criteria were: mothers who have children aged 7–10 years, reside in Duria Village, are able to communicate effectively, and are willing to participate as respondents.

The incidence of diarrhea was measured using a questionnaire. Each correct answer was scored as 1, while an incorrect answer was scored as 0. The total score was used to categorize the mother's knowledge about diarrhea: "Good" (7–10 correct answers), "Sufficient" (5–7 correct answers), and "Less" (1–4 correct answers). Similarly, handwashing behavior was measured using a questionnaire, with the same scoring and categorization criteria as for knowledge about diarrhea. The availability of clean water sources was measured using a questionnaire, with the same assessment criteria. The categorization was "Available" (5–10 correct answers) and "Not available" (1–5 correct answers). The condition of latrines and garbage disposal sites were also measured using questionnaires, with the same assessment criteria. Latrine conditions were categorized as "Good" (5–10 correct answers) or "Bad" (1–5 correct answers). Garbage disposal site conditions were similarly categorized as "Good" (5–10 correct answers) or "Bad" (1–5 correct answers).

Univariate analysis was used to describe the characteristics and frequency distribution of each variable, both independent and dependent, to provide a descriptive overview of each variable separately. Bivariate analysis, specifically the Chi-Square test, will be used to examine the relationship between maternal behavior and environmental sanitation and the incidence of diarrhea in children, to determine whether the relationships are statistically significant.

Results

Table 1 presents the characteristics of the 35 respondents, including their occupation, education level, incidence of diarrhea, handwashing habits, access to clean water, and sanitation conditions. Most respondents were farmers (94.3%, n = 33), while a small minority were tailors (5.7%, n = 2). Concerning education, over half the respondents completed elementary school (54.3%, n = 19), while 25.7% (n = 9) finished junior high school, and 14.3% (n = 5) had no schooling. Only a small proportion completed senior high school (5.7%, n = 2). More than three-quarters of respondents reported experiencing diarrhea (77.1%, n = 27), while less than a quarter did not (22.9%, n = 8). Handwashing practices with soap before meals were categorized as poor, fair, or good. The largest group demonstrated fair handwashing practices (42.9%, n = 15), closely followed by those with poor practices (40.0%, n = 14). A small minority exhibited good handwashing habits (17.1%, n = 6).

Table 1. Respondent characteristics (n = 35)

Characteristic	n	%
Occupation		
Farmer	33	94.3
Tailor	2	5.7
Education		
No schooling	5	14.3
Elementary School	19	54.3
Junior High School	9	25.7
Senior High School	2	5.7
Incidence of diarrhea		
Experienced diarrhea	27	77.1
Did not experience diarrhea	8	22.9
Handwashing with soap before meals		
Poor	14	40.0
Fair	15	42.9
Good	6	17.1
Availability of clean water source		
Not available	14	40.0
Available	21	60.0
Latrine condition		
Not meet requirements	5	14.3
Meet requirements	30	85.7
Garbage disposal condition		
Not meet requirements	30	85.7
Meet requirements	5	14.3

The majority of respondents had access to clean water (60.0%, n = 21), while a significant minority did not (40.0%, n = 14). Most respondents had latrines that met requirements (85.7%, n = 30), while the remainder did not (14.3%, n = 5). Conversely, most respondents had garbage disposal practices that did not meet requirements (85.7%, n = 30), while a small proportion had acceptable methods (14.3%, n = 5).

Table 2 presents the results of a chi-square test examining the relationship between various risk factors and the prevalence of diarrhea among 35 participants. The data indicates that 64.3% (9 out of 14) of participants with poor handwashing habits before meals experienced diarrhea, while 35.7% (5 out of 14) did not. This p-value is greater than the conventional significance level of 0.05, suggesting that the observed differences in diarrhea prevalence across different handwashing practices are not statistically significant. In other words, based on this data, there's no strong evidence to conclude a relationship between handwashing habits and diarrhea.

A strikingly high percentage (93.3%, or 14 out of 15) of those with fair handwashing practices experienced diarrhea, compared to only 6.7% (1 out of 15) who did not. Among individuals reporting good handwashing habits, 66.7% (4 out of 6) had diarrhea, and 33.3% (2 out of 6) did not. The chi-square test for handwashing habits yielded a p-value of 0.141. Because this p-value exceeds the conventional significance level of 0.05, we cannot conclude that there is a statistically significant relationship between handwashing habits and diarrhea prevalence based on this sample.

Access to a clean water source showed a strong association with diarrhea. Among participants lacking access to a clean water source, 42.9% (6 out of 14) experienced diarrhea, while 57.1% (8 out of 14) did not.

Notably, all participants with access to a clean water source (21 out of 21, or 100%) experienced diarrhea. The chi-square test for access to a clean water source produced a p-value of 0.000 ($p < 0.001$), indicating a highly statistically significant association with diarrhea. Counterintuitively, these data suggest that access to clean water is associated with increased diarrhea. This unexpected finding warrants further investigation to understand the underlying reasons and potential confounding factors.

Table 2. Chi square test results (n = 35)

Risk factor	Experienced diarrhea		Did not experience diarrhea		p
	n	%	n	%	
Handwashing with soap before meals					
Poor	9	64.3	5	35.7	0.141
Fair	14	93.3	1	6.7	
Good	4	66.7	2	33.3	
Availability of clean water source					
Not available	6	42.9	8	57.1	0.000
Available	21	100.0	-	-	
Latrine condition					
Not meet requirements	3	60.0	2	40.0	0.324
Meet requirements	24	80.0	6	20.0	
Garbage disposal condition					
Not meet requirements	24	80.0	6	20.0	0.236
Meet requirements	3	60.0	2	40.0	

Among participants whose latrine conditions did not meet requirements, 60.0% (3 out of 5) experienced diarrhea, compared to 80.0% (24 out of 30) of those whose latrine conditions met requirements. The chi-square test for latrine conditions yielded a p-value of 0.324, which is not statistically significant. Therefore, these data do not provide sufficient evidence to conclude a statistically significant association between latrine condition and diarrhea prevalence.

Regarding garbage disposal, 80.0% (24 out of 30) of participants whose garbage disposal conditions did not meet requirements experienced diarrhea, compared to 60.0% (3 out of 5) of those whose garbage disposal conditions met requirements. The chi-square test for garbage disposal conditions yielded a p-value of 0.236, indicating that the observed differences are not statistically significant. Thus, these data do not provide sufficient evidence to conclude a statistically significant association between garbage disposal conditions and diarrhea prevalence.

Discussion

The results did not show a statistically significant relationship between handwashing habits before meals and diarrhea prevalence. This finding contradicts existing literature, which generally demonstrates a significant association between handwashing and reduced diarrhea risk. Those studies emphasize that proper handwashing with soap is important for effectiveness. They suggest that poor handwashing habits significantly increase the risk of diarrhea, while consistent and correct handwashing, especially with soap, can substantially reduce its incidence.[16,17] The unexpected results may stem from factors not accounted for, such as sample size, the specific handwashing techniques employed (even within the 'good' category), or other confounding variables. It is crucial to note that the existing body of research strongly supports the protective effect of handwashing, particularly with soap, against diarrhea.

This data presents a paradoxical situation regarding the relationship between clean water access and diarrhea. While the initial finding reveals a statistically significant positive correlation ($p < 0.001$) between clean water access and diarrhea – with 100% of those with access experiencing it compared to 42.9% without – this result is highly counterintuitive and likely indicative of confounding factors or methodological flaws. It strongly suggests the presence of an unobserved variable influencing both clean water access and diarrhea, rather than clean water directly causing diarrhea. Supporting studies offer mixed evidence. Some, such as the Kelurahan Tangkahan study[18] ($p = 0.0376$), research from the Siantan Tengah Public Health Center[19] (OR 5.6881), an additional study[20] (OR 2.38), and the Palangka Raya study[21] ($p < 0.05$), confirm a statistically significant link between water sources and diarrhea, although they don't necessarily identify clean water as the causative agent. While these studies support a general link, they do not explain the anomalous 100% figure. Crucially, the provided text also mentions studies with contradictory findings. The Kangkung Village research[22], which found no correlation due to water boiling practices, highlights the

importance of considering hygiene and water treatment practices. A study that contradicts the claim of a relationship between clean water and diarrhea further underscores the complexity of this issue.[23]

The data presents a complex picture regarding the relationship between latrine conditions and diarrhea. Although the dataset shows no statistically significant association (p=0.324)—indeed, a higher percentage of individuals with adequate latrines experienced diarrhea (80%) compared to those with inadequate latrines (60%)—several other studies contradict this finding. These studies, conducted in different locations such as Belawan Sicanang[24] and Tinigi Village[25], demonstrate a statistically significant link between latrine ownership/presence and diarrhea, indicating that those lacking proper sanitation are at higher risk. This discrepancy highlights the complexity of diarrheal disease transmission. The non-significant result in the original dataset could stem from several factors, including a small sample size, unaddressed confounding variables, or even data anomalies. However, the cited studies, which reveal a significant association, underscore the importance of proper sanitation. In conclusion, while the initial data suggests no link, the broader body of research indicates a strong relationship between inadequate latrine conditions and an increased risk of diarrhea. It is crucial to acknowledge the limitations of the initial dataset and consider the weight of evidence from other studies. Furthermore, factors such as access to clean water, proper waste disposal, and personal hygiene also play significant roles and likely interact with sanitation conditions to influence diarrhea prevalence.[24–26]

This study observed a higher prevalence of diarrhea (80%) in participants with inadequate garbage disposal compared to those with adequate disposal (60%), but this difference was not statistically significant ($p = 0.236$). Although this study did not demonstrate a statistically significant association, other research has established a connection between inadequate waste management and diarrhea.[27] Several studies have shown statistically significant correlations between poor waste management and increased diarrhea incidence.[28–30] Conversely, a study in Argasunya, Cirebon, found no significant association, highlighting the variability in research findings.[31] The discrepancies between studies likely arise from variations in location, population demographics, specific waste management practices, environmental conditions, and other contributing factors, such as water quality, sanitation, and socioeconomic status.[30,32] The current study emphasizes the need for further research with larger sample sizes and more detailed assessments of waste management practices, including specific types of waste disposal methods and other potential risk factors, to better understand the complex relationship between waste disposal and diarrhea.

Conclusion

This study investigated the relationship between several risk factors and diarrhea prevalence among 35 participants. While the data suggests potential associations, the chi-square test revealed a statistically significant result only for access to a clean water source ($p < 0.001$). Surprisingly, all participants with access to clean water experienced diarrhea, compared to 42.9% of those without access. This counterintuitive finding strongly suggests the presence of confounding factors and warrants further investigation. Although the data showed a higher diarrhea prevalence among those with poor and fair handwashing habits compared to those with good habits, this association was not statistically significant ($p = 0.141$). Similarly, while participants with inadequate latrine and garbage disposal conditions showed a higher diarrhea prevalence, these associations were also not statistically significant ($p = 0.324$ and $p = 0.236$, respectively). Therefore, based on this limited sample, only access to clean water demonstrated a statistically significant (though unexpected) association with diarrhea, highlighting the need for further research to explore the underlying causes of this relationship and the potential influence of confounding variables.

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