ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jul617

Risk Factors Affecting the Incidence of Diarrhea in Children Aged 12-59 Months

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Publication Date: 2025/08/07

Abstract: Diarrhea is the third leading cause of death in children under the age of five, accounting for approximately 443,832 fatalities per year. Diarrhea can be caused by a variety of factors, including insufficient sanitation. The study aimed to analyze risk factors affecting the incidence of diarrhea in children aged 12-59 Months. This study used quantitative research with a cross-sectional approach. The sample consisted of mothers who had children aged 12-59 months. Data collection was conducted using a questionnaire designed to contain a series of questions related to the risk factors affecting the incidence of diarrhea. A chi-square test was performed to determine the association between the variables, and the data were analyzed using SPSS. The study found that clean water, toilet utilization, and socioeconomic factors are significantly associated with diarrhea incidence in children aged 12-59 months. Nutritional status is not significantly associated with diarrhea incidence. Improving family sanitation, enhancing access to clean water, and encouraging hygiene behaviors are all critical initiatives. Furthermore, focused health promotion and education activities can help mitigate the effects of socioeconomic disparities on child health outcomes.

Keywords: *Nutritional Status, Clean Water, Toilet Utilization, Socioeconomic Status, Diarrhea.*

How to Cite: Elias Pereira Moniz; Daniela R. M. U. Fernandes; Isabel Belo; Andre Soares dos Santos; Marcos Carvalho (2025) Risk Factors Affecting the Incidence of Diarrhea in Children Aged 12-59 Months. *International Journal of Innovative Science and Research Technology*, 10(7), 3134-3140. https://doi.org/10.38124/ijisrt/25jul617

I. INTRODUCTION

Diarrhea is the passage of three or more loose or liquid stools per day (or more frequent passage than is normal for the individual). It is usually a symptom of gastrointestinal infection, which various bacterial, viral, and parasitic organisms can cause. (Fenta & Nigussie, 2021). Diarrhea is the third leading cause of death in children under the age of 5, leading to approximately 443,832 deaths per year. Diarrhea can last several days and leave the body without the water and salts that are required for survival. In the past, severe dehydration and fluid loss were the main causes of diarrhea-associated deaths; currently, other causes, such as septic bacterial infections, are likely to account for an increase. Children who are malnourished or have impaired immunity, as well as people living with HIV, are most at risk of life-threatening diarrhea. Interventions to prevent diarrhea, including safe drinking water, use of improved sanitation, and hand washing with soap, can reduce disease risk. Diarrhea should be treated with oral rehydration solution (ORS), a solution of clean water, sugar, and salt (WHO, 2024). In a study conducted in Senegal, the prevalence of acute diarrhea among children was 26%, with the highest acute diarrhea prevalence in the peri-central at 44.8% and urban central zones at 36.3%. The information obtained from Gelsha Health Center indicates that acute diarrhea is the major public health problem locally and is among the top 10 causes of morbidity among children in that area. (Natnael et al., 2021; Thiam et al., 2017).

Based on data from the statistical report of the Ministry of Health, Timor-Leste in 2023, shows that the disease that young children get is diarrhea. In 2016, from a total of 45,374 cases, to 24,295 cases for men and 21,079 cases for women in 2017, 37,558 cases for men and 20,483. And women 17,075 cases, and in 2018, there were 36,674 cases for men 19,518 cases, and for women 17,156. And in 2019, total cases of diarrhea amounted to 33,065, and in 2020, total cases of diarrhea amounted to 370,955. Based on data from the Remexio Health Center, the number of diarrhea cases in 2017 was 95.90 cases; in 2018, there were 1,382 cases; in 2019, there were 1,407 cases; and in 2020, there were 5,842 cases.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jul617

The factors associated with diarrhea are environmental lack of access to clean drinking water increased exposure to waterborne pathogens such as *Escherichia coli*, *Rotavirus*, and other enteric pathogens, use of contaminated surface water or untreated water sources, Poor access to sanitation facilities like toilets or latrines, open defecation practices that contaminate the environment, Inadequate handwashing practices, especially after defecation or before food preparation, Poor hygiene during food handling or feeding of children. Behavioral factors are the early introduction of contaminated complementary foods and the Lack of exclusive breastfeeding during the first six months, which reduce the protective benefits of breast milk. Poor maternal or caregiver knowledge like limited awareness of hygiene, safe feeding, and preventive measures, Socioeconomic factors limited resources to access healthcare, clean water, and sanitation, overcrowded living conditions that promote the spread of infections, Parental Education Lower levels of maternal education often correlate with inadequate child care and hygiene practices, (Thiam et al., 2017).

The study indicated that the incidence of diarrhea was significantly associated with the duration of breastfeeding. Children who had ever been breastfed were less likely to experience diarrhea as compared to children who had never been breastfed, and the incidence of diarrhea was significantly associated with the source of water supply. Children from mothers who used unprotected sources of drinking water were more likely to develop diarrhea as compared to children from mothers who used protected sources of drinking water. (Fenta & Nigussie, 2021).

Based on observations conducted by researchers show that in Remexio Post Administrative, Aileu Municipality, there is a shortage of clean water supply and some people do not have access to septic tanks with people dispose of large waste elsewhere, related to this, the community's septic tank meets the needs of the community in the village, especially for clean water such as for drinking, bathing, washing clothes, and disposing of it outside, in this case, households related to the supply of clean water and septic tanks that are not the same or do not have access to water can also cause diarrhea. The research objective is to analysis of causal factors such as nutritional status, clean water utilization, toilet utilization, socio-economic and mothers' behavior for diarrhea in children aged 12-59 months.

- *Nutrition Status*

The current nutrition situation of the region reflects the fact that most of the recent economic, cultural, and demographic changes have not impacted the population equally, resulting in a scenario where undernutrition (primarily stunting) exists alongside overweight and obesity, with micronutrient malnutrition across both conditions. (Corvalán et al., 2017).

- *Clean Water*

Clean water is used for daily purposes, and its quality meets the requirements of clean water quality, following applicable laws and regulations. It can be drunk when cooked. (Fontes et al., 2023). Clean water is very important for human life, but water quality must be maintained so that water does not endanger public health. By using clean water, we can avoid diseases such as diarrhea, cholera, dysentery, typhoid, intestinal worms, skin diseases, to poisoning. Clean water must meet 3 main parameters, namely: physical requirements, chemical requirements, and bacteriological requirements. (Anatolia S.M. Exposto et al., 2021).

- *Toilet Utilization*

Latrines are one of the sanitation facilities needed in every house to support the health of its residents as a human waste disposal facility, consisting of a squat or seating place with a gooseneck or gooseneck not equipped with a dirty storage unit and water for cleaning (Proverawati et al., 2022)

- *Socio-Economic*

The socioeconomic factors of the family can be measured with several indicators, such as parents' educational level, parents' job type, and income. Based on the study by (Sumampouw et al., 2019)There was a significant influence of the family's socioeconomic factors on the incidence in children. Indeed, improving the family's socioeconomic conditions would reduce the risk of diarrhea in infants and young children.

- *Mother's Behavior*

Maternal behavior can have a significant impact on the incidence of diarrhea in children, especially in resource-constrained contexts. Health-seeking behavior was defined as diarrheal management practices by mothers/caregivers of children with acute diarrhea for the treatment and recovery of the child from acute diarrhea within 2 weeks prior to data collection. (Adane et al., 2017).

- *Diarrhea*

Diarrhea still appears to be one of the leading global killers and disability-adjusted life-years lost, particularly in infants and children. As per WHO, about 88% of diarrhea-related deaths are attributable to unsafe water, inadequate sanitation, and insufficient hygiene, mainly in the developing world (Mebrahtom et al., 2022). Diarrhea is an infectious disease with a frequency of defecation more than three times per day or more. The form of feces with a semi-liquid or liquid consistency becomes the main symptom, in addition to the frequency of defecation. Diarrhea is experienced by almost everyone due to poor sanitation (Fontes et al., 2023). It may be caused by some bacterial, viral, protozoan, or parasitic organisms. In developed and developing countries, rotavirus and Escherichia coli are the most common etiological agents of diarrheal disease. Diarrheal diseases are more common in communities with poor sanitation, poor hygiene practices, a lack of safe water for drinking, improper child-feeding practices, and poor housing conditions (Mernie et al., 2022).

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II. RESEARCH METHOD

This study used quantitative research with a cross-sectional approach. The sample consisted of mothers who had children aged 12-59 months. Sampling techniques for this study used random sampling to select participants based on the Remexio Post Administrative, Aileu Municipality. Data collection was conducted using a questionnaire designed to contain a series of questions related to the causal factors for diarrhea. Technical analysis data, using a chi-square test, was performed to determine the association between nutrition status, Socio-Economic Status, Clean water, Toilet utilization, Mother's behavior, and diarrhea as independent variables. The data were analyzed using SPSS version 22.0.

III. RESULTS AND DISCUSSION

Table 1 The Knowledge of Nutritional Status Factors Associated with Diarrhea Incidence

Knowledge of Nutritional Status	Incidence of Diarrhea		Total	*P=value*
	Diahrea	Not Diarrhea		
Low	3 (7.1%)	2 (4.8%)	5 (12%)	0.259
Modrate	4 (9.5%)	14 (33.3%)	18 (43%)	
Good	7 (16.7 %)	12 (28.6%)	19 (45%)	
Total	14 (33.3%)	28 (66,7%)	42 (100%)	

Based on the results of the analysis, it shows that respondents who have knowledge about poor nutritional status can suffer from diarrhea by 7.1%, those who have moderate knowledge can suffer from diarrhea by 9.5% and those who have good knowledge can suffer from diarrhea by 16.7%. The results of the statistical analysis showed that there was no significant Association between knowledge about nutritional status and the incidence of diarrhea.

More than half of the children living in the remote hilly areas of Nepal suffered from impaired nutritional status, nutritional deficiencies, intestinal parasitic infections, and, to a lesser degree, diarrhea. Better nutritional status of children was only indirectly linked to WASH factors (Shrestha et al., 2020). Several studies have found the importance of targeted educational programs and community-based interventions to improve maternal knowledge and promote appropriate behavioral practices related to childhood diarrhea, which will ultimately lead to improved health outcomes for children worldwide (Bayomy et al., 2024). Mothers with low knowledge are more likely to have severe stunting, while those with moderate knowledge are more likely to have moderate stunting. This knowledge is primarily obtained through formal education, media, and counseling. Therefore, mothers must have adequate knowledge about stunting (Carvalho et al., 2024).

Parents often want immediate treatment; however, education about prevention through vaccination and adequate nutrition is essential. Overall, sanitation, hygiene, water quality, and education all play a role in reducing diarrhea rates.

Addressing these connected concerns necessitates a comprehensive approach that prioritizes increasing nutrition, improving water, sanitation, and hygiene (WASH) practices, and encouraging better health-seeking behavior. Malnutrition and diarrhea reduction efforts must involve strong family education on the necessity of getting children to health care as soon as possible when they get unwell, as well as improvements in maternity, newborn, and child health services.

Table 2 The Clean Water Utilization Factor Associated with Diarrhea Incidence

Clean Water Utilization	Incidence of Diarrhea		Total	P=value
	Diahrea	Not Diarrhea		
Not good	13 (31%)	13 (31%)	26 (62%)	0.003
Good	1 (2 %)	15 (36%)	16 (38%)	
Total	14 (33.3%)	28 (66,7%)	42 (100%)	

Based on the study's results, respondents with poor use of clean water can suffer from diarrhea (31%), while respondents with good use of clean water can suffer from diarrhea (2%). Statistical research shows a significant association between the use of clean water and the incidence of diarrhea. The study shows that maintaining access to clean, safe drinking water is critical for avoiding diarrhea in children. Clean water is very important for human life, but water quality must be maintained so that water does not endanger public health. By using clean water, we can avoid diseases such as diarrhea, cholera, dysentery, typhoid, intestinal worms, skin diseases, to poisoning. Clean water must meet 3 main parameters, namely: physical requirements,

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jul617

chemical requirements, and bacteriological requirements. (Anatolia S.M. Exposto et al., 2021).

According to a previous study, the incidence of diarrhea was significantly related to the source of water supply. This study found a strong link between the quality of a child's drinking water and their chance of acquiring diarrhea. Children whose mothers reported utilizing unprotected water sources, such as untreated wells or springs, were substantially more likely to have diarrhea than children with access to protected water sources (Lakew et al., 2024). Infant diarrheal death was found to be significantly higher in households with unsafe drinking water storage and households that treated their drinking water at the point of use. However, households exposed to unsafe drinking water storage were less likely to be at risk of infant death from diarrhea than those exposed to safe drinking water storage (Mebrahtom et al., 2022; Pacheco et al., 2025).

Treatment of drinking water alongside good animal husbandry practices potentially lowered exposure to diarrhea prevalence, resulting in decreased prevalence of diarrhea post-interventions. These outcomes suggest that contextualizing diarrhea interventions to fit prevailing exposure conditions and implementing them in combination may effectively prevent the transmission of diarrhea. (Muriithi et al., 2024). Based on the comparison results found that needs to good drinking water treatment has the potential to reduce the prevalence of diarrhea and requires interventions to prevent diarrhea transmission effectively.

According to the World Health Organization (2024), Safe WASH is not only a prerequisite to health, but contributes to livelihoods, school attendance, and dignity, and helps to create resilient communities living in healthy environments. Drinking unsafe water impairs health through illnesses such as diarrhea, and untreated excreta contaminates groundwaters and surface waters used for drinking water, irrigation, bathing, and household purposes.

Table 3 The Toilet Utilization Factor Associated with Diarrhea Incidence

Toilet Condition	Incidence of Diarrhea		Total	P=value
	Diahrea	Not Diarrhea		
Unclean	10 (23.8%)	6 (14%)	16 (38%)	0.002
Clean	4 (9.5 %)	22 (53%)	26 (62%)	
Total	14 (33.3%)	28 (66,7%)	42 (100%)	

Based on the results of the study, respondents with unclean toilet conditions can experience diarrhea (23.8%), while respondents with clean toilet conditions can experience diarrhea (2%). Statistical research shows a significant Association between toilet conditions and diarrhea incidents. Rural and urban areas in Timor-Leste experience high levels of contamination from human waste, surface water, and uncontrolled solid waste. Coverage for basic sanitation remains low, with only 39% of Timorese using proper sanitation facilities, including 25% in rural areas and 81% in urban areas. (Pacheco et al., 2024).

Previous study indicates that 55.6% of toilets are privately owned, 43.1% are public restrooms, and 1.4% are without toilets. The types of toilets used are 66.67% water, 29.17% non-water, and 4.17% other. The cleanliness evaluation shows that the toilets are 33.3% clean, 63.9% less clean, and 2.8% filthy. According to the research, 63.9% of people still use family restrooms that do not satisfy health standards. This is a serious issue since feces require particular care because they are trash that creates several problems in the health sector and serve as carriers of pathogens such as diarrhea, typhoid, dysentery, worms, and itching. (Fontes et al., 2023).

Approximately 65.6% of cases and 76.2% of control babies in families had their own toilets. Open defecation was performed by about the same number of families in cases and controls (21.3% and 20.1%, respectively). Household toilet usage appeared to be 60.7% in cases and 71.3% in controls. Less than half of the research individuals (39.3%) in cases and around 49.6% in controls discovered a clean toilet, (Mebrahtom et al., 2022). The prevalence of acute diarrhea was still high. Latrine cleanness, availability of handwashing facilities around the latrine, hand washing practice at the critical time for handwashing, storage of water by “Jerrican”, and time of initiation of supplementary food were the determining factors of diarrheal diseases. (Adugna Fenta, 2020).

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jul617

Table 4 The Socio-Economic Factors Associated with Diarrhea Incidence

Socio-Economic	Incidence of Diarrhea		Total	P=value
	Diahrea	Not diarrhea		
Not good	9 (21.4%)	4 (9.5%)	13 (31%)	0.01
Good	5 (11.9 %)	24 (57.1%)	29 (69%)	
Total	14 (33.3%)	28 (66,7%)	42 (100%)	

Based on the results of the study, respondents with low socioeconomic factors can experience diarrhea (21.4%), while respondents with good socioeconomic factors can experience diarrhea (11.9%). The results of statistical research indicate a significant Association between socioeconomic factors and the incidence of diarrhea.

Children born into low-income homes are more likely to have diarrhea than children born into middle-income households. It was possible to observe with the present study that socioeconomic and environmental conditions had a significant association with maternal self-efficacy levels for the prevention of childhood diarrhea. It is necessary to interfere in the socioeconomic and sanitary conditions as environmental measures to prevent diarrhea, as well as the implementation of strategies that act on the self-efficacy of mothers to have success in preventing diarrhea in their children (Oliveira et al., 2017).

The study identified that socioeconomic factors are influencing the diarrhea incidence among children under five in the coastal area of Manado City, (Sumampouw et al., 2019). Household income level was determined by questioning respondents about their primary source of income and the total monthly income produced by the household from multiple sources. Income is classified into brackets, as indicated in the table below. Permanent employees, casual laborers, and small-scale companies provided the majority of respondents' income, (Ikua, 2024).

Table 5 The Mother's Behavior Factor with Diarrhea Incidence

Mother's Behavior	Diahrea		Total	P=value
	Diahrea	Not Diarrhea		
Not good	11 (26%)	8 (19%)	19 (45%)	0.002
Good	3 (7%)	20 (48%)	23 (55%)	
Total	14 (33%)	28 (67%)	42 (100%)	

The research results show that respondents with poor maternal behavioral factors can experience diarrhea (11.4%), while respondents with good socioeconomic factors can experience diarrhea (7%). The results of statistical research indicate a significant association between socioeconomic factors and the incidence of diarrhea. Strengthening maternal health-seeking behavior and skills regarding home remedies and childhood illnesses, advocating for mass media exposure, helping financially disadvantaged mothers, and postnatal check-ups after delivery will improve medical care-seeking behavior. (Shrestha et al., 2020)

The study finding is that almost two-thirds of under-five children with acute diarrhea sought care either at home or health facilities, and one-third did not receive any care. Out of those who sought care at health facilities, the majority preferred utilization of government health facilities, but prompt care within 24 hours after recognizing acute diarrhea was low. Mothers' caregiver literacy, occupation, household monthly income, availability of health facilities within 15 minutes walking distance, and recognizing danger signs of fever and vomiting were significantly associated with health-seeking behavior. (Adane et al., 2017)

The created model can predict 39.2% of the variation in mother behavior in avoiding childhood diarrhea. Perceived self-efficacy in diarrhea prevention is the biggest predictor of a mother's behavior. Mothers who perceive a high level of self-efficacy in preventing diarrhea in children have ten times more opportunities to engage in excellent preventative activity. These findings suggest that those who are confident in their capacity to succeed in acting might engage in healthful behaviors (Rumbo et al., 2022). Health education improved mothers' understanding and home management behaviors, favorably impacting their children's health. Social media may be a valuable resource for teaching mothers about home management of children's diarrhea, as it provides free information (Said et al., 2024).

Mothers' attitudes and behaviors towards diarrhea have a significant effect on the number of toddlers with diarrhea brought to health facilities. Although overall the knowledge, attitudes, and behaviors of mothers are considered quite good, the knowledge, attitudes, and behaviors regarding the provision of oral care are still, (Irin & Kurniadi, 2022). Maternal behavior can have a significant impact on the incidence of diarrhea in children, especially in resource-constrained contexts.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jul617

Inadequate handwashing, especially after using the toilet and before preparing meals, might spread diarrhea-causing microorganisms. Improper food storage, feeding with contaminated utensils, and a lack of exclusive breastfeeding all increase the risk of diarrhea. Giving untreated water to youngsters may occasionally cause diarrhea.

IV. CONCLUSIONS

The study found that clean water, toilet utilization, and socioeconomic factors are significantly associated with diarrhea incidence in children aged 12-5 months. Nutritional status is not significantly associated with diarrhea incidence. Improving family sanitation, enhancing access to clean water, and encouraging hygiene behaviors are all critical initiatives. Furthermore, focused health promotion and education activities can help mitigate the effects of socioeconomic disparities on child health outcomes.

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