African Journal of Health, Nursing and Midwifery
ISSN: 2689-9418
Volume 9, Issue 2, 2026 (pp. 27-46)
www.abjournals.org

WATER, SANITATION, AND BURDEN OF WATER-RELATED DISEASES AMONG UNDER-FIVE CHILDREN IN KENEMA CITY, SIERRA LEONE

Lawrence Sao Babawo*, Bintu Sabur Janneh, and Rashid Bundu Kpaka.

Faculty of Health Sciences and Disaster Management,
Eastern Technical University of Sierra Leone, Kenema, Sierra Leone.

*Corresponding Author's Email: lsbabawo@etusl.edu.sl

Cite this article:

L. S., Babawo, B. J., Janneh, R. B., Kpaka (2026), Water, Sanitation, and Burden of Water-Related Diseases among Under-Five Children in Kenema City, Sierra Leone. African Journal of Health, Nursing and Midwifery 9(2), 27-46. DOI: 10.52589/AJHNM-CBMHECLU

Manuscript History

Received: 3 Feb 2026

Accepted: 2 Mar 2026

Published: 7 Apr 2026

ABSTRACT: *Introduction: Water-related diseases remain a leading cause of morbidity among under-five children in low-income urban settings, driven by inadequate access to safe water, sanitation, and hygiene. In Sierra Leone, rapid urbanisation has intensified these risks, particularly in secondary cities such as Kenema, where water sanitation and hygiene (WASH) infrastructure remains limited. Aim: This study assessed the prevalence, determinants, and impacts of water-related diseases among under-five children in selected communities in Kenema city, with an emphasis on water access, sanitation, hygiene practices, and prevention strategies. Methods: A mixed-methods cross-sectional study was conducted among 400 households with under-five children. Quantitative data were collected via structured household questionnaires capturing sociodemographic characteristics, water sources, sanitation facilities, hygiene practices, and childhood illness episodes. Data were analysed using SPSS version 28, employing descriptive statistics, chi-square tests, and multivariate logistic regression at a 5% significance level ($p < 0.05$). Qualitative data were obtained through five focus group discussions with caregivers and 15 key informant interviews with community leaders, health workers, and local officials. Thematic analysis was conducted via NVivo version 14 to contextualise the quantitative findings. Results: Overall, 83.0% of households reported at least one episode of water-related disease among under-five children in the preceding 12 months, with diarrhoea (31%), cholera (29%), and typhoid fever (26%) most frequently reported. The use of unimproved water sources (χ^2, $p < 0.001$), shared sanitation facilities ($p = 0.002$), the absence of handwashing with soap ($p < 0.001$), and walking ≥ 1 km to water sources ($p = 0.01$) were significantly associated with disease occurrence. In the multivariate analysis, a lack of household water treatment (AOR = 2.4; 95% CI: 1.5–3.9) and poor hand hygiene (AOR = 3.1; 95% CI: 1.9–5.0) were independently associated with elevated health risk. Recurrent illness episodes were linked to reported weight loss, reduced appetite, and delayed care seeking. Conclusion: Water-related diseases are highly prevalent among under-five children in Kenema city, driven by systemic WASH failures. Policymakers must invest in infrastructure, subsidise treatment and soap, integrate WASH into health services, and eliminate user fees. Longitudinal studies are needed to establish causal pathways and scalable strategies.*

KEYWORDS: Diarrhoea, Sanitation, Sierra Leone, Under-five children, Urban health, WASH, Water-related diseases.

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

African Journal of Health, Nursing and Midwifery
ISSN: 2689-9418
Volume 9, Issue 2, 2026 (pp. 27-46)

www.abjournals.org

INTRODUCTION

Water-related diseases remain a major public health challenge worldwide and continue to disproportionately affect children under five years of age. Globally, unsafe drinking water, inadequate sanitation, and poor hygiene practices are among the leading contributors to childhood morbidity and mortality (WHO & UNICEF, 2021). Diarrhoeal diseases alone account for a substantial share of preventable child deaths, particularly in low- and middle-income countries where access to safe water and sanitation remains limited (Arnold, 2024). In addition to mortality, repeated exposure to waterborne infections contributes to malnutrition, impaired growth, developmental delays, and increased healthcare costs, further entrenching cycles of poverty and poor health.

Despite decades of global investment in water, sanitation, and hygiene programmes, progress has been uneven (Fotio & Nguea, 2022). Billions of people worldwide still lack access to safely managed drinking water and basic sanitation services, with the greatest burden concentrated in Sub-Saharan Africa (WHO/UNICEF, 2021). The World Health Organisation estimates that waterborne diseases such as diarrhea, cholera, and typhoid fever contribute to millions of deaths each year, with children under five bearing a disproportionate share of this burden (WHO/UNICEF, 2021). Although improvements in water infrastructure have been recorded in some settings, disease transmission persists due to contamination, poor sanitation coverage, and unsafe household practices.

In Sub-Saharan Africa, water-related diseases remain among the leading causes of illness and death in young children (Gaffan et al., 2023). The incidence of diarrhoeal diseases alone is estimated to reach over one million under-five lives annually across the region, exceeding the number of deaths from malaria, measles, and HIV/AIDS combined (Dbaibo, Tatochenko, & Wutzler, 2016). Children from poorer households, larger families, and those living far from safe water sources face significantly greater risks (Demissie et al., 2021). Even where improved water sources exist, failures in water quality monitoring and sanitation infrastructure continue to undermine child health outcomes.

Sierra Leone faces significant child health challenges, with the fifth highest under-five mortality rate among off-track countries at 104.7 deaths per 1,000 live births (ZK et al., 2025), to which diarrhoeal diseases contribute 14% of deaths among children aged 1–59 months. Access to improved drinking water remains uneven: whilst 34% of the urban population has access to safely managed services, rural coverage lags substantially behind, with 73% of rural residents relying on unimproved sources (WHO, 2023; Kim & Jin, 2024). Furthermore, basic sanitation coverage stands at merely 18% nationally, with 26% of the population still practising open defecation (WHO, 2023). Water, sanitation, and hygiene-related diseases account for approximately 30% of the country's health burden and an estimated 5% of all deaths among children under five (Bah et al., 2019), with children aged 12–23 months bearing the greatest burden due to weaning, increased mobility, and exposure to environmental contaminants (Kim & Jin, 2024). Empirical evidence of increased diarrhoeal prevalence among children using unlined and unprotected wells or boreholes reveals persistent risks of water contamination and inadequate water quality control (Sesay et al., 2022).

Although national and international partners have implemented various WASH interventions in Sierra Leone (Vonk, 2022), the burden of water-related diseases among under-five children remain high (Ben-Carew, 2024). Existing studies largely rely on national survey data, offering

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

limited insight into community-level variations and context-specific risk factors. This limits the ability of policymakers and health planners to design targeted interventions that address local drivers of disease transmission.

Kenema city, located in the eastern region of Sierra Leone, represents a particularly vulnerable setting. Seasonal flooding, reliance on untreated surface water, overcrowded settlements, and inadequate sanitation infrastructure contribute to recurrent outbreaks of diarrhea, cholera, and typhoid fever, especially during the rainy season (Sesay et al. 2022; Ben-Carew, 2024). Despite its recognised vulnerability, there is a lack of recent, community-level evidence on the prevalence, contributing factors, and preventive practices related to water-related diseases among children under five years of age in Kenema. This evidence gap hampers effective local planning and resource allocation.

This study aims to investigate the prevalence and impact of water-related diseases among under-five children in selected communities within Kenema city, with particular attention given to access to clean water, sanitation facilities, contributing factors, and preventive practices.

THEORETICAL AND CONCEPTUAL FRAMEWORK

Theoretical Framework

This study is grounded in the ***social ecological model*** *(SEM)***,** which provides a comprehensive framework for examining the multiple and interacting factors that influence water-related diseases among children under five years of age. SEM recognises that health outcomes are not determined by a single factor but rather by the dynamic interaction between individual behaviours, household conditions, community environments, and broader structural and policy contexts (Brown, 2015). This perspective is particularly relevant in low-income urban settings such as Kenema city, where environmental exposure, caregiving practices, and infrastructural constraints intersect to shape child health outcomes.

At the *individual level***,** the model draws attention to child-specific characteristics such as age and vulnerability to infection, as well as caregiver knowledge and hygiene practices. Evidence shows that children aged 12 to 23 months are at the highest risk of diarrhoeal disease due to increased mobility, weaning practices, and frequent hand-to-mouth behaviour (Sesay et al., 2022). These individual risks are further shaped by caregiver perceptions of illness severity, hygiene routines, and water handling practices within the household.

The *household or interpersonal level* captures the influence of family structure and living conditions. Factors such as household size, socioeconomic status, water storage methods, and access to sanitation facilities directly affect children's exposure to contaminated water and faecal pathogens. Studies in Sierra Leone have shown that larger households and low-income settings are associated with significantly higher odds of diarrhoeal disease among under-five children (Azanaw et al., 2024; Choi, 2025). Even where improved water sources exist, unsafe storage and handling practices can undermine their protective effect, a finding that helps explain the paradoxical association between borehole use and increased diarrhoeal risk reported in recent studies (Sesay et al., 2022).

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

At the *community level,* SEM highlights the role of shared environmental conditions, including neighbourhood sanitation, drainage systems, population density, and seasonal flooding. In Kenema, contamination of water sources during the rainy season, coupled with shared sanitation facilities and poor waste management, creates sustained exposure to waterborne pathogens (Sesay et al., 2022, 2018; Ben-Carew, 2024). These community-level risks are often beyond the control of individual households, yet they strongly shape health outcomes, particularly for young children.

The institutional and structural levels encompass access to water and sanitation infrastructure, health services, and governance systems. National data indicate persistent inequalities in access to improved water and sanitation between urban and rural areas in Sierra Leone, with sanitation coverage remaining critically low nationwide (WHO, 2023; Sesay et al., 2022). Weak regulation of water quality, limited monitoring, and overstretched health services further compound these risks, contributing to delayed care seeking and increased disease severity (WHO/UNICEF, 2021).

To complement SEM, elements of the *health belief model (HBM)* are used to interpret caregiver behaviour related to disease prevention and care seeking. The HBM helps explain why knowledge of water-related diseases does not always translate into protective action (Andrade et al., 2019). Perceived barriers such as cost, time, and limited access to treatment options often outweigh the perceived benefits of preventive practices, particularly in low-resource households (Demissie et al., 2021). This behavioural dimension is critical for understanding gaps between awareness and practice observed in Sierra Leonean settings.

Together, these models provide a coherent theoretical basis for analysing the prevalence and determinants of water-related diseases among children under five years of age in Kenema city. By situating individual behaviours within household, community, and structural contexts, this study moves beyond single-factor explanations and supports a more integrated understanding of risk. This approach also aligns with existing evidence that effective reduction of water-related diseases requires coordinated interventions across multiple levels rather than improvements in the water supply alone (Gaffan et al., 2023; WHO/UNICEF, 2021).

Conceptual Framework

This study is guided by a socioecological conceptual framework that explains how sociodemographic, environmental, and behavioural factors interact to influence exposure to unsafe water, inadequate sanitation, and poor hygiene, thereby shaping the occurrence of water-related diseases among children under five years of age (Miller-Petrie et al., 2026; Williams et al., 2021). The framework assumes that childhood morbidity does not arise from a single determinant but from interconnected household and environmental conditions that modify water quality and hygiene compliance, consistent with the UNICEF undernutrition framework and its application to WASH–nutrition pathways (Cumming & Cairncross, 2016; Cumming et al., 2019). These pathways operate through key mediating factors namely, water contamination risk, hygiene compliance, and environmental cleanliness which directly affect children's vulnerability to diarrhoea, cholera, and typhoid fever via faecal–oral transmission routes (Wolf et al., 2023).

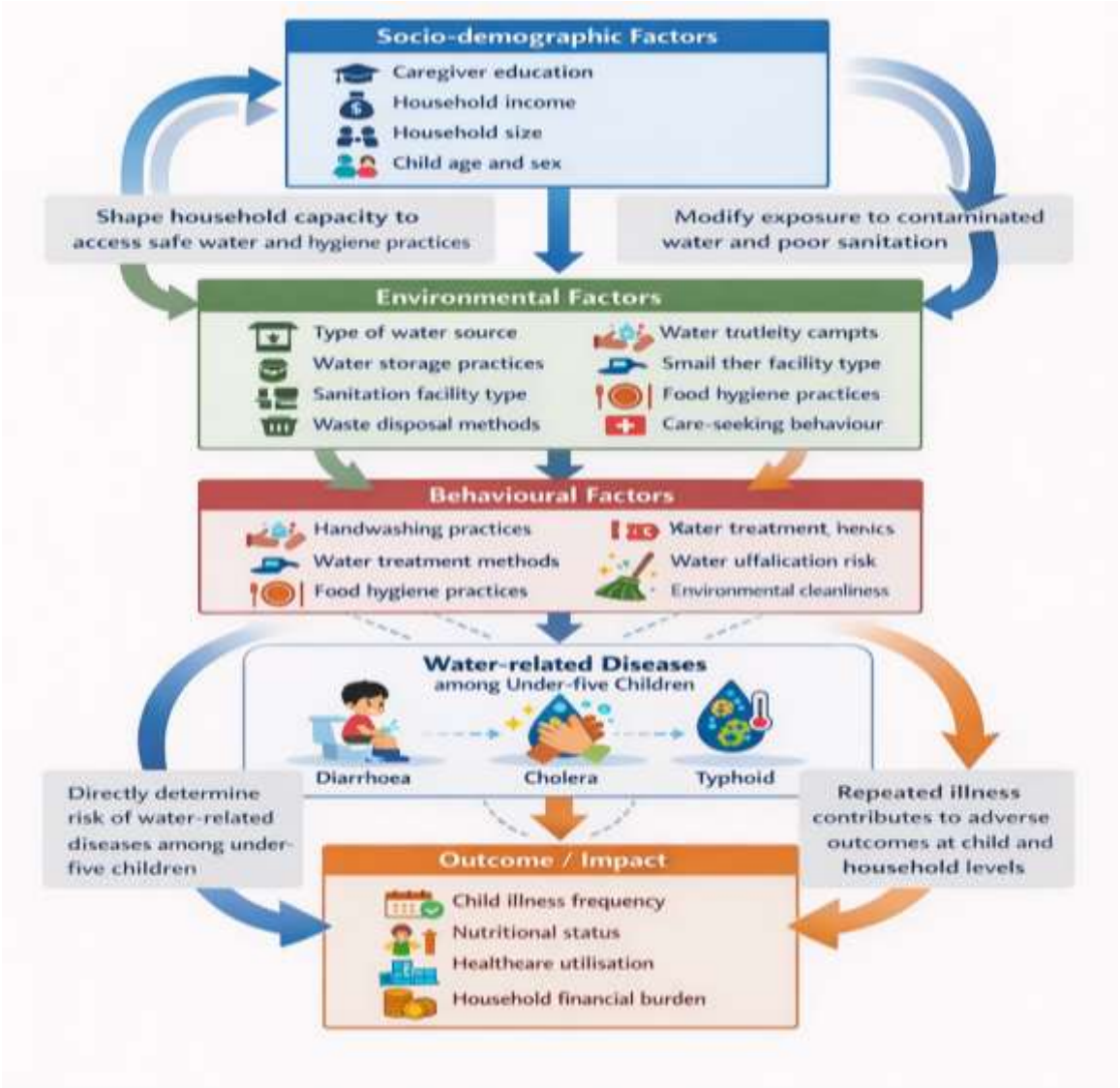
Repeated episodes of water-related illness are further conceptualised as drivers of broader health and socioeconomic consequences, including increased illness frequency, compromised

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

nutritional status, heightened healthcare utilisation, and increased household financial burden (Ngure et al., 2014; Pickering et al., 2019). This aligns with evidence demonstrating that enteric pathogen exposure and environmental enteric dysfunction contribute to undernutrition and impaired neurodevelopment through chronic inflammation and reduced nutrient absorption (Leela, 2025; Cumming et al., 2019).

Within this framework, sociodemographic characteristics shape household capacity to access safe water and adopt appropriate hygiene practices (Miller-Petrie et al., 2026). Environmental conditions and behavioural practices further modify exposure to contaminated water and poor sanitation (Williams et al., 2021). These influences converge through mediating factors that directly determine disease risk among children under five. Persistent exposure results in repeated illness, which in turn contributes to adverse nutritional, health service, and economic outcomes at both child and household levels (Ngure et al., 2014).

Figure 1. Conceptual framework showing pathways of water-related disease among children under five years of age.



Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

African Journal of Health, Nursing and Midwifery
ISSN: 2689-9418
Volume 9, Issue 2, 2026 (pp. 27-46)

www.abjournals.org

METHODS

Study Design

This study employed a cross-sectional, mixed-methods design to assess the prevalence and impact of water-related diseases among under-five children in selected communities in Kenema city, Sierra Leone. The design combined quantitative surveys to estimate prevalence and identify associated factors with qualitative methods to explore household and community practices regarding water access, sanitation, and disease prevention. This approach allows a comprehensive understanding of both the measurable burden of water-related diseases and the contextual factors influencing exposure and mitigation practices (Creswell & Clark, 2017). Given the descriptive and exploratory nature of this cross-sectional study, formal hypotheses were not specified. Instead, the study was guided by predefined objectives to estimate the prevalence and examine associations between water access, sanitation, hygiene practices, and the occurrence of water-related diseases among children under five years of age.

Study Site

The study was conducted in selected communities within Kenema city, the third-largest urban centre in Sierra Leone. Kenema city is characterised by heterogeneous urban and peri-urban settlements with varied access to potable water, sanitation facilities, and healthcare services. The city experiences recurrent outbreaks of diarrhoeal diseases, cholera, and typhoid, particularly affecting children under five years of age. The selected communities were purposively chosen to represent areas with diverse sociodemographic and environmental conditions, allowing for meaningful comparisons of water access, sanitation, and hygiene practices.

Study Population, Sampling, and Sample Size

The study population comprised households with children under five years of age residing in the selected communities. For the quantitative component, a multistage sampling technique was used. First, communities were stratified into urban and peri-urban clusters. Second, households were selected via systematic random sampling on the basis of household lists obtained from local community health workers. The sample size for the household survey was calculated via the standard prevalence formula for cross-sectional studies (Lwanga & Lemeshow, 1991), assuming a 50% prevalence of water-related diseases, 95% confidence level, 5% margin of error, and a 10% nonresponse rate, resulting in a final target of approximately 400 households.

For the qualitative component, purposive sampling was applied to recruit participants for focus group discussions (FGDs) and key informant interviews (KIIs). Five FGDs were conducted, each comprising 6–10 caregivers of under-five children. Additionally, 15 key informants, including community health workers, local leaders, and health facility staff, were interviewed to provide contextual insights into community water access, sanitation practices, and disease prevention strategies.

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

Data collection tools and procedures

Data were collected via structured household questionnaires, semistructured FGD guides, and KII guides. The household questionnaire captured sociodemographic characteristics, water sources, sanitation facilities, hygiene practices, and the occurrence of water-related diseases among children under five years of age. The FGD and KII guides explored community perceptions, prevention strategies, barriers to safe water and sanitation, and care-seeking behaviours.

All tools were adapted to the local context through consultation with local health experts and translated into Krio and Mende to ensure cultural relevance and comprehension.

Pretesting was conducted in a community outside the study sample, involving 20 households, to assess clarity, flow, and content validity. Adjustments were made to wording and response options based on the pretest findings.

Data collection was conducted by trained research assistants fluent in local languages. For the household surveys, face-to-face interviews were carried out at the participants' homes. FGDs were facilitated in community meeting spaces to ensure privacy, whereas KIIs were conducted at health facilities or community offices. All interviews were audio-recorded with participant consent and supplemented with detailed field notes.

Data Quality Assurance

To ensure data quality, several strategies were implemented. Research assistants underwent a three-day training workshop covering the study objectives, data collection techniques, ethical procedures, and instrument administration. Supervisors conducted daily checks of the completed questionnaires for completeness and consistency. For qualitative data, recordings were cross-checked against field notes, and preliminary coding was reviewed collaboratively by two independent researchers to ensure reliability.

Data analysis

The quantitative data were entered into SPSS version 28 and checked for accuracy before analysis. Descriptive statistics, including frequencies and proportions, were calculated to determine the prevalence of water-related diseases and the distributions of household water, sanitation, and hygiene characteristics. Bivariate analyses via chi-square tests were performed to identify associations between independent variables (sociodemographic, environmental, and behavioural factors) and the occurrence of water-related diseases. Variables significant at $p < 0.05$ were included in multivariate logistic regression models to adjust for potential confounders.

Qualitative data from FGDs and KIIs were transcribed verbatim and imported into NVivo version 14 for thematic analysis. Coding was conducted inductively, and themes were generated through iterative reading of the transcripts. Patterns were identified regarding community perceptions of water-related disease, preventive practices, and barriers to improved water and sanitation. Triangulation of the quantitative and qualitative findings enhanced the validity of the results.

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

Ethical considerations

Ethical approval for the study was obtained from the Njala University Ethical Review Board (NUERB/2024/04). Permission to conduct the study in selected communities was granted by local health authorities and community leaders. Written and verbal informed consent was obtained from parents or legal guardians for child participation prior to participation. For participants who could not read, the consent form was read aloud in their preferred language, and a thumbprint was obtained. Confidentiality was maintained by anonymising data and storing electronic files on password-protected devices.

RESULTS

A total of 400 households with under-five children participated in the study, yielding a 100% response rate. Data were collected via structured household questionnaires, FGDs, and KIIs. The quantitative data provided information on water sources, sanitation, hygiene practices, and disease prevalence, whereas the qualitative data explored community perceptions, barriers, and prevention strategies.

Sociodemographic characteristics of the respondents

The majority of respondents were aged 26–45 years (63%), whereas younger (<25 years) and older (>45 years) respondents constituted 18% and 19%, respectively. Males represented 63% of the sample, and females represented 37%. Household sizes varied from 1–3 members (47%) to ≥7 members (23%), with most households being nuclear or medium-sized (Table 1).

Table 1. Sociodemographic characteristics of the respondents (n=400)

Characteristic	Frequency	Percentage (%)
Age (years)		
<18	16	4.0
18–25	56	14.0
26–35	128	32.0
36–45	128	32.0
46–55	48	12.0
>55	24	6.0
Gender		
Male	252	63.0
Female	148	37.0
Household size		
1–3	188	47.0
4–6	112	28.0
7–9	80	20.0
≥10	20	5.0

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

Household Access to Water and Sanitation

Primary Sources of Drinking Water

Traditional unlined or unprotected well water was the predominant source (27%), followed by boreholes (17%), piped water (12%), swamp/river (14%), protected wells (8%), rainwater (7%), and commercially packaged water (7%). Other unspecified sources accounted for 8% of the households.

Water access and availability

Approximately 38% of the respondents accessed water within 500 metres, whereas 18% walked more than 2 km especially during the dry seasons. Regarding water availability, 43% rated it as "good," 17% reported frequent shortages, and 40% rated availability as moderate.

Water treatment practices

Most households (74%) treated their drinking water, primarily by boiling (43%) and chlorination (38%), whereas sun disinfection (7%) and filtration (2%) were less common. Twenty-six percent did not treat the water prior to consumption (Table 2).

Table 2. Water treatment and quality (n=400)

Indicator	Frequency	Percentage (%)
Water treated		
Yes	296	74.0
No	104	26.0
Method of treatment		
Boiling	172	43.0
Chlorination	152	38.0
Sun disinfection	28	7.0
Filtration	8	2.0
Water quality perception		
Very good	172	43.0
Good	152	38.0
Acceptable	8	2.0
Poor	28	7.0
Very poor	40	10.0

Sanitation and hand hygiene

Flush toilets were used by 43% of the households, whereas 10% practiced open defecation. Shared sanitation facilities were reported by 77% of the respondents. With respect to handwashing after toilet use, 41% always washed their hands, 25% washed their hands most of the time, 15% sometimes washed them, and 17% never washed them. Forty-two percent of the households lacked hand soap (Table 3).

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

Table 3. Sanitation facilities and hand hygiene practices (n=400)

Indicator	Frequency	Percentage (%)
Toilet type		
Flush toilet	172	43.0
Pit latrine	160	40.0
Open defecation	40	10.0
Shared sanitation facility	308	77.0
Handwashing after toilet		
Always	164	41.0
Most of the time	100	25.0
Sometimes	60	15.0
Never	76	19.0
Soap availability		
Available	232	58.0
Not available	168	42.0

Prevalence of Water-related Diseases

Among the households, 83% reported having at least one child under five years of experience with water-related diseases in the past year. Diarrhoea (35%) was the most commonly reported bacterium, followed by Cholera (31%) and typhoid (26%) (Table 4).

Table 4. Prevalence of water-related diseases among children under five years of age (n=400)

Disease	Frequency	Percentage (%)
Diarrhoea	140	35.0
Cholera	124	31.0
Typhoid	104	26.0
None	32	8.0

Frequency of illness episodes and care-seeking

Approximately 35.9% of households reported 1–2 episodes of water-related disease, 29.1% reported 3–4 episodes, 19.4% reported 5–6 episodes, and 12.6% reported more than six episodes in the past year. Regarding care-seeking, 22.3% always sought medical treatment, 28.2% sought treatment occasionally, and 30.1% never sought treatment.

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

Bivariate Associations

Chi-square tests were conducted to examine associations between independent variables and disease occurrence (Table 5). Only handwashing frequency was significantly associated with water-related diseases ($\chi^2 = 9.43$, df = 3, p = 0.024) at $p < 0.05$.

Table 5. Bivariate associations between independent variables and water-related diseases (n=400)

Variable*	χ^2	df	p value
Water source	7.03	3	0.071
Water treatment	0.64	1	0.424
Sanitation type	1.24	2	0.537
Handwashing	9.43	3	0.024

**These four variables in table 5 above were selected for bivariate analysis because they represent the core proximate determinants of faecal-oral disease transmission within the WHO/UNICEF Joint Monitoring Programme framework for WASH, whereas distance to water and household size act as distal contextual factors whose effects are largely mediated through these primary exposure pathways.*

Multivariate logistic regression

Variables significant at $p < 0.05$ in bivariate analyses and key household risk factors were included in a multivariate logistic regression model. The results (Table 6) indicate that water treatment, sanitation practices, handwashing, and water source were significant predictors of water-related diseases.

Table 6. Multivariate logistic regression of factors associated with water-related diseases (n=400)

Variable	AOR	95% CI	p value
Water source (traditional unlined wells vs others*)	3.0	1.2–7.5	0.015
Water treatment (not treated vs treated)	3.2	1.5–6.9	0.003
Sanitation (open defecation vs others**)	2.8	1.1–7.1	0.025
Handwashing (never vs sometimes/always)	2.5	1.2–5.3	0.014

*others- *lined wells with hand pumps, boreholes with hand pumps, traditional unlined wells, gravity schemes, and spring boxes*

**others- *flush/pour flush toilets connected to septic tanks or pits, VIP latrines, pit latrines with slabs, and composting toilets, comprise pit latrines without slabs, hanging latrines, and bucket latrines*

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

Community-recommended strategies for prevention

The respondents suggested several strategies to prevent water-related diseases, such as handwashing facilities with soap and water (21%), improved sanitation facilities (16%), regular health education programmes (15%), and community health initiatives (15%) (Table 7). Government intervention and improved water supplies were also highlighted.

Table 7. Community-recommended prevention strategies (n=400)

Strategy	Frequency	Percentage (%)
Handwashing facilities with soap and water	84	21.0
Improved sanitation facilities	64	16.0
Regular health education programmes	60	15.0
Community health initiatives	60	15.0
Government intervention/policies	52	13.0
Improved water supply systems	48	12.0
Other	32	8.0

Qualitative findings

The qualitative component explored caregivers' and key stakeholders' experiences and perceptions regarding water access, sanitation, hygiene practices, and the prevention of water-related diseases among under-five children in selected communities in Kenema city. The data were generated through five focus group discussions (FGDs) with caregivers and fifteen key informant interviews (KIIs) with community health workers, local leaders, and health facility staff. All interviews and discussions were conducted in Krio or Mende, audio-recorded with participants' consent, transcribed verbatim, and translated into English. Thematic analysis was undertaken via an inductive approach, allowing themes to emerge directly from the data.

Five major themes were identified and are presented below, supported by illustrative verbatim quotations to enhance credibility and confirmability.

Theme 1: Water Access and Availability

Limited access to safe, reliable, and proximate water sources emerged as a dominant theme across FGDs and KIIs. The participants consistently described long distances to water sources, irregular supply, and reliance on unsafe alternatives as factors constraining household water use and hygiene practices.

Caregivers reported that the physical burden of collecting water reduced the quantity of water available for domestic use, particularly for handwashing and cleaning children:

"Sometimes I have to walk more than 20 minutes to the the river or swamp especially during the dry season when our wells dry out to get water for my children and family. It is tiring, and we cannot always wash hands or clothes properly."
(FGD 2, caregiver, 29 years)

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

Although participants recognised the health risks associated with well, swamp or river water, the absence of viable alternatives compelled continued use:

"The unlined well and the swamp/river is our main source, especially during the dry season. However, we know it is dirty and can make children sick, yet there is no closer alternative."

(FGD 4, caregiver, 34 years)

Key informants further highlighted systemic challenges, particularly the breakdown of boreholes, standpipes and limited maintenance capacity:

"Most households rely on boreholes, or standpipes but they sometimes break down, leaving families to use unsafe sources."
(KII 7, health worker)

Theme 2: Sanitation and hygiene practices

Sanitation and hygiene practices vary substantially across households and are shaped by both infrastructural limitations and behavioural norms. Shared sanitation facilities are commonly reported and are often described as poorly maintained, overcrowded, and unhygienic.

A caregiver noted:

"We share pit latrines with neighbours. Sometimes they are very dirty, and children avoid using them, which is risky."
(FGD 1, caregiver, 26 years)

Hand hygiene practices were inconsistent, with limited soap availability and low prioritisation of soap use emerging as recurrent subthemes. Community leaders emphasised that handwashing was frequently performed without soap, even after toilet use:

"Even when water is available, not everyone washes hands with soap after using the toilet. Some just rinse with water."
(KII 3, Community Leader)

These findings suggest that inadequate sanitation infrastructure, combined with suboptimal hygiene behaviours, increases children's exposure to faecal contamination.

Theme 3: Knowledge and Perception of Water-related Diseases

The participants demonstrated general awareness of water-related diseases, particularly diarrhea, fever, and cholera. However, this knowledge was often superficial and did not consistently translate into effective preventive behaviours.

Caregivers associated illness primarily with contaminated water and seasonal changes:

"We know when a child has diarrhoea or fever that it may be from water. Sometimes we also worry about cholera during the rainy season."
(FGD 5, caregiver, 31 years)

Key informants acknowledged that while contamination pathways were broadly recognised, households frequently prioritised convenience over safety:

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

"Contaminated water and dirty surroundings are the main reasons for sickness. However, sometimes we cannot avoid using unlined well, swamp/river water because it is close." (KII 12, health facility staff)

Overall, the participants' narratives revealed a gap between awareness of disease risk and the ability to adopt consistent preventive practices.

Theme 4: Care-seeking behaviour

Care-seeking behaviour for childhood water-related illnesses was influenced by perceived severity, financial constraints, and access to health facilities. Caregivers commonly reported initiating treatment at home, particularly for mild symptoms.

One caregiver explained:

"For mild diarrhoea, we first give herbal teas or sugar and salt solutions at home before going to the clinic."
(FGD 3, caregiver, 38 years)

Delays in seeking formal healthcare were attributed to transportation costs, long waiting times, and competing household responsibilities:

"If the child is very sick, we take them to the health centre. However, sometimes we delay because of transport costs or long queues."
(KII 1, Community Health Worker)

These narratives highlight a pragmatic but potentially risky pattern of delayed healthcare utilisation.

Theme 5: Strategies for Prevention and Control

The participants articulated a range of prevention strategies, emphasising infrastructural improvements, sustained health education, and stronger institutional involvement. Caregivers underscored the need for reliable water sources and improved sanitation facilities:

"If we had more boreholes/stand pipes and clean toilets, children would be safer. The government should help provide these facilities."
(FGD 2, caregiver, 29 years)

Health workers and local leaders highlighted the importance of continuous community education and material support:

"We need regular teaching on handwashing, treating water, and keeping surroundings clean. Some families do not know the risks."
(KII 10, health facility staff)

"The municipality should monitor water quality and provide soap and chlorine to households. Prevention is cheaper than treating diseases."
(KII 5, local leader)

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

African Journal of Health, Nursing and Midwifery
ISSN: 2689-9418
Volume 9, Issue 2, 2026 (pp. 27-46)

www.abjournals.org

INTEGRATION OF FINDINGS

The integration of qualitative and quantitative findings revealed convergence in identifying water source type, sanitation conditions, and hygiene behaviours as key determinants of water-related diseases among children under five years of age. The quantitative analyses quantified these associations, whereas the qualitative findings revealed the contextual, behavioural, and structural mechanisms underlying the observed patterns. Data triangulation across FGDs and KIIs enhanced the credibility of the findings, whereas the inclusion of diverse participant perspectives strengthened transferability to similar urban settings.

DISCUSSION

The findings demonstrate that water-related diseases constitute a substantial public health burden among under-five children in Kenema city, driven by systemic deficiencies in water access, sanitation infrastructure, and hygiene practices. These results align with global evidence indicating that diarrhoeal diseases remain leading causes of child morbidity and mortality in low- and middle-income countries, despite progress toward Sustainable Development Goal targets (Khan & Amin, 2024; Arnold, 2024; Omarova et al., 2017). The persistence of high disease prevalence in this urban setting reflects enduring inequities in WASH services, with nearly two billion people globally lacking safely managed drinking water and over 3.5 billion without adequate sanitation (WHO & UNICEF, 2021).

Sierra Leone's national WASH coverage ranks among the lowest in West Africa, and rapid urbanisation in cities such as Kenema has outpaced infrastructure development (Koroma & Macarthy, 2024; Pepaj, 2021). The predominance of diarrhoea, cholera, and typhoid fever reported here mirrors national surveillance data and indicates sustained faecal contamination of water sources (WHO, 2019; Sesay et al., 2022). Whilst urban residence typically confers health advantages in sub-Saharan Africa, these benefits appear attenuated in contexts of urban poverty and informal settlement growth (Ben-Carew, 2024; Gaffan et al., 2023).

Continued reliance on unimproved water sources reflects systemic failures in urban water supply systems, a pattern documented across African cities where informal communities remain excluded from piped networks (Fotio & Nguea, 2022; WHO & UNICEF, 2019). Although many households reported treating drinking water, the persistence of disease suggests irregular practices, inadequate dosing, or post-treatment recontamination during storage (Paudel et al., 2021; WHO, 2023). Sanitation conditions further compound exposure risks; widespread use of poorly maintained shared facilities aligns with evidence that such arrangements frequently fail to interrupt faecal–oral transmission (Diep et al., 2021; WHO, 2023).

Hand hygiene emerged as a critical determinant of disease occurrence. Poor handwashing practices were significantly associated with increased illness risk, consistent with evidence that handwashing with soap can reduce diarrhoeal incidence by up to 40% (Mukherjee, 2020; McDonald et al., 2021). However, limited access to water, soap, and functional facilities constrains consistent practice, illustrating the interdependence of behavioural and environmental factors. The observed gap between caregiver knowledge and practice aligns with health behaviour theory, which posits that awareness alone is insufficient without enabling environments and perceived behavioural control (Glanz et al., 2008). Similar knowledge–

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

practice discrepancies have been documented in comparable urban low-income settings, where water scarcity and competing priorities undermine hygiene compliance (Gevera et al., 2022; Yeboah et al., 2024).

Frequent illness episodes and delayed care-seeking reflect well-documented barriers to healthcare access in low-income contexts, including treatment costs, transport challenges, and opportunity costs (Das et al., 2023). Moreover, inadequate WASH conditions within health facilities may discourage utilisation and compromise care quality (WHO & UNICEF, 2021). Beyond immediate morbidity, recurrent water-related illness contributes to undernutrition, immune dysfunction, and long-term developmental deficits, a cycle of infection and vulnerability consistent with findings across sub-Saharan Africa (UNICEF, 2019; Upashe & Shil, 2022; Ben-Carew, 2024).

Qualitative findings revealed high community awareness of disease risks and preventive strategies, yet participants consistently identified structural barriers including inadequate infrastructure, limited government support, and poverty that constrained translation of knowledge into practice. These findings reinforce systematic review evidence indicating that effective WASH interventions require combined infrastructural improvements, sustained behaviour change efforts, and supportive policy environments; isolated educational initiatives without addressing service gaps are unlikely to achieve sustained impact (Wolf et al., 2022).

Policy-level investment in safely managed water and sanitation infrastructure is essential, particularly in underserved urban communities. Strengthening water quality regulation and subsidising household water treatment technologies, such as chlorine tablets or ceramic filters, would reduce contamination exposure. Programmatically, WASH interventions should be integrated into routine child health and nutrition services, with community-based strategies prioritising functional handwashing stations with soap at public points and schools. Behaviour change efforts must be paired with infrastructural support, including municipal provision of water storage containers and soap subsidies for low-income households. Health system strengthening requires eliminating user fees for diarrhoeal disease treatment, establishing community health worker programmes for rapid case management, and enforcing WASH standards in all health facilities

This study has several limitations that should be considered when interpreting the findings. Self-reported data on illness and household practices may be subject to recall and social desirability biases. The cross-sectional design limits causal inference, and clinical verification of reported illnesses was not undertaken. Nevertheless, the mixed-methods approach strengthened interpretation by triangulating quantitative associations with qualitative insights, thereby providing a more nuanced understanding of the contextual drivers of water-related diseases in this setting.

CONCLUSION

This study demonstrated that water-related diseases remain highly prevalent among children under five in Kenema city, driven by reliance on unimproved water sources, inadequate sanitation, and inconsistent hygiene practices. Caregivers' capacity to adopt preventive

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

measures was constrained by unreliable water supply, shared facilities, and poverty, underscoring that disease burden stems from systemic failures rather than knowledge deficits.

To reduce water-related diseases among under-five children in urban Sierra Leone, policymakers must simultaneously invest in safely managed water and sanitation infrastructure, subsidised household water treatment and soap, integrate WASH into child health services, and eliminate user fees for diarrhoeal treatment whilst enforcing WASH standards in health facilities.

Longitudinal and intervention-based studies are needed to establish causal WASH–health pathways and identify scalable, cost-effective strategies for rapidly urbanising low-income settings.

Author Contributions: The three authors contributed equally at every stage of the development of this work.

Acknowledgements: We acknowledge all who took part in this study, and all sources cited.

Funding Information: No funding was solicited or received for this work

Conflict of Interest Statement: The authors declare no competing interests

Data Availability Statement: The data presented in this study are available upon request from the corresponding author upon reasonable request.

Ethics Approval: Ethical approval for this study was obtained from the Njala University Institutional Review Board (NUIRB).

Clinical Trial Number: Not applicable.

REFERENCES

1. Andrade, L., O'Malley, K., Hynds, P., O'Neill, E., & O'Dwyer, J. (2019). Assessment of two behavioural models (HBM and RANAS) for predicting health behaviours in response to environmental threats: Surface water flooding as a source of groundwater contamination and subsequent waterborne infection in the Republic of Ireland. *Science of the Total Environment*, *685*, 1019-1029.
2. Arnold, K. (2024). *Water Pollution and Children's Health* (pp. 362-377). Oxford University PressNew York.
3. Azanaw, J., Malede, A., Yalew, H. F., & Worede, E. A. (2024). Determinants of diarrhoeal diseases among underfive children in Africa (2013–2023): a comprehensive systematic review highlighting geographic variances, socioeconomic influences, and environmental factors. *BMC Public Health*, *24*(1), 2399.
4. Bah, D., Gebru, G., Hakizimana, J. L., Ogbonna, U., Sesay, B., Bah, B., ... & Elduma, A. H. (2022). Prevalence and risk factors of diarrheal diseases in Sierra Leone, 2019: a cross-sectional study. *Pan African Medical Journal*, *41*(1).

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

5. Ben-Carew, C. (2024). *Impact of Drinking Water and Sanitation Facilities on Child Mortality in Sierra Leone* (Doctoral dissertation, Walden University).
6. Brown, V. (2015). Using the social ecological model to inform community needs assessments. *Journal of Family & Consumer Sciences*, *107*(1), 45-51.
7. Cumming, O., & Cairncross, S. (2016). Can water, sanitation and hygiene help eliminate stunting? Current evidence and policy implications. *Maternal & child nutrition*, *12*, 91-105.
8. Cumming, O., Arnold, B. F., Ban, R., Clasen, T., Esteves Mills, J., Freeman, M. C., ... & Colford Jr, J. M. (2019). The implications of three major new trials for the effect of water, sanitation and hygiene on childhood diarrhea and stunting: a consensus statement. *BMC medicine*, *17*(1), 173.
9. Das, J. K., Siddiqui, F., Padhani, Z. A., Khan, M. H., Jabeen, S., Mirani, M., ... & Bhutta, Z. A. (2023). Health behaviors and care-seeking practices for childhood diarrhea and pneumonia in a rural district of Pakistan: a qualitative study. *Plos one*, *18*(5), e0285868
10. Dbaibo, G., Tatochenko, V., & Wutzler, P. (2016). Issues in pediatric vaccine-preventable diseases in low-to middle-income countries. *Human Vaccines & Immunotherapeutics*, *12*(9), 2365-2377.
11. Demissie, G. D., Yeshaw, Y., Aleminew, W., & Akalu, Y. (2021). Diarrhea and associated factors among under-five children in sub-Saharan Africa: evidence from demographic and health surveys of 34 sub-Saharan countries. *Plos one*, *16*(9), e0257522.
12. Diep, L., Martins, F. P., Campos, L. C., Hofmann, P., Tomei, J., Lakhanpaul, M., & Parikh, P. (2021). Linkages between sanitation and the sustainable development goals: A case study of Brazil. *Sustainable Development*, *29*(2), 339-352.
13. Fotio, H. K., & Nguea, S. M. (2022). Access to water and sanitation in Africa: Does globalisation matter?. *International Economics*, *170*, 79-91.
14. Gaffan, N., Kpozehouen, A., Degbey, C., Ahanhanzo, Y. G., & Paraïso, M. N. (2023). Effects of household access to water, sanitation, and hygiene services on under-fivemortality in Sub-Saharan Africa. *Frontiers in Public Health*, *11*, 1136299.
15. Gevera, P. K., Dowling, K., Gikuma-Njuru, P., & Mouri, H. (2022). Public knowledge and perception of drinking water quality and its health implications: an example from the Makueni County, South-Eastern Kenya. *International Journal of Environmental Research and Public Health*, *19*(8), 4530.
16. Glanz, K., Rimer, B. K., & Viswanath, K. (2008). Theory, research, and practice in health behavior and health education.
17. Khan, A. I., & Amin, M. A. (2024). Understanding deaths from diarrhoea in children younger than 5 years. *The Lancet Global Health*, *12*(6), e891-e892.
18. Kim, H., & Jin, Y. (2024). Prevalence of child fever, acute respiratory infection, and diarrhea and their risk factors in Sierra Leone. *Life*, *14*(11), 1493.
19. Koroma, B., & Macarthy, J. M. (2024). daniel Oviedo, Clemence Cavoli, Alexandria z. w. Chong, Yasmina Yusuf. *Urban Transformations in*, 99.
20. Leela, V. (2025). UNICEF–Strategy For Water, Sanitation And Hygiene (Wash). *Journal of Scientific Research and Technology*, 252-260.
21. Lwanga, S. K., & Lemeshow, S. (2022). Geneva: World Health Organisation; 1991. *Sample size determination in health studies: a practical manual*, 80.
22. McDonald, M. V., Brickner, C., Russell, D., Dowding, D., Larson, E. L., Trifilio, M., ... & Shang, J. (2021). Observation of hand hygiene practices in home health care. *Journal of the American Medical Directors Association*, *22*(5), 1029-1034.

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

23. Miller-Petrie, M. K., Lee, G. O., Spiker, M. L., Lupero, A., Ayovi, M., Cevallos, W., ... & Levy, K. (2026). Socioecological drivers of water, sanitation, and hygiene (WASH) choices: A qualitative analysis of maternal perspectives in northwest Ecuador. *PLOS Water*, *5*(1), e0000368.
24. Mukherjee, S. (2020). Factors influencing access to basic handwashing facilities in developing countries.
25. Ngure, F. M., Reid, B. M., Humphrey, J. H., Mbuya, M. N., Pelto, G., & Stoltzfus, R. J. (2014). Water, sanitation, and hygiene (WASH), environmental enteropathy, nutrition, and early child development: making the links. *Annals of the new York Academy of Sciences*, *1308*(1), 118-128.
26. Omarova, A. O., Tussupova, K. M., Berndtsson, R., & Kalishev, M. G. (2017). Burden of water-related diseases in developing countries. Review. *Наука и здравоохранение*, (3), 95-109.
27. Paudel, S., Kumar, P., Dasgupta, R., Johnson, B. A., Avtar, R., Shaw, R., ... & Kanbara, S. (2021). Nexus between water security framework and public health: A comprehensive scientific review. *Water*, *13*(10), 1365.
28. Pepaj, E. (2022). SIERRA LEONE.
29. Pickering, A. J., Null, C., Winch, P. J., Mangwadu, G., Arnold, B. F., Prendergast, A. J., ... & Humphrey, J. H. (2019). The WASH Benefits and SHINE trials: interpretation of WASH intervention effects on linear growth and diarrhoea. *The Lancet Global Health*, *7*(8), e1139-e1146.
30. Sesay, B. P., Hakizimana, J. L., Elduma, A. H., & Gebru, G. N. (2022). Assessment of water, sanitation, and hygiene practices among households, 2019− Sierra Leone: a community-based cluster survey. *Environmental Health Insights*, *16*, 11786302221125042.
31. Sesay, B. P., Hakizimana, J. L., Elduma, A. H., & Gebru, G. N. (2022). Assessment of water, sanitation, and hygiene practices among households, 2019− Sierra Leone: a community-based cluster survey. *Environmental Health Insights*, *16*, 11786302221125042.
32. Sierra Leone Ethics and Scientific Review Committee. (2025). Ethical approval for research studies [Approval reference SLESRC/2025/04]. Freetown, Sierra Leone.
33. Upashe, S. P., & Shil, R. (2022). A cross-sectional approach. *International Journal of Nursing Education and Research*, *10*(1).
34. Vonk, J. (2022). Sustainable Water and Sanitation in Sierra Leone: Impact evaluation of the 'Improved WASH Services in WAU and WAR Districts' project.
35. Williams, C., Thomas, E. D., Kuhl, J., Bisimwa, L., Coglianese, N., Bauler, S., ... & George, C. M. (2021). Identifying psychosocial determinants of water, sanitation, and hygiene (WASH) behaviors for the development of evidence-based Baby WASH interventions (REDUCE program). *International journal of hygiene and environmental health*, *238*, 113850.
36. Wolf, J., Johnston, R. B., Ambelu, A., Arnold, B. F., Bain, R., Brauer, M., ... & Cumming, O. (2023). Burden of disease attributable to unsafe drinking water, sanitation, and hygiene in domestic settings: a global analysis for selected adverse health outcomes. *The Lancet*, *401*(10393), 2060-2071.
37. World Health Organisation, & United Nations Children's Fund. (2021). *Progress on household drinking water, sanitation, and hygiene 2000-2020: five years into the SDGs*. World Health Organisation.

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU

38. World Health Organisation. (2023). *Water safety plan manual: step-by-step risk management for drinking-water suppliers*. World Health Organisation.
39. World Health Organisation. (2023). *WHO Global water, sanitation and hygiene: annual report 2022*. World Health Organisation.
40. World Health Organization. (2024). *Progress on household drinking water, sanitation and hygiene 2000-2022: special focus on gender*. World Health Organization.
41. Yeboah, S. I. I. K., Antwi-Agyei, P., Kabo-Bah, A. T., & Ackerson, N. O. B. (2024). Water, environment, and health nexus: understanding the risk factors for waterborne diseases in communities along the Tano River Basin, Ghana. *Journal of Water and Health*, *22*(8), 1556-1577.
42. ZK, A., FO, M., BM, B., & NK, B. (2025). Forecasting progress: analyzing the trajectory of under-five child mortality for Ghana, Niger, Nigeria, and Sierra Leone towards SDG3 using ARIMA time series model.

Article DOI: 10.52589/AJHNM-CBMHECLU
DOI URL: https://doi.org/10.52589/AJHNM-CBMHECLU