Relationship of Waterborne Disease with Source of water and Sanitation Facilities in Flood-affected & River Erosion Areas of Noakhali

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Abstract

WASH practices are crucial for public health issue, but nearly 2 billion people lack access to safe drinking water and sanitation facilities globally. Natural disasters, such as floods, can disrupt WASH facilities, contaminate water sources, and influence hygiene practices, leading to increased water-borne diseases.

The study investigates the link between WASH practices and waterborne disease prevalence in river erosion areas post-flood, identifying key risk factors and evaluating current practices and facilities.

A cross-sectional quantitative study was conducted among 183 households in Companigonj Upazila from January 10 to January 14, 2025. Data were collected through structured interviews and analyzed using STATA to assess associations between water source usage, sanitation conditions, hygiene behaviors, and disease prevalence.

The study shows that despite 96.7% of households using safe water for drinking, 80.3% rely on pond water for cooking, increasing disease transmission. Floods damaged 49.1% of toilets, leading 13.1% of households to open defecation. Poor hygiene practices were evident, with 78.7% not treating drinking water and 67.0% improperly disposing of waste. 56.3% reported at least one waterborne disease case, with 43.1% experiencing diarrhea, 12.0% dysentery, and 1.1% typhoid.

Statistical analysis highlights significant associations between inadequate sanitation, flood-induced infrastructure damage, and the prevalence of waterborne diseases. The study underscores the urgent need for flood-resilient sanitation infrastructure, improved water treatment methods, and targeted behavioral change interventions to mitigate health risks in vulnerable areas.

Keywords: WASH, waterborne diseases, sanitation, hygiene, flood-affected areas, river erosion, Noakhali, Bangladesh.

Chapter One: Introduction

1.1 Background of The Study: Water, sanitation, and hygiene (WASH) practices are recognized as major determinants of public health. Access to clean water and proper sanitation facilities may significantly reduce the prevalence of waterborne diseases. According to the World Health Organization (WHO), nearly 2 billion people do not have access to safe drinking water worldwide and more than 4 billion do not have safe sanitation facilities(1 in 3 People Globally Do Not Have Access to Safe Drinking Water – UNICEF, WHO, 2025). This problem is more prevalent in natural disaster-prone regions such as floods, which have a significant impact on public health. Natural calamities like floods can disrupt WASH facilities, contaminate drinking water sources, and influence the basic hygiene practices of individuals who are affected by the disaster. Which may lead to an increased incidence of water-borne diseases like diarrhea, cholera, typhoid etc.

Asia is in the most vulnerable state of natural calamities. Floods and other natural disasters are common events in this region. Regular occurrence of flood and other disaster significantly impact WASH facilities and practices of the people in this region. In rural and isolated areas, lack of proper facilities, and inadequate recovery process often result in public health problems as a consequence of natural disaster(Asia, Most at Risk for Natural Hazards, Most Vulnerable to Cyclones | PreventionWeb, 2025).

Bangladesh, a riverine country, is highly susceptible to natural disasters like floods due to its low elevation from sea level and annual monsoons. This country experiences regular river erosion and flooding. Bangladesh is a densely populated country almost one-third of its population lives in flood-prone areas. It faces frequent problems of river erosion, flood, and climate migration, which eventually negatively impact WASH practices and the public health of the population(Outbreak Of Diseases After Flood | Check Spread of Waterborne Diseases in Flood-Hit Areas, 2025.; Risk of Disease Outbreak Rises as Bangladesh Floods Devastate Sanitation Infrastructure - Oxfam | Oxfam International, 2025.)

Noakhali district, located in the southeastern part of Bangladesh, faces the dual challenges of river erosion and flooding throughout the year. Noakhali, one of the most vulnerable regions in the country, is significantly displaced due to erosion where communities lack access to drinking water, sanitation, and hygiene facilities. Flooding exacerbates these challenges as it contaminates water

sources and increases the rate of waterborne diseases related to inadequate sanitation. Many communities in this district live in poverty, with limited health facilities and disaster response, making them more susceptible to the health impacts of poor WASH practices(Tusar et al., 2023).

This study focuses on the impact of flood and river erosion-prone area-associated WASH practices on getting infected with waterborne diseases in Noakhali. The report examines the impact of current WASH practices and what happened next, focuses on the relationship between environmental disasters, public health issues, and WASH infrastructure, and tries to develop new disaster preparedness strategies.

1.2 Statement of the Problem

Flood and River erosion-prone areas in Bangladesh, particularly in Noakhali District, are plagued by inadequate access to safe water, sanitation, and hygiene facilities. These disasters damage WASH infrastructure, leaving communities vulnerable to waterborne diseases like cholera, typhoid, and dysentery. These recurring disasters undermine long-term WASH interventions, causing displaced populations to live without reliable access, and increasing the risk of disease outbreaks.

Flood-prone areas are still vulnerable to environmental disasters due to the loss of water sources and sanitation facilities. There is limited literature linking disaster-induced WASH challenges to disease burden in flood-affected regions. This Research is to assess WASH practices and the causal factors of the problem(As Floodwater Recedes, Diseases Spread | The Daily Star, 2025; Contaminated Water Endangers People’s Health Following Floods in Bangladesh - Bangladesh | ReliefWeb, 2025; Situational Overview of Noakhali District - Eastern Flash Floods 2024 (28 October 2024) - Bangladesh | ReliefWeb, 2025).

1.3 Justification of the Study

The study is significant because few there are only a few studies have explored how river erosion and flooding affect WASH facilities and practices in Bangladesh, particularly in Noakhali. Most of the previous studies asses broader WASH challenges, but only a few of the studies address how both flood and river erosion has disrupted WASH practices and facilities in Noakhali. For example, Mou et al. (2023) identified the socioeconomic consequences of riverbank erosion in Chairman Ghat, Noakhali, but did not explore how it affected WASH infrastructure. Rahaman et

al. (2020) also looked at waterlogging problems in southern Bangladesh, including Noakhali, but their emphasis was not particularly on WASH-related effects(Mou et al., 2023; Rahaman et al., 2020).

This research on Water, Sanitation, and Hygiene (WASH) in the Noakhali district, affected by river erosion and flooding, offers unique insights into the relationship between these factors and waterborne diseases and sanitation issues. It has a conceptual impact by filling the knowledge gap. The research significance lies in the urgent need to improve WASH practices, rebuild disrupted WASH facilities, and decrease disease prevalence. The purpose of this study is to assess the impact of river erosion and flooding on WASH practices and facilities in Noakhali, Bangladesh, and to examine their relationship with waterborne disease prevalence.

i. ***Public Health Issue:*** The study findings will have a potential say on the health burden in the population of river erosion and flood affected area
ii. ***Policy and Planning:*** Findings from the study will support the development of policy to improve WASH practices and facilities and prevention of disease in the aftermath of a disaster.
iii. ***Academic:*** This study will generate academic knowledge about WASH practices and facilities in the river erosion area of Bangladesh particularly Noakhali and identify determinants of the practice.

1.4 Objective

The objectives of this research were divided into two-part headings: broad objectives and specific objectives. These objectives are the leading purposes of this study.

1.4.1 General Objective

The main aim of the study is to investigate the relationship between WASH practices and the prevalence of waterborne diseases in river erosion areas following a recent flood, identifying key risk factors

1.4.2 Specific Objectives

1. To evaluate the current condition of water use, hygiene practices and sanitation facilities in the flood-affected river erosion area of Noakhali

2. To describe the condition of post-flood water source and sanitation facilities in the flood-affected river erosion area of Noakhali
3. To identify post-flood waterborne disease prevalence in the flood-affected river erosion area of Noakhali.
4. To assess the association between sanitation facilities and water practices with the prevalence of waterborne diseases in the flood-affected river erosion area of Noakhali.

1.5 Operational Definition

WASH: Water, Sanitation, and Hygiene, which refers to the key services and practices that ensure access to clean drinking water, safe sanitation facilities, and the promotion of good hygiene practices to prevent the spread of disease(Water Sanitation and Health, 2025).

Waterborne Disease: Water-borne diseases are the ones caused by pathogenic microbes spread via contaminated water(Water-Borne Diseases, 2025).

Flood-affected Areas: Areas that experience frequent flooding where water covers land areas which are usually dry(Flood-Prone Area Definition | Law Insider, 2025).

River Erosion: The process by which riverbanks are broken away by continuous water flow(Types of Erosion - River Processes - AQA - GCSE Geography Revision - AQA - BBC Bitesize, 2025).

1.6 Limitations of the Study:

“Every study has more or less limitation in regard to timing, cost and staffing” (Karon, 1971). In short, a limitation is any defect that has a negative effect on the findings of the study. They refer to a standard feature of any study. This study has some limitations too. This study was completed in a short amount of time with some close-ended questionnaire and a small sample size. The research requires sufficient time and financial support, but obtaining financial support as a student researcher is difficult. Besides, some of the respondents were not comfortable to talk. The area of the study was remote and transportation service was not adequate.

1.7 Ethical Consideration

The ethical consideration is a crucial part of any research. Researchers must maintain the ethical issue during data collection, description, analysis as well as tabulation. In this study, research assured respondents security and promised them to secure their information. Researcher also

obtain informed consent from respondents, and provide freedom to withdraw at any time. Participants were also informed about the objective and purpose of the study. Rules and regulations regarding the study were sincerely obliged. Any kind of social, cultural or religious beliefs were not hurt during conducting this research.

Chapter Two: Literature Review

Robert O. et al. (2018). "*Assessment of water, sanitation and hygiene practices associated with diarrhea prevalence among households' members in flood prone areas: A cross-sectional study along Kilombero Valley."*

Robert O. et al. in 2018 conducted a study which focus on assessing WASH practices and its association with the prevalence of diarrhea among household member in flood-prone areas of the Kilombero Valley. The study uses a cross-sectional design. In August 2017, 384 households were interviewed, and data was collected on water supply, water treatment, sanitation, and hygiene. The study found that households in flood prone areas are at significant risk of diarrhea due to poor WASH practices, and the prevalence of diarrhea among was 30.6%. Treatment and source of drinking water, sanitation status and use of pit latrines without slabs were major determinants of diarrhea(Robert O, 2018).

Shrestha et al. (2022) *"WASH and Health in Sindhupalchowk District of Nepal after the Gorkha Earthquake."*

Shrestha et al. in 2022 carried out a study aimed at examining the WASH scenario and its association with health in Sindhupalchowk District of Nepal after the Gorkha Earthquake. The study uses a cluster sampling technique to collect data. 30 clusters were selected for the analysis and 7 households were sampled from each cluster. Data was collected during pre-monsoon and during the monsoon season to analyze the seasonal variation. The study revealed that most of the households do not have access to safe water sources which results in contamination of water. Another finding of the study was that households with low water consumption are at higher risk of waterborne diseases(Shrestha et al., 2022).

Manetu & Karanja (2021) *"Waterborne Disease Risk Factors and Intervention Practices: A Review."*

The study identifies major risk factors for waterborne disease in less developed countries. The study explores multiple interventions proposed to reduce the incidence and spread of waterborne disease. It examined both past and present research to identify risk factors associated with waterborne disease. The findings of the research reveal that lack of access to clean piped water

and reliance on contaminated surface water sources are major risk factors for waterborne diseases. Besides that, poor hygiene practices are another significant determinant of waterborne diseases. Inadequate management of waste also contributes to the health problems related to waterborne disease(Manetu & Karanja, 2021).

Elvis Fon et al. (2024*) "Emergency Preparedness for Waterborne Diseases in the Wake of Floods in Northern Cameroon: A Call for Immediate Action."*

The study conducted by Elvis Fon et al. in 2024 examines how various extreme weather event like flood is associated with waterborne disease outbreak in Italy. The national statistics collected by the Italian Ministry of Health were used as data for the study. The research looked for connections between water-borne diseases and floods in Italy, but further analysis is still required to prove the relationship. The result of the study indicates that, In Italy, there appears to be a link between some water-borne infectious diseases and flood events, although further research is required to prove this association. The study also found that flood can cause immediate, medium-term, or long-term Impact. Various factors influencing the degree and severity of the consequences of flood(Elvis Fon et al., 2024).

Ahmed, (2009) *"An Assessment of the Impacts of Floods on Sanitation in Rural Bangladesh."*

The purpose of the study conducted by Ahmed at 2009 was to examine how flood damage sanitation facilities in rural Bangladesh and explores ways to reduce the negative impacts of floods on sanitation. The study collected data from 880 households from selected flood affected areas of BRAC WASH programme. The study found that flood was the primary reason behind disruption of latrines along with other factors. It also found that installing latrines at a higher place could prevent or reduce the damage(Ahmed, 2009).

Rafa et al., (2021) *"Impact of cyclone Amphan on the water, sanitation, hygiene, and health (WASH2) facilities of coastal Bangladesh."*

Rafa N. et al. conducted research on impact of cyclone Amphan on the water, sanitation, hygiene, and health (WASH2) facilities of coastal Bangladesh. The study uses a structured questionnaire survey, key informant interviews (KII), and direct observation of WASH2 facilities affecting affected residents to collect data for the study. The result shows that Cyclone Amphan severely damaged coastal Bangladesh's WASH2 facilities, only 20% of respondents had proper access to

WASH2 facilities after the cyclone. Which lead to increased use of unsafe drinking water, open defecation, and WASH2 related diseases(Rafa et al., 2021)

Islam M, Parvin S, Farukh M (2017*) "Impacts of riverbank erosion hazards in the Brahmaputra floodplain areas of Mymensingh in Bangladesh"*

In 2017, Islam M, Parvin S, Farukh M performed research to analyze the effect of Brahmaputra riverbank erosion on the livelihood, agriculture practice and effect on the environment. The study was conducted on five villages in Mymensingh, Bangladesh. The study revealed that there was displacement of people, loss of land and degradation of water source at significant level. The study was conducted through both primary and secondary data. Qualitative methods such as semi structured questionnaire, interview, focus group discussions (FGD), and observations was used as primary source of data. The study revealed that, about 88% of the household uses tubewell water as primary source of drinking water. This figure was smaller than national rate of 96.42% in rural area. Some household living in river bank used river water for bathing, drinking and household use, leading to unhygienic conditions. Major diseases like diarrhea, dysentery, asthma, TB, and typhoid were prevalent during floods and river erosion(M. Islam et al., 2017).

Chapter Three: Data and Methodology

3.1 Introduction to Data and Methodology

The purpose of this chapter is to provide an overview of the type of data used, the study area of the research, geography of the study area, study population, sampling size, sample design, preparation of questionnaire, collection of data, data processing, data editing, data coding, computerization, selection of variable, methodology and as well as all other related and important aspects of the study.

3.2 Type of Data

Data is any facts, statistics, or recorded measure of any event. In this study researcher obtained primary data from the study area through the direct interview method. A structured questionnaire was used to collect data from the selected sample. After collecting raw data, it must be turned into information that can be used for analysis and provide answers to research questions.

3.3 Study Area

The selection of research areas for data collection plays a significant role in research. The collection of relevant, realistic primary data from the field is crucial. In this study, research attempted to estimate WASH practice and the prevalence of waterborne disease in recently flood-affected river erosion areas. Bangladesh is divided into eight divisions, sixty-four districts, and nine city corporations. To collect field-level data Charparboti Union and Musapur Union of Companygonj Upazila under Noakhali District were chosen carefully, taking into account practical limitations such as time, distance, and resources. Noakhali District is prone to natural disasters like cyclones and floods. Recently flooding and river erosion caused widespread distraction of life and infrastructure. The vulnerability of the area makes it crucial to study the impact of floods and river erosion on WASH practices and public health outcomes. To meet the objectives of the research the study area was chosen based on practical rather than methodological considerations. Due to a lack of time and resources, a researcher was unable to cover the other vulnerable areas of the country.

3.4 Geography of the Area

Companygonj Upazila under Noakhali District is located in the southern part of Bangladesh. Companigani is bounded by Senbgh and Daganbhuiyan upazilas on the north, Noakhali Sadar and

Sandwip on the south, Sonagazi and Mirsharai on the east, and Noakhali Sadar on the west. The main rivers are Little Feni and Bamni.(Sirajul. Islam, 2003)(Companiganj Upazila, Noakhali - Wikipedia, 2025). Companygonj Upazilas' geographical coordinates are 22°52.5′N 91°17′E. It has a total land area of 380.95 km^2 (147.09 sq mi). According to the BBS Population and Housing Census 2022, the total population of the upazila is 301295 with 65348 households(Population and Housing Census 2022 MINISTRY OF PLANNING, 2024).

Figure 1: Map of Companigonj Upazila.

3.5 Study Population

The study population is the population for whom data is collected. In this study, individual households of Companigonj Upazila were selected. Information was collected from the head of the household.

3.6 Sampling Design and Sample Size

Sampling is one of the most significant steps of a study. It is important to know the sampling frame and the technique of sampling involved in it. In any statistical study, collecting data from the total population is impractical. In this study researcher selected a subset of the population, which is called a sample of the population, and on the basis of these samples, the whole population was studied.

3.6.1 Sampling Technique: The study has been performed to identify the prevalence of Waterborne disease and investigate the relationship between WASH practice and facilities and

waterborne disease in flood-affected river erosion areas. To perform the study convenient sampling techniques were applied, and data was collected from those who were available.

3.6.2 Sample Size

The formula for calculating the sample size is:

$$n = \frac{Z^2.p\ (1-p)}{e^2}$$

Where:

- **n** = Required sample size.
- **Z** = At 95% confidence interval Z = 1.96 (value corresponding to the desired confidence level confidence).
- **p** = Estimated Prevalence 0.5 (Estimated proportion of the population with the characteristic of interest).
- **e** = 5% or 0.05 (Margin of error)

$$n = \frac{1.96^2.(0.5)\ (1-0.5)}{0.05^2}$$

The required sample size was 384 households. Data was collected from 183 households due to time and financial limitations(Cochran, 1977).

3.7 Field Study and Tools Development

Field study and tool development are one of the most important research processes. The details of the field study and tools development are discussed below:

3.8 Preparation of the Questionnaire

A proper questionnaire is crucial for the success of any research study. To achieve the objectives, a written questionnaire under the close supervision honorable supervisor. The questionnaire consists of thirty-two questions divided into six domains:

- Demography

- Water source and use
- Sanitation
- Hygiene Practice
- Disruption of WASH facilities
- Waterborne Diseases

3.8.1 Pilot Survey

A pilot survey was conducted between 21-23 December 2024 to test the questionnaire, identifying challenges, estimating cost and time required. The questionnaire was edited after the pilot survey removing errors and inconsistent data.

3.8.2 Data Collection

Data collection was conducted between the 10th to 14th of January 2025. Data was collected from the household Companigonj Upazila. Among the various methods of data collection, the direct interview method was used for collecting the data through a structured questionnaire. During data collection, the researcher explained to respondents about the scope, purpose, and benefits. The research assured respondents security and promised them to secure their information. To ensure accurate responses and eliminate irrelevant information each question was explained clearly to respondents.

3.9 Data Processing

An important part of conducting research is processing collected data in a proper way. A computer application was used to data entry, analyze, and write the final report of the study. The steps of data processing and analysis are as follows:

3.9.1 Editing and Coding

Editing data is the process of evaluating acquired raw data for errors and omissions and correcting them when possible. After data collection process was done, collected data were extensively edited.. Collected data were categorized into a small number of classes or categories to simplify the process. Unorganized data was categorized to identify patterns, trends. For example, education level was coded as 0=Illiterate 1=Primary 2=Secondary 3=Higer-secondary 4=Higher

3.9.3 Computerization

Data were processed on a computer after coding and editing. Microsoft Excel was used for data entry. The entire analysis of data was performed by a computer package named STATA MP 14.2. Microsoft Word was used for completing the research.

3.10 Selection of Variables

A variable is defined as a characteristic that changes over time, place, and people. Numerous factors, including Income, Education, Source of water, Treatment method, Sanitation facilities, Handwashing habits, and Waterborne diseases were taken into account to conduct the study. The researcher carefully chose a subset of dependent and independent variables.

3.10.1 Dependent Variable

In this study, several variables were considered to find association. For example, education level, income of the household, type of toilet used, source and treatment of drinking water, and so on. To establish a meaningful association, make the study more reliable, perform a binary logistic regression, and obtain answers to the research question prevalence of waterborne disease was chosen as a dependent variable.

3.10.2 Independent Variable

In this study, several independent variables were chosen

I. Socio-Demographic: Income, Education.
II. WASH Practice: Source of water, Treatment method, Sanitation facilities.
III. Environmental: Extent of damage to WASH facilities due to river erosion or flood.

3.11 Statistical Analysis

To analyze the data several statistical tools were used and the most logical tool was selected which provided a realistic conclusion. The methodology applied for this study was:

1) Frequency distribution and percentage.

2) Data Visualization (Pie Chart, Bar Chart)

3) Bivariate distribution (Chi-Test)

Chapter Four: Findings

Frequency table is a process of organizing raw data in a tabular format. It is defined as a table where collected data for the research is arranged in a tabular format and classified into different classes.

Graphical Representation is a process of data visualization of collected data to make trends, and patterns easy to understand.

4.1 Demographic and Socio-Economic Characteristics

Characteristics		Frequency	Percentage
Family Type	Nuclear	124	67.7
	Joint	59	32.3
Family Size	Small (1-3)	18	9.8
	Medium (4-6)	25	68.3
	Large (7 or more)	40	21.8
Main Source of Income	Agriculture	59	32.2
	Job	44	24.0
	Business	41	22.4
	Others	39	21.3
Average Monthly Income	4000-12000	88	48.1
	12001-20000	77	42.1
	20001-30000	11	6.0
	30001-50000	7	3.8
Education Level of Household Head	Illiterate	46	25.1
	Primary	61	33.3
	Secondary	34	18.5
	Higher-Secondary	28	15.3
	Higher	14	7.7

Table 1: Demographic and Socio-Economic Characteristics

The table provides insights into the demographic and socio-economic characteristics of households. It includes family type, size, income sources, monthly income, and education levels. The majority of families are nuclear (67.7%) and medium-sized (68.3% have 4-6 members). Third

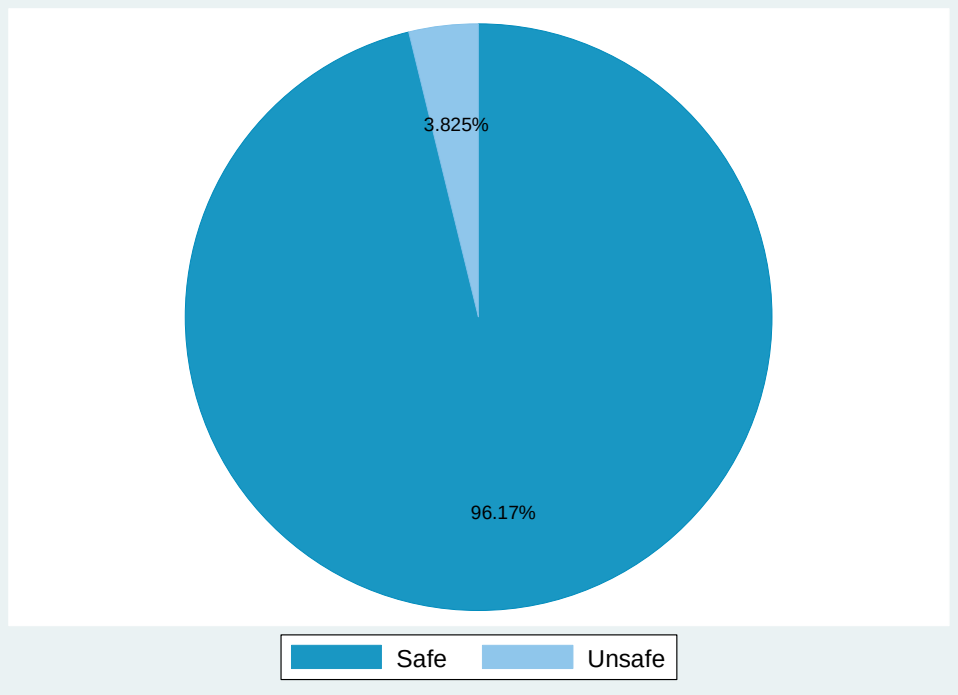
of families (32.2%) e from agricultural. Other sources (21.3%), jobs (24.0%), businesses (22.4%), and other the sources (21.0%). Almost half of the families (48.1%) earn between 4000 and 12000 taka a month, and only 3.8% earn more than 30000 taka a month. The level of education is usually low; 25.1% of household heads is illiterate, and only 33.3% have finished primary school. The data shows that there are a lot of nuclear families, that household heads don't make a lot of money, and that they don't have a lot of schooling.

4.2 Water Source and Use

Characteristics		Frequency	Percentage
Primary Source of Drinking Water	Tubewell	167	91.2
	Tap/Supply	10	4.2
	Pond/River	7	3.8
	Others	0	0
Ownership of Drinking Water Source	Private	107	41.3
	Shared	76	58.4
Time to Bring Water	<15 minutes	154	84.1
	15-30 minutes	29	15.9
	>30 minutes	0	0
Treatment of Drinking Water	No Treatment	144	78.7
	Filtration	23	12.8
	Boil	16	8.7
Storage Facility	Open Container	38	20.8
	Covered Container	145	79.2

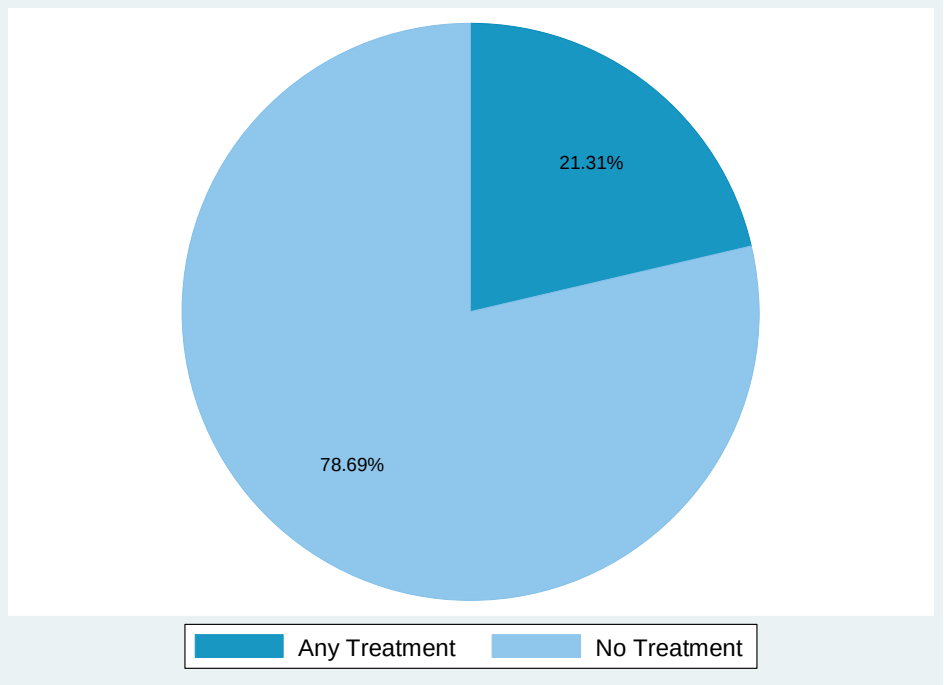
Table 2: Water Source and Use

The table presents data on water sources and usage. Most people (91.2%) use tubewells for drinking water, while only a few rely on tap water (4.2%) or ponds/rivers (3.8%). About 58.4% share their drinking water source, while 41.3% have private access. Most people (84.1%) bring water in less than 15 minutes, and no one takes more than 30 minutes. 78.7% do not treat their drinking water, while some use filtration (12.8%) or boiling (8.7%). No one uses tablets. For storage, 79.2% use covered containers, while 20.8% store water in open containers.



Graph 1: Source of Water

The graph displays the water sources used by households. The source of drinking water used by households was merged into two categories, safe and unsafe. Water from tubewell and tap/supply was selected as safe and pond or other sources of drinking water were selected as unsafe sources of drinking water. It reveals that a significant majority, almost 96.7% of households rely on safe water, in contrast, a few rely on unsafe sources of water. Only 3.8% use unsafe water sources. This suggests that most people have access to safe water, with only a few depending on unsafe sources. It suggests that access to safe water is common in the whole population. However, the small proportion of the population still relying on unsafe water needs to be addressed to make safe water resources available and accessible to all.



Graph 2: Treatment of Water

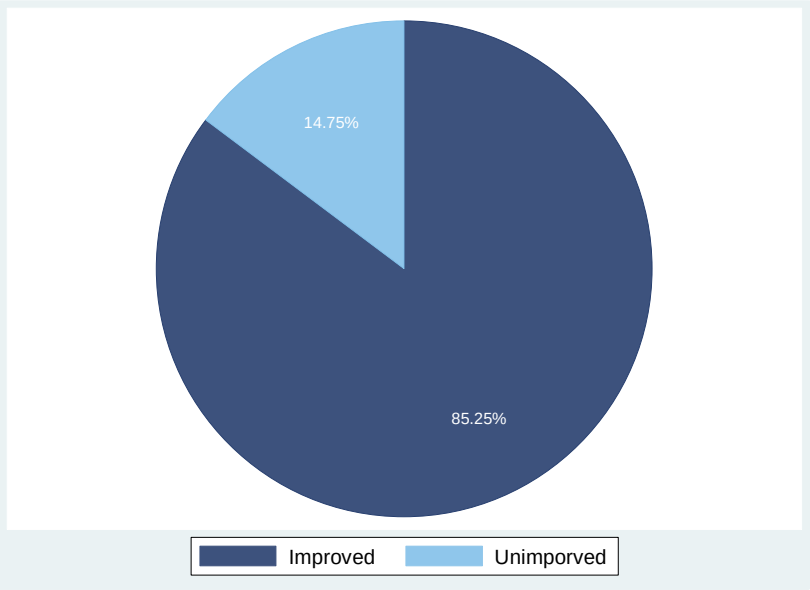
The graph displays the treatment provided for drinking water. It reveals that 78.7% of households do not use any treatment for drinking water before using either purification, filtration or boiling the water. In contrast, one-fifth of the population, almost only 21.3**%** use any kind of treatment. This suggests that most people may have a lack of knowledge about safe water treatment. They do not know the importance of purification and filtration before use. Another factor behind not purification might be the lack of access to filtration facilities. The average monthly income of the respondents was around 13000tk, which might be a reason behind the lack of access to filtration facilities. Addressing these issues through a campaign programme can reduce the health burden and improve overall population health.

4.3 Overview of Sanitation Facilities and Their Usage Practices

Characteristics		Frequency	Percentage
Ownership of Toilet Used	Private	144	78.6
	Shared	39	21.4
Type of Toilet Used	Flush Toilet	96	
	Pit Latrine with Slab	61	60.0
	Pit Latrine without Slab	0	0
	Raw/Hanging	27	14.7
Distance to Nearest Toilet	Within Premises	122	66.6
	<50 miters	49	26.7
	>50 miters	10	5.4
	Weekly	21	11.4
	Monthly	68	37.1
	Quarterly	80	43.7
	Annually	14	7.6
Child Defection Facility	Open Defection	6	8.1
	Separate Raw Toilet	7	9.4
	Uses a Pot	4	5.4
	Uses Family Toilet	57	77.0

Table 3: Overview of Sanitation Facilities and Their Usage Practices

The table provides insights into sanitation facilities and practices. The majority (78.6%) have private toilets, while 21.4% share them. Flush toilets (96 people) and pit latrines with slabs (61 people) are the most common, whereas 14.7% use raw or hanging toilets. About 66.6% have toilets within their homes, while others travel less than 50 meters (26.7%) or over 50 meters (5.4%) to access one. No one cleans toilets daily, but some clean them weekly (11.4%), monthly (37.1%), quarterly (43.7%), or annually (7.6%). Most children (77%) use family toilets, while a few uses open defecation (8.1%) or use separate raw toilets (9.4%).



Graph 3: Type of Toilet

The type of toilet used was merged into two categories, improved toiler and unimproved toilet. Flush toilets and pit latrines with slabs were levelled as improved toilets and raw/hanging or any other types of toilets were levelled as unimproved toilets. The graph displays the toilet facilities used by households. It reveals that 85.25% of households have access to improved toilets, while only 14.75% use unimproved toilets. This suggests that most people have access to better sanitation while a smaller number still rely on less developed toilet facilities. The prevalence of improved toilet use is slightly lower than data collected at the ***"Population and Housing Census 2022"*** for Companiganj Upazila, Noakhali. The prevalence for improved facility was around 90% in PHC 2022(Population and Housing Census 2022 MINISTRY OF PLANNING, 2024).

4.4 Hygiene Practice Among People

Characteristics		Frequency	Percentage
Handwashing Before Eating	No	0	0
	Yes	183	100
Handwashing After Toilet Use	No	0	0
	Yes	183	100
Handwashing Before Cooking	No	5	2.7
	Yes	178	97.3
Handwashing Before Feeding a Child	No	16	8.7
	Yes	167	91.3
Handwashing After Taking Care of Sick People	No	23	12.5
	Yes	160	87.5
Handwashing After Touching Domestic Animals	No	22	12.0
	Yes	161	88.0
Handwashing Method	Soap and Water	172	94.0
	Ash and Water	11	6.0
Child Handwashing Before Eating and After Using Toilet	Sometimes	4	2.1
	Almost Always	64	35.0
	Always	115	62.9
Washing Fruit and Vegetable Before Cooking	Sometimes	0	0
	Almost Always	47	25.7
	Always	136	74.3
Water Source for Cleaning and Cooking	Tubewell	36	19.7
	Pond and Others	147	80.3
Household Waste Disposal Site	Open Dumping	69	37.7
	Burning	14	7.6
	Pond/River/Cannel	24	13.1
	Dustbin	76	41.5

Table 4: Hygiene Practice

The table presents data on hygiene practices, water sources, and waste disposal. All people wash their hands before eating (100%) and after using the toilet (100%). Most prefer washing with soap and water (94.0%), while a few uses ash and water (6.0%). For cleaning and cooking, pond water is the primary source (80.3%), followed by tubewells (19.7%). Waste disposal methods vary, with 41.5% using dustbins, 37.7% opting for open dumping, and 13.1% discarding waste in water bodies like ponds or rivers. A smaller portion (7.6%) burns their waste, while no other methods were reported.

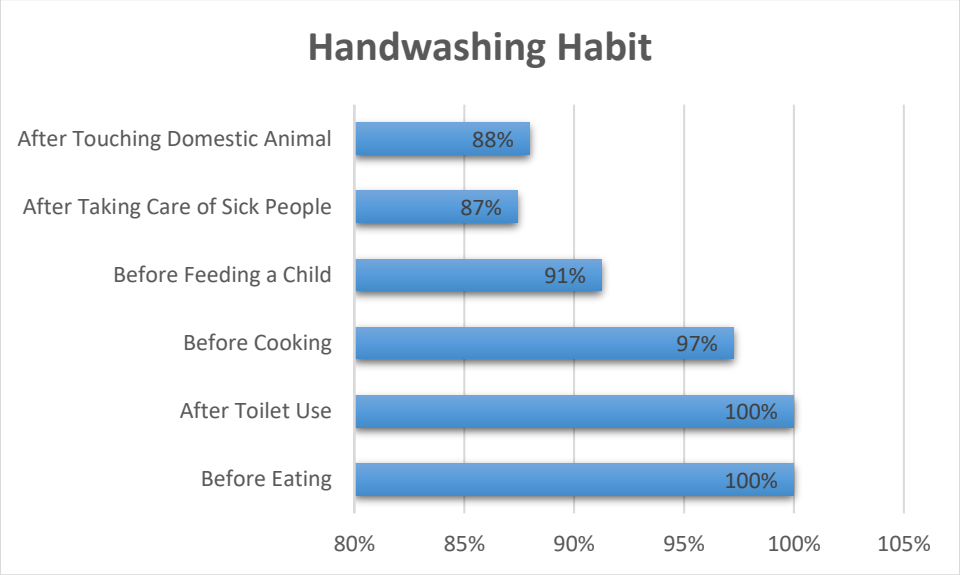
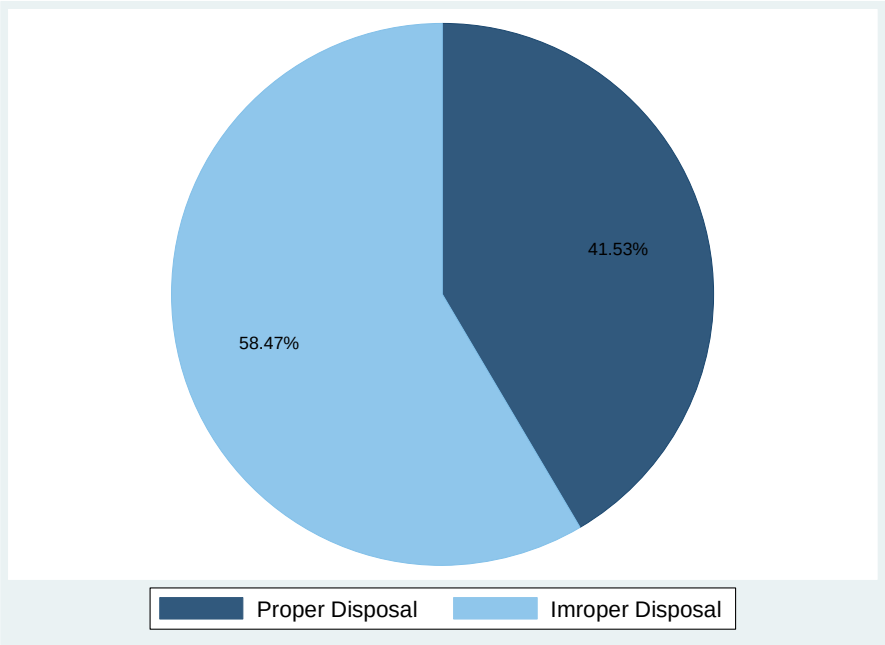


Chart 1: Bar Chart for Handwashing Habit

This graph shows the handwashing rates of people in different situations based on handwashing habits. It shows that 100% of people wash their hands after using the toilet and before eating, which marks these two situations as the most important. On the other hand, handwashing rates are slightly lower after contact with animals (88%) and after caring for patients (87%), but still quite high.



Graph 4: Household Waste Disposal

The graph indicates how different household dispose waste. It shows that 58.47% of households dispose it waste in proper waste disposal, while 41.53% follow improper disposal practices. This suggests that a majority of households manage waste correctly, but a notable percentage still dispose of it incorrectly.

4.5 Impact of Flood and River Erosion

Characteristics		Frequency	Percentage
Damage to Toilet Due to Flood	No Damage	68	37.1
	Partially Damaged	25	13.6
	Completely Damage	90	49.1
Damage to Toilet Due to River Erosion	No Damage	150	82.0
	Partially Damaged	7	3.8
	Completely Damage	26	14.1
Action Taken for Unusable Toilet	Open Defection	13	13.1
	Neighbor Toilet	50	50
	Community Toilet	36	36.9
Damage to Water Source Due to Flood	No Damage	91	49.8
	Partially Damaged	19	10.4
	Completely Damage	73	39.9
Damage to Toilet Due to River Erosion	No Damage	151	12.2
	Partially Damaged	10	5.4
	Completely Damage	22	82.5
Action Taken for Unusable Water Source	Boil	15	16.8
	Collected from a Distance Place	41	46.0
	Rain	19	21.3
	Bottled Water	14	15.7

Table 5: Impact of Flood and River Erosion

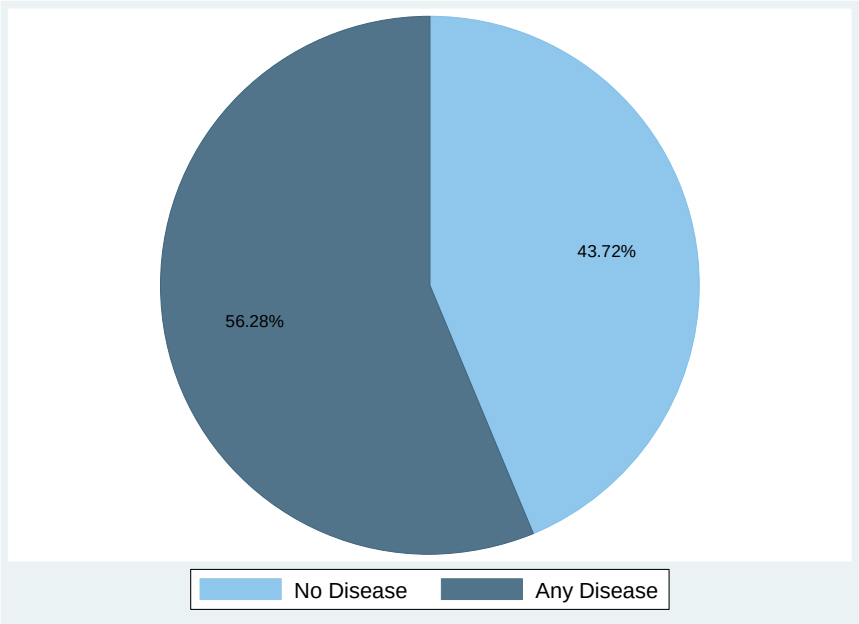
The table highlights the impact of flood and river erosion on household facilities and water sources. It shows that 37.1% of households had no damage to their toilets due to floods, while 49.1% experienced complete damage. 82.5% of households reported no damage to toilets due to river erosion, while 13.4% faced complete damage. In response, 13.1% of households resorted to open defecation, and 13.8% relied on neighbour's toilets. Regarding water sources, 49.5% had no damage due to flooding, while 39.9% had complete damage. For unsafe water sources, 82.5% of families used boiled water, while others collected water from a distant place (15.6%), used rainwater (21.3%), or bottled water (15.7%).

4.6 Prevalence and Management of Waterborne Diseases

Characteristics		Frequency	Percentage
Waterborne Disease in Family	Not Affected	80	43.7
	Diarrhea	79	43.1
	Dysentery	22	12.0
	Typhoid or Others	2	1.1
Treatment of Waterborne Diseases	No Treatment	0	0
	Home Remedy	23	12.5
	Pharmacist	121	66.2
	Doctor/Hospital/Clinic	39	21.3
Drinking Water Adjustment During Disease	No Change	132	72.1
	Boil	45	24.6
	Filter	6	3.3

Table 6: Prevalence and Management of Waterborne Diseases

The table shows the occurrence of waterborne diseases in families and the treatment methods used. It indicates that 43.7% of families were not affected by waterborne diseases, while 43.1% had diarrhoea, 12.0% had dysentery, and a small percentage had typhoid (1.1%). Most families who dealt with waterborne diseases used home remedies (12.5%), pharmacist treatments (66.2%), or went to a doctor/hospital/clinic (21.3%). When it comes to drinking water adjustments during illness, 72.1% of families did not change their water source, while 24.6% boiled the water, and 3.3% filtered it.



Graph 5: Prevalence of Waterborne Disease

The graph shows the prevalence of waterborne diseases in households in the last 14 days before data collection. It shows that more than half of the households were not diagnosed with any waterborne disease. While 43.73% of households had any of the waterborne diseases.

4.7 Association Between Waterborne Diseases and Independent Variables

Before conducting the association test between the dependent variable waterborne disease and another independent variable such as income, education level, water source, sanitation, and household practices. The process of categorization was performed to enhance the accuracy of the association. The researcher systematically and carefully categorized them into different categories.

For example,

- Average Monthly Income was categorized into *8000-16000, 16001-30001 and 30001-50000.*
- The Education Level of the household head was categorized into *Illiterate, Primary, Secondary, Higher-Secondary and Higher.*
- Source of drinking water was merged into two categories, *Safe* (tubewell, tap/supply) and *Unsafe* (others)

- Treatment provided for drinking water was merged as *No Treatment and Any Treatment* (using any kind of treatment method to filter the water).
- The type of toilet used was merged into *Improved Toilet* (flush toilet, pit latrine with slab) and *Unimproved* (raw, open)
- Water for cleaning and cooking merged into *Safe* (tubewell, rain) and *Unsafe* (pond and others)

- Household waste disposal was merged as *Proper (*using a dustbin) and *Improper (*burning, open dumping or others)
- Toilet or water source damaged due to flood was categorized as *Damaged* (Fully Damaged or Partially Damaged) and *Not Damaged* (Fully Functional)

The Chi-square (Chi^2) test was used to assess the association between the variables. This experiment works as a hypothesis testing method, where there are two main hypotheses. *Null Hypothesis (H_0)* indicates there is no association between the two variables and *Alternative Hypothesis (H_1)* indicates a significant association between the two variables.

The test's p-value indicates the level of significance between variables, with a value below 0.05 rejecting the null hypothesis and above 0.05 indicating no significant relationship

Characteristics		Waterborne Disease		χ^2	P-value
		Not Affected	Affected		
Average Monthly Income	8000-16000	4 (5.0%)	40 (38.8%)	28.29	0.00*
	16001-30000	49 (61.25%)	42 (40.8%)		
	30001-30000	27 (33.75%)	21 (20.7%)		
Education Level	Illiterate	19 (23.75%)	27 (26.2%)	21.23	0.00*
	Primary	16 (20.0%)	45 (43.7%)		
	Secondary	15(18.7%)	19 (18.45%)		
	Higher-	19 (23.7%)	9 (8.7%)		
	Higher	11(13.7%)	3 (2.9%)		
Source of Drinking Water	Safe	79 (98.75%)	(94.7%)	2.56	0.10
	Unsafe	1 (1.25%)	6(5.8%)		
Treatment to Water	No Treatment	60 (75.0%)	84(81.5 %)	1.15	0.28
	Any Treatment	20 (25.0%)	19 (%)		
Type of Toilet Use	Improved	75 (93.75%)	81(78.6%)	8.17	0.004*
	Unimproved	5 (6.25%)	22 (21.4%)		
Water for Cooking and Cleaning	Safe	17 (21.25%)	19 (18.45%)	0.22	0.63
	Unsafe	63 (78.75%)	84 (81.55%)		
Household Waste Disposal	Proper	42 (52.5%)	34 (33.0%)	7.04	0.008*
	Improper	38 (47.5%)	69 (67.0%)		
Toilet Damaged Due to Flood	Not Damaged	36 (45.0%)	32 (31.0%)	3.74	0.05*
	Damaged	44 (55.0%)	71 (69.0%)		
Toilet Damaged Due to River Erosion	Not Damaged	70 (87.5%)	80 (77.7%)	8.49	0.08
	Damaged	10 (12.5%)	23 (33.3%)		
Water Source Damaged Due to Flood	Not Damaged	30 (%)	61 (59.2%)	8.49	0.004*
	Damaged	50 (62.5%)	42 (40.8%)		
Water Source Damaged Due to River Erosion	Not Damaged	76 (95.0%)	97 (94.2%)	0.059	0.80
	Damaged	4 (5.0%)	6 (5.83%)		

Table 7: Association Between Waterborne Diseases and Independent Variables

N.B: * Indicates at 95% confidence interval value p-value (<0.05) is significant

The table presents the association between waterborne diseases and various factors such as income, education level, water source, sanitation, and household practices. Here are the key findings:

Average Monthly Income: The Table shows us the association between the dependent variable waterborne disease and the independent variable monthly income. To perform the chi-square test researcher categorized the numeric value of monthly income into three groups. Households with monthly incomes between 8000-16000 taka showed a significantly higher percentage of waterborne diseases (38.8%), with a p-value of 0.00, indicating a strong association.

Education Level: The Table shows us the association between the dependent variable waterborne disease and the independent variable education level of the household head. To perform the chi-square test researcher categorized the level of education into five groups. Illiterate households had a higher percentage of waterborne diseases (26.2%) compared to those with higher education. The p-value of 0.00 suggests a significant relationship.

Source of Drinking Water: The Table shows us the association between the dependent variable waterborne disease and the independent variable source of drinking water. To perform the chi-square test researcher merged the source of water into two groups, namely safe and unsafe. Safe Sources include Tubewell and Tap/Supply. Unsafe sources includes all other sources. There is a minimal association between waterborne diseases and the safety of drinking water, with a p-value of 0.10 indicating no significant relationship.

Treatment of Water: The Table shows us the association between the dependent variable waterborne disease and the independent variable treatment of water. To perform the chi-square test researcher merged the source of water into two groups, namely a) no treatment and b) any treatment. No significant difference was found between treated and untreated water, as indicated by the p-value of 0.28.

Type of Toilet Use: The Table shows us the association between the dependent variable waterborne disease and the independent variable toilet type. The researcher merged source of water into two groups, namely a) proper and b) improper. The proper type of toilet includes flush toilet and a pit latrine with a slab. The improper type consists of raw, hanging or pit latrines without slab.

The use of improved toilets was linked to fewer cases of waterborne diseases, with a p-value of 0.004, showing a significant association.

Water for Cooking and Cleaning: The Table shows us the association between the dependent variable waterborne disease and the independent variable cooking and cleaning water type. Safe water includes water from tubewell and rain. Unsafe water includes Ponds, River or any other source of water No significant relationship between the safety of water for cooking and cleaning and the prevalence of waterborne diseases, with a p-value of 0.63.

Household Waste Disposal: The Table shows us the association between the dependent variable waterborne disease and the independent variable household waste disposal practice. Disposing into a designated dustbin indicates proper and safe disposal. While burning, open dumping or duping in pond/river/channel indicates improper disposal. Improper waste disposal was strongly associated with waterborne diseases, as seen with a p-value of 0.008.

Toilet Facility Damage Due to Flood: The Table shows us the association between the dependent variable waterborne disease and the independent variable toilet facility damages due to flood. If the toilet was fully or partially damaged it goes into the damaged category otherwise in the not-damaged category. Households with damaged toilets due to flooding had more waterborne diseases, with a p-value of 0.05, indicating a moderate association.

Toilet Facility Damage Due to River Erosion: The Table shows us the association between the dependent variable waterborne disease and the independent variable toilet facility damage due to river erosion. If the toilet was fully or partially damaged it goes into the damaged category otherwise in the not-damaged category. No significant association was found between toilet damage due to river erosion and waterborne diseases, with a p-value of 0.08.

Water Source Damage Due to Flood: The Table shows us the association between the dependent variable waterborne disease and the independent variable damage to the water source due to flooding. Researcher categorized completely damaged or partially damaged as “Damaged” and fully functional. It was strongly linked to waterborne diseases, with a p-value of 0.004.

Water Source Damage Due to River Erosion: No significant relationship was found between water source damage due to river erosion and waterborne diseases, with a p-value of 0.80

Chapter Five: Discussion and Limitations

The objective of this study was to review water source use, sanitation practices and prevalence of waterborne diseases. These findings show us how households manage their water sources and how these arrangements impact health and well-being. Independent and dependent variable was chosen carefully for the study. In the study, the waterborne disease was the dependent and several other socio-demographic and WASH practices and facilities were the independent variable.

A key finding of the study is that most households use two separate sources of water: one for drinking and one for cooking. 96.7% of households use safe water for drinking, but they prefer to use pond water most of the time for cooking. This indicates that although people are concerned about water safety, their perception of the safety of water used for cooking is somewhat lower, which may be due to limited safe water sources. This study also found that most people (91.2%) use tubewells for drinking water, and ponds/rivers (3.8%). These findings align with (M. Islam et al., 2017). M.Islam et al found that 88% of the population from river banks use tubewells for collecting their drinking water. But while using water for cooking, pond water is the primary source (80.3%). In terms of water treatment, 78.9% of households do not treat their water, which may be responsible for the outbreak of waterborne diseases. While(Jube Gore et al., 2021) found that in rural areas of South-Sudan, 66% of the community uses chlorine for drinking water treatment, 19% use boiling, 10% use filtration, and 5% do not know water treatment. Differences in study results may be due to a variety of factors, including differences in study populations, differences in data collection methods, or the influence of additional variables such as hygiene practices, sanitation infrastructure, and immune status. Despite safe water use, lack of treatment in cooking water and use of pond water can spread diseases.(Rana, 2010) found that water, sanitation, and hygiene (WASH) programs decreased the prevalence of waterborne diseases from 10% to 7% overall and among under-five children it reduced from 22% to 13% ($p<0.001$), which underlines that to reduce waterborne disease water, sanitation and hygiene intervention plays important role However, the association table shows that there is almost no association between water source or treatment and waterborne diseases. There was a minimal association between waterborne diseases and the safety of drinking water, with a p-value of 0.10 indicating no significant relationship. No significant difference was found between treated and untreated water, as indicated by the p-value of 0.28

The study findings indicate that sanitation has a significant impact on human health and the spread of waterborne diseases. Although most households use safe water for drinking, their sanitation practices are not hygienic, which plays a significant role in the spread of waterborne diseases.

In terms of the use of improved toilets, 85.25% of households follow a hygienic sanitation system, but some households have damaged toilets due to floods or river erosion. Such infrastructural problems are hindering the improvement of proper sanitation systems and increasing the spread of diseases. The use of improved toilets was linked to fewer cases of waterborne diseases, with a p-value of 0.004, showing a significant association. (John T. Watson et al., 2007) found similar result, the found Flooding contaminates drinking water sources, damages sanitation infrastructure, and displaces populations, forcing them to rely on unsafe water sources.

Research has found that awareness about sanitation is directly related to the level of education. Uneducated households have lower levels of proper use of sanitation, which makes them more susceptible to water-borne diseases. Increasing education can help increase awareness about sanitation and help households develop healthy habits. Illiterate households had a higher percentage of waterborne diseases (26.2%) compared to those with higher education. The p-value of 0.00 suggests a significant relationship.(Azizur R. Molla, 1999)found that the level of education and prevalence of diarrhea has no significant association with a p-value of 0.744. However, another study has found that Children whose mothers have no formal education are more likely to experience diarrhea compared to those whose mothers have higher levels of education. For example, in Nigeria, the prevalence of diarrhea among children aged 0-24 months was 15.5% for children of women with no formal education, compared to 6.4% for those whose mothers had tertiary education(Desmennu et al., 2017).

When floods hit, many families face problems accessing their toilets. Floods can damage or move toilets away from homes, making it impossible to defecate properly. In this situation, 69% of household faces deterioration of their toilets due to flood and 40.8% experienced disruption of water supply. In another study (Rafa et al., 2021) found that only 20% of the population had proper access to WASH2 facilities. Households with damaged toilets due to flooding had more waterborne diseases, with a p-value of 0.05, indicating a moderate association which was also found by (Rafa et al., 2021). Anotherstudy by (Ahmed, 2009) found that flood was the primary reason behind disruption of toilet.

During floods, when it is not possible to use water sources, local people try to collect water in various ways. About 16.8% of households use safe water by boiling water, which helps prevent the spread of waterborne diseases. In addition, 46% of households collect water from distant places, which is the only way, although time-consuming. Some households are collecting rainwater and using it. It was strongly linked to waterborne diseases, with a p-value of 0.004. (Ahmed et al., 2020) had found that communities affected by river erosion often experience WASH infrastructure collapse, leading to increased exposure to contaminated water sources. However, no significant relationship was found in this study between water source damage due to river erosion and waterborne diseases, with a p-value of 0.80.

A report by WHO revels that open defecation and improper waste disposal contribute to the spread of fecal-oral diseases. This study also found strong association between with a significant p-value of 0.008 (*Progress on Household Drinking Water, Sanitation and Hygiene 2000-2020 Five Years into the SDGs*, 2021)

Poverty and waterborne diseases are strongly interconnected as found in this study. In 2016 Hutton & Chase found that many developing nations, access to safe drinking water depends on financial ability, forcing the poor to rely on unsafe water sources.(Hutton G & Chase C, 2016.)

Limitations

i. Cross-sectional studies collect data only at a specific point in time, which cannot assess any changes or continuity related to changes over time. As a result, the study did not allow for analysis of long-term trends or cause-and-effect relationships.
ii. The study required a total of 384 samples to be collected, but only 183 samples were collected. This created data gaps and somewhat reduced the generalizability of the study results.
iii. Due to late data collection, some important data or statistics may be missed, which may cause deficiencies in subsequent analysis. This gap has created some obstacles in presenting the research results completely and accurately.
iv. The regression odds ratio was not used in the study, which limited the ability to analyze the relationship between different variables and their effects.

v. The transportation system in the study area was not good, it took some time and effort to collect accurate data. In particular, it was difficult to reach the area at times due to the damage to roads and communication systems in the post-flood situation.

vi. Due to the lack of adequate funding for the research, there were problems in procuring some of the necessary materials or equipment. Due to the lack of funds, it became difficult to make full arrangements for data collection and fieldwork.

Chapter Six: Recommendation

Based on this study, some recommendations have been made for the river erosion and flood-affected areas of the Noakhali district, which can help improve the health and livelihood of the local people:

Improvement of sanitation system: Initiatives by the government and local authorities are necessary to improve the sanitation system in the flood-affected areas. Construction of new toilets, promotion of cleanliness and proper waste disposal system should be implemented. It is very important to install tubewells in local areas. In the current situation, due to the lack of safe water, people are using pond water, which is creating sanitation problems and spreading water-borne diseases. By providing tubewells, the local people will be able to get safe water, which will play an important role in protecting their health. Especially after floods, tubewells will act as a permanent source of water, which will help in dealing with the water crisis. For this, it is necessary to take measures to install and maintain tubewells at the initiative of the local government.

Development of permanent water sources: Permanent and safe water sources must be created for this region so that there is no water shortage even after the floods. Arrangements should be made to install and maintain tubewells through local governments and other supporting organizations to ensure long-term water security.

Increase sanitation awareness among the people: Training and awareness programs should be conducted among the local people on sanitation and safe water use. Raising public awareness for sanitation and safe water use is essential. Sanitation awareness should be raised through local community centers, schools, mosques and other social platforms. Training, workshops and awareness camps can educate the local population about the importance of safe water use. By instilling proper sanitation habits among the population, it will be possible to reduce the risk of waterborne diseases.

If these recommendations are implemented, the risk of waterborne diseases for the people of Noakhali district will be greatly reduced and they will be able to lead a healthy life. The quality of life of the local people will be improved through the development of safe water supply and sanitation systems, post-flood health care systems, and increased awareness among the people.

Chapter: Seven: Conclusion

The objective of this study was to analyze the current situation of water, sanitation and hygiene (WASH) in Noakhali district, which has been affected by river erosion and floods, and to determine its relationship with waterborne diseases. According to the results of the study, most households use two different water sources: on the one hand, safe water used for drinking, and on the other hand, pond water used for cooking and other purposes. Although people use safe water only for drinking, the use of pond water for cooking is causing various sanitation-related problems, which has been identified as a major factor in the increase in the incidence of waterborne diseases.

The most important finding of the study is that the outbreak of waterborne diseases is mainly due to the weakness of the sanitation system rather than the water source. According to our observations, the sanitation practices of the local population are not proper and there are serious problems with cleanliness and waste management. As a result, the pond water, which is usually used for cooking, can cause outbreaks of various diseases. In addition, the health situation in the area is getting worse due to the destruction of sanitation infrastructure in the post-flood situation.

It is clear that ensuring the safety of water sources alone is not enough; waterborne diseases can be prevented by improving sanitation systems, healthy waste management, and increasing sanitation awareness among the population. Sanitation and hygiene activities should be accelerated after a flood or river erosion situation so that the population of the affected areas can be free from health risks.

Reference

1 in 3 people globally do not have access to safe drinking water – UNICEF, WHO. (n.d.). Retrieved February 14, 2025, from https://www.who.int/news/item/18-06-2019-1-in-3-people-globally-do-not-have-access-to-safe-drinking-water-unicef-who

Ahmed, S. (2009). *An Assessment of the Impacts of Floods on Sanitation in Rural Bangladesh*.

As floodwater recedes, diseases spread | The Daily Star. (n.d.). Retrieved February 19, 2025, from https://www.thedailystar.net/news/bangladesh/news/floodwater-recedes-diseases-spread-3691341

Asia, most at risk for natural hazards, most vulnerable to cyclones | PreventionWeb. (n.d.). Retrieved February 19, 2025, from https://www.preventionweb.net/news/asia-most-risk-natural-hazards-most-vulnerable-cyclones

Azizur R. Molla. (n.d.). *Pond Water Contamination And Incidence of Disease in Rural Bangladesh*.

Cochran, W. G. (1977). *Sampling techniques* (3rd ed.).

Companiganj Upazila, Noakhali - Wikipedia. (n.d.). Retrieved February 16, 2025, from https://en.wikipedia.org/wiki/Companiganj_Upazila,_Noakhali

Contaminated water endangers people's health following floods in Bangladesh - Bangladesh | ReliefWeb. (n.d.). Retrieved February 19, 2025, from https://reliefweb.int/report/bangladesh/contaminated-water-endangers-peoples-health-following-floods-bangladesh

Desmennu, A. T., Oluwasanu, M. M., John-Akinola, Y. O., Opeyemi, O., & Ayo, A. S. (2017). Maternal education and diarrhea among children aged 0-24 months in Nigeria. *African Journal of Reproductive Health*, *21*(3), 27–36. https://doi.org/10.29063/AJRH2017/V21I3.2

Elvis Fon, T., Atanga Mary, B. S., & Fonyuy Emmanuel, B. (2024). Emergency Preparedness for Waterborne Diseases in the Wake of Floods in Northern Cameroon: A Call for Immediate Action. *International Journal of Science and Healthcare Research*, *9*(4), 23–29. https://doi.org/10.52403/ijshr.20240404

Flood-prone area Definition | Law Insider. (n.d.). Retrieved February 14, 2025, from https://www.lawinsider.com/dictionary/flood-prone-area

Hutton G, & Chase C. (n.d.). *he Knowledge Base for Achieving the Sustainable Development Goal Targets on Water Supply, Sanitation and Hygiene*.

Islam, M., Parvin, S., & Farukh, M. (2017). Impacts of riverbank erosion hazards in the Brahmaputra floodplain areas of Mymensingh in Bangladesh. *Progressive Agriculture*, *28*(2), 73–83. https://doi.org/10.3329/PA.V28I2.33467

Islam, Sirajul. (2003). *Banglapedia : national encyclopedia of Bangladesh*.

John T. Watson, Michelle Gayer, & Maire A. Connoll. (2007). *Emerging Infectious Diseasee*. www.cdc.gov/eid

Jube Gore, E. W., Tang, Y., & Boying, H. H. (2021). Evaluation of Rural Household Drinking Water Treatment: A Case Study of Rajaf Payam Central Equatoria State, Juba-South Sudan. *International Journal Of Scientific Advances*, *2*(2). https://doi.org/10.51542/IJSCIA.V2I2.16

Manetu, W. M., & Karanja, A. M. (2021). Waterborne Disease Risk Factors and Intervention Practices: A Review. *OALib*, *08*(05), 1–11. https://doi.org/10.4236/oalib.1107401

Mou, M. A., Tusar, Md. K., Haque, Md. R., Chakraborty, S., & Ahmed, S. (2023). Assessment of Riverbank Erosion and Accretion and its Impact on the People of Chairman Ghat, Noakhali, Bangladesh. *Journal of Sustainability and Environmental Management*, *2*(4), 220–230. https://doi.org/10.3126/josem.v2i4.61022

Outbreak Of Diseases After Flood | Check spread of waterborne diseases in flood-hit areas. (n.d.). Retrieved February 14, 2025, from https://www.thedailystar.net/opinion/editorial/news/check-spread-waterborne-diseases-flood-hit-areas-3691946

Population and Housing Census 2022 MINISTRY OF PLANNING. (2024).

Progress on Household Drinking Water, Sanitation and Hygiene 2000-2020 Five Years into the SDGs. (2021).

Rafa, N., Jubayer, A., & Uddin, S. M. N. (2021). Impact of cyclone Amphan on the water, sanitation, hygiene, and health (WASH2) facilities of coastal

Bangladesh. *Journal of Water Sanitation and Hygiene for Development*, *11*(2), 304–313. https://doi.org/10.2166/WASHDEV.2021.170

Rahaman, Md. S., Hossain, N., Nurain, A., Sarker, P., & Ichihara, S. (2020). INVESTIGATION ON CAUSES AND EFFECTS OF WATERLOGGING IN THE SOUTHERN PART OF BANGLADESH. *Management of Sustainable Development*, *12*(2), 4–11. https://doi.org/10.54989/msd-2020-0006

Rana, A. M. (2010). *Effect of Water , Sanitation and Hygiene Intervention in Reducing self-reported Waterborne Diseases in Rural Bangladesh*.

Risk of disease outbreak rises as Bangladesh floods devastate sanitation infrastructure - Oxfam | Oxfam International. (n.d.). Retrieved February 14, 2025, from https://www.oxfam.org/en/press-releases/risk-disease-outbreak-rises-bangladesh-floods-devastate-sanitation-infrastructure

Robert O. (2018). *ASSESSING WATER, SANITATION AND HYGIENE PRACTICES ASSOCIATED WITH DIARRHEA PREVALENCE AMONG HOUSEHOLDS' MEMBERS IN FLOOD PRONE AREAS*. http://www.journalcra.com

Shrestha, S., Malla, R., & Kazama, F. (2022). WASH and Health in Sindhupalchowk District of Nepal after the Gorkha Earthquake. *Societies*, *12*(3). https://doi.org/10.3390/soc12030091

Situational Overview of Noakhali District - Eastern Flash Floods 2024 (28 October 2024) - Bangladesh | ReliefWeb. (n.d.). Retrieved February 19, 2025, from https://reliefweb.int/report/bangladesh/situational-overview-noakhali-district-eastern-flash-floods-2024-28-october-2024

Tusar, M. A., Haque, M. K., Chakraborty, M. R., & Ahmed, S. (2023). Assessment of Riverbank Erosion and Accretion and its Impact on the People of Chairman Ghat. *Original Article Journal of Sustainability and Environmental Management*, *2*(4), 220–230. https://www.nepjol.info/index.php/josem

Types of erosion - River processes - AQA - GCSE Geography Revision - AQA - BBC Bitesize. (n.d.). Retrieved February 14, 2025, from https://www.bbc.co.uk/bitesize/guides/zq2b9qt/revision/1

Water Sanitation and Health. (n.d.). Retrieved February 14, 2025, from https://www.who.int/teams/environment-climate-change-and-health/water-sanitation-and-health

Water-Borne Diseases. (n.d.). Retrieved February 14, 2025, from https://www.news-medical.net/health/Water-Borne-Diseases.aspx

Questionnaire

আমি সাদমান জামান, জাতীয় কবি কাজী নজরুল ইসলাম বিশ্ববিদ্যালয়ের পপুলেশন সায়েন্স বিভাগের একজন শিক্ষার্থী। আমি "বন্যা-পরবর্তী এলাকায় পরিষ্কার-পরিচ্ছন্নতার অনুশীলন এবং জলবাহিত রোগ" শীর্ষক গবেষণার জন্য তথ্য সংগ্রহ করছি। এই গবেষণাটি জাতীয় কবি কাজী নজরুল ইসলাম বিশ্ববিদ্যালয়ের পপুলেশন সায়েন্স বিভাগের সহকারী অধ্যাপক শিলা সরকার ম্যামের তত্ত্বাবধানে পরিচালিত হচ্ছে। এই সাক্ষাৎকারে আপনার অংশগ্রহণ সম্পূর্ণ স্বেচ্ছা মূলক, আপনি যেকোনো সময় সাক্ষাৎকার বা তথ্য প্রদান বন্ধ করার অধিকার রাখেন। আপনার প্রদানকৃত তথ্য শুধুমাত্র গবেষণার উদ্দেশ্যে ব্যবহৃত হবে এবং আপনার গোপনীয়তা সম্পূর্ণরূপে রক্ষা করা হবে। আপনার মূল্যবান সময় ও সহযোগিতার জন্য আন্তরিক ধন্যবাদ।

প্রথম অধ্যায়ঃ পরিচিতি তথ্য

পরিবার প্রধান এর লিঙ্গঃ ক. পুরুষ খ. মহিলা

পরিবারের ধরনঃ ক.একক খ.যৌথ

পরিবারের সদস্য সংখ্যাঃ _____

পরিবারে শিশুর সংখ্যাঃ (৫ বছরের নীচে)_____

আয়ের প্রধান উৎসঃ ক. কৃষি খ.ব্যবসা গ. চাকরি ঘ.অন্যান্য

পরিবারের মাসিক আয়_____

শিক্ষার মাত্রা (পরিবার প্রধান): ক. অশিক্ষিত খ.প্রাথমিক গ. মাধ্যমিক ঘ.উচ্চ-মাধ্যমিক ঙ. বিশ্ববিদ্যালয়

আপনার বর্তমান আবাসন পরিস্থিতি কী? ক. নিজস্ব বাড়ি খ. অস্থায়ী গ.আত্মীয়/অন্য কারো সাথে বসবাস

দ্বিতীয় অধ্যায়ঃ পানির উৎস ও ব্যবহার

পরিবার কর্তৃক ব্যবহৃত টয়লেটের ধরনঃ ক.একক খ. যৌথ

আপনার পরিবারের খাবার পানির প্রধান উৎস কি?
ক.টিউবওয়েল খ.ট্যাপ/সাপ্লাই গ.বোতলজাত ঘ.পুকুর/নদী ঙ.কুয়া চ.অন্যান্য (উল্লেখ করুন):

পানি আনতে সময় (একপথে): ক.১৫ মিনিটের কম খ.১৫–৩০ মিনিট গ.৩০ মিনিটের বেশি

গৃহস্থালিতে ব্যবহৃত পানি পানিশোধন পদ্ধতিঃ

ক. ফুটানো খ.পরিশোধন ট্যাবলেট ব্যবহার গ.ছাঁকনি(ফিল্টার) দিয়ে পরিশোধন ঘ.কোনোটি নয়

আপনারা কীভাবে পানি সংরক্ষণ করেন? ক. ঢাকনাযুক্ত পাত্রে খ. খোলা পাত্রে গ. অন্যান্য_____

তৃতীয় অধ্যায়ঃ স্যানিটেশন

পরিবার কর্তৃক ব্যবহৃত টয়লেটের ধরনঃ ক.একক খ. যৌথ

টয়লেট সুবিধাঃ ১)ফ্ল্যাশ টয়লেট ২) স্ল্যাব যুক্ত পিট ৩) স্ল্যাববিহীন পিট ৪)কাচা/ঝুলন্ত

পরিবার থেকে নিকটতম টয়লেটের দূরত্বঃ ক. প্রাঙ্গণের মধ্যে খ. ৫০ মিটারের কম গ. ৫০ মিটারের বেশি

পরিবারের শিশুরা সাধারণত কোথায় মলত্যাগ করে?

ক.টয়লেট/ল্যাট্রিনে খ.খোলা স্থানে গ. পটি ব্যবহার করে ঘ.অন্যান্য (উল্লেখ করুন):_____

টয়লেট সাধারনত কতদিন পরপর পরিষ্কার করেন? ক.দৈনিক খ.সাপ্তাহিক গ.মাসিক ঘ.ত্রৈ- মাসিক

চতুর্থ অধ্যায়ঃ পরিচ্ছন্নতার অভ্যাস

আপনার পরিবারের লোকজন কখন হাত ধৌত করে?

ক. খাবার গ্রহনের আগে খ.মলত্যাগের পর গ.রান্নার আগে ঘ.শিশুর পরিচর্যার আগে ঙ.শিশুর মল পরিষ্কারে পরে চ.পশু স্পর্শ করার পরে ছ.বাইরে থেকে ঘরে ফেরার পরে জ.কোনো অসুস্থ ব্যক্তির সংস্পর্শে আসার পরে

হাত ধোয়ার জন্য পরিবারের লোকজন কি ব্যবহার করে? ক.সাবান খ.ছাই গ.পানি ঘ.অন্যান্য (উল্লেখ করুন):____

শিশুরা গ্রহনের আগে ও মলত্যাগের পরে হাত ধোয় কি? ক.সবসময় খ. প্রায়ই গ.মাঝে-মাঝে ঘ. কখনো না

সবজি ও ফল খাবার আগে পরিষ্কার করেন? ক.সবসময় খ. প্রায়ই গ.মাঝে-মাঝে ঘ. কখনোই না

রান্নার আগে আপনি হাত ধোয়া ও রান্নার স্থান পরিষ্কার করেন? ক.সবসময় খ. প্রায়ই গ.মাঝে-মাঝে ঘ. কখনোই না

পরিষ্কার ও রান্নার জন্য কি পানি ব্যবহার করেন? ক. টিউবওয়েলের পানি খ.পুকুরের পানি গ.নদীর পানি ঘ. অন্যান্য__

দৈনন্দিন বর্জ্য কোথায় ফেলা হয়? ক.নির্দিষ্ট ডাস্টবিনে খ.খোলা স্থানে গ.নদী/খাল/পুকুরে ঘ.পুড়িয়ে ফেলা

পঞ্চম অধ্যায়ঃ বন্যা/ নদী ভাঙনের প্রভাব

বন্যার কারনে আপনার টয়লেট এ কোন ধরনের ক্ষতি হয়েছে

ক. হ্যা, পুরোপুরি অকার্যকর হয়েছে খ. ক্ষতি হয়েছে কিন্তু ব্যবহার যোগ্য গ. কোন ক্ষতি হয়ন. **নদী ভাঙন এর কারনে আপনার টয়লেট এ কোন ধরনের ক্ষতি হয়েছে**

ক. হ্যা, পুরোপুরি অকার্যকর হয়েছে খ. ক্ষতি হয়েছে কিন্তু ব্যবহার যোগ্য গ. কোন ক্ষতি হয়নি

টয়লেট অকার্যকর হলে আপনি সেক্ষেত্রে কি করেছেন?

ক.প্রতিবেশির টয়লেট ব্যবহার করেছেন খ.খোলা স্থানে মলত্যাগ করেছেন গ. কমিউনিটি টয়লেট ব্যবহার করেছেন

বন্যার কারনে আপনার নিরাপদ পানির উৎস এর কোন ধরনের ক্ষতি হয়েছে

ক. হ্যা, পুরোপুরি অকার্যকর হয়েছে খ. ক্ষতি হয়েছে কিন্তু ব্যবহার যোগ্য গ. কোন ক্ষতি হয়নি

নদী ভাঙন এর কারনে নিরাপদ পানির উৎস এর কোন ধরনের ক্ষতি হয়েছে

ক. হ্যা, পুরোপুরি অকার্যকর হয়েছে খ. ক্ষতি হয়েছে কিন্তু ব্যবহার যোগ্য গ. কোন ক্ষতি হয়নি

নিরাপদ পানির উৎস অকার্যকর হলে আপনি সেক্ষেত্রে কি করেছেন?

ক. ফুটিয়ে পান করেছেন খ.ট্যবলেট ব্যবহার গ.বৃষ্টির পানি সংগ্রহ ঘ.বোতলজাত পানি ব্যবহার ঙ.দুর থেকে সংগ্রহ করেছেন চ.অন্যান্য_____

সষ্ট অধায়ঃ পানিবাহিত রোগ

গত দুই সপ্তাহে (১৪ দিন) আপনার পরিবারে কি কেউ কোনো পানিবাহিত রোগে আক্রান্ত হয়েছে?

ক. ডায়রিয়া খ. টাইফয়েড গ. কলেরা ঘ. আমাশয় ঙ. জন্ডিস চ. কোন রোগে আক্রান্ত হয় নি

যদি আপনার পরিবারে কেউ পানিবাহিত রোগে আক্রান্ত হলে, তাদের চিকিৎসার জন্য কিভাবে ব্যবস্থা নেয়া হয়?

ক. স্থানীয় ক্লিনিক/হাসপাতাল খ. চিকিৎসক/পরামর্শক গ. বাড়িতে নিজে চিকিৎসা ঘ. চিকিৎসা নেয়নি

আপনার পরিবারের সদস্যরা কি পানিবাহিত রোগে আক্রান্ত হওয়ার পর পানি ব্যবহারের ধরন পরিবর্তন করে থাকেন?

ক. হ্যাঁ, পানি ফুটিয়ে খাওয়া খ. হ্যাঁ, পানি ফিল্টার বা পরিশোধন করে ব্যবহার

গ. হ্যাঁ, নতুন কোনো নিরাপদ পানি উৎস ব্যবহার ঘ. কোন পরিবর্তন করিনি।