Effectiveness of Educational Intervention on Water Sanitation and Hygiene Practices Among Rural Dwellers in Two Local Government Areas in Ibadan, Oyo State Nigeria

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2025

Certification

This is to certify that **Bukola Mujidat MUSTAPHA** with the matriculation number LCU/PG/1918 carried out this research work: **'Effectiveness of Educational Intervention on Water Sanitation and Hygiene (WASH) Practices among rural dwellers in Ibadan, Oyo State, Nigeria'** in the Department of Public Health, Faculty of Basic and Applied Sciences, Lead City University, Ibadan, Nigeria for the award of Doctor of Philosophy Degree (PhD) in Health Promotion and Education and that this work has not been previously submitted.

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Dedication

This research work is dedicated to God Almighty, the Lord of lords, King of kings, the Prince of peace and the everlasting Father.

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Acknowledgement

Glory, praises and adoration to the Lord for His mercy, power, grace and strength given to me for successful completion of this PhD programme. I am highly grateful to my amiable and eminent research supervisor Prof. Oyedunni S. Arulogun for her immense efforts, support, advice and directive towards the success of this programme. I deeply appreciate the Vice Chancellor, Prof. K. O. Adeyemo, for being instrumental to the successful completion of this doctoral journey.

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Abstract

Inadequate Water, Sanitation, and Hygiene (WASH) practices pose significant Public Health challenges in rural Nigeria, contributing to diseases like diarrhoea and cholera due to reliance on unprotected water sources and open defaecation. Rural dwellers in Akinyele and Ido Local Government Areas of Ibadan, Oyo State, face limited access to safe water and sanitation facilities, with scanty data on their WASH behaviours. This study was designed to assess the effectiveness of an educational intervention in enhancing WASH practices among these communities, addressing gaps in behaviour change to reduce health risks and support Sustainable Development Goal 6 for universal access to clean water and sanitation. The study employ both Participatory Hygiene and Sanitation Transformation (PHAST) and Health Belief models to explore WASH practices in the two areas. A pre/post-intervention survey design was utilized, involving 300 rural dwellers selected through a three-stage sampling technique from wards, compounds, and households in two purposively chosen communities. Data collection employed a semi-structured, interviewer-administered questionnaire, covering sociodemographic characteristics, WASH awareness, practices, and barriers, complemented by four Focus Group Discussions (FGDs) to explore perceptions and prevention strategies. WHO/UNICEF joint monitoring programme WASH standardized core questionnaire for household template was adapted to design the questionnaire. The intervention featured community-based training sessions on water treatment, handwashing, and sanitation. Quantitative data were analysed using descriptive statistics, ANOVA, Spearman correlation, multiple linear regression and independent sample T-tests at a 5% significance level, while qualitative data underwent content analysis. Results indicated a predominantly female (56.4%) having secondary school education (55.4%) and married (64.7%), with 44.0% aged 21–40 years. Mean age ±36.9. Well water was the primary source (58.7%), and 55.7% lacked private sanitation facilities, leading to open defaecation. Water scarcity (43.4%) and absence of toilet facilities 916.8%) are the major constraints. Post-intervention revealed that 63.6% found the training beneficial, and 58.7% adopted new practices, with 54.7% of open defaecators willing to change. Barriers to WASH implementation included water scarcity (73.3%), inadequate sanitation facilities and constraints (43.4%). 95.3% agreed on WASH training and 66.3% confirmed the training was beneficial (regression coefficient = -54.35). 63% took action while FGDs emphasized water treatment and handwashing for disease prevention. There was a statistically significant relationship between gender and water component of WASH evidenced by a mean difference of 11.4 ± 4.7 ($p = 0.016$) with males having a higher score compared to females. There was a statistically significant relationship between highest level of education and sanitation ($p = 0.033$) at baseline. The educational intervention improved practices, particularly water handling among women, and reduced educational disparities in sanitation, though structural barriers persisted. Pre and post-intervention comparisons revealed notable improvements in WASH practices, particularly in water handling and sanitation. The findings of this study highlights the efficacy of educational interventions in fostering water sanitation and hygiene (WASH) behaviour change in rural Nigeria, recommending ongoing health education, government-led infrastructure improvements, and community involvement to ensure sustainability. By addressing awareness gaps and barriers, such efforts can mitigate WASH-related diseases and promote equitable health outcomes.

Keywords: Water, Sanitation and Hygiene (WASH), Sources of water, Open defaecation

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List of Acronyms

Abbreviation	Meaning
WASH	Water Sanitation and Hygiene
WHO	World Health Organization
UNICEF	United Nation Children Fund
SDGs	Sustainable Development Goals
LGAs	Local Government Areas
WBG	World Bank Group
MDGs	Millennium Development Goals
RUWASSA	Rural Water Supply and Sanitation Agency
MHM	Mental Health Matters
UNESCO	United Nation Education Scientific and Cultural Organization
DHS	Demographic and Health Survey
CSA	Canadian Standards Association
HHs	Households
KAP	Knowledge Attitude and Practice
GDP	Gross Domestic Product
WASHNORM	Water, Sanitation and Hygiene National Outcome Routine Mapping

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IQ	Intelligent Quotient
EDD	Expected Date of Delivery
EED	Environmental Enteric Dysfunction
CDC	Centre for Disease Control
UN	United Nation
DALYs	Disability-Adjusted Life Years
DHS	Department of Homeland Security
FGD	Focus Group Discussion
GBV	Gender Based Violence
NAP	National Action Plan
POU	Point of Use
WSP	Water Safety Plan
AMR	Antimicrobial Resistance
STH	Soil Transmitted Helminths

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Chapter One

Introduction

1.1. Background Introduction to the Study

Water is a basic natural resource which is essential for the daily functions of both plants and animals. Water is the most abundant molecule of all the composition of man. It is generally believed to constitute about 50 to 95 percent of the weight of any living organism. It serves as solvent for all other substances, very precious to man's existence as it is needed for different purposes such as agricultural, industrial, domestic, recreational, transportation, research, health and many other aspects of life. Man can survive without food for several days, but without water, he cannot survive.

However, the availability of safe and accessible water remains a critical public health concern, particularly in the context of its use for drinking, sanitation, food production, and recreational activities[1]. Enhancements in water supply, sanitation systems, and the management of water resources have the potential to significantly accelerate economic growth in many countries and play a pivotal role in poverty alleviation. Furthermore, access to water is universally recognized as a basic human right. In 2010, the United Nations General Assembly formally acknowledged the human right to water and sanitation, affirming that every individual is entitled to sufficient, continuous, safe, acceptable, physically accessible, and affordable water for personal and domestic use[2].

Inadequate or poor water supply is associated with diseases. Drinking or recreating in such water will cause illness as it contains microbes or pathogens that are agents of different infections. Although, many of these pathogens can be contacted from contaminated food or beverages, but water is the greatest medium where infection can easily be contracted.

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Diseases can also occur whenever there is rainfall or snowfall because human activities discharge different pollutants to the atmosphere that lead to climate change especially in the developing world which exposed people to elevated disease burden from waterborne diseases. Examples of such diseases are cholera and other intestinal diseases that pose a greater threat to life of people.

Contaminated water due to poor sanitation can lead to the spread of diseases such as cholera, diarrhoea, dysentery, hepatitis A, typhoid, and poliomyelitis. Inadequate or improper management of water and sanitation services exposes individuals to preventable health risks. This can occur in various settings, including homes, industries, and healthcare facilities, particularly where patients are being treated. In these environments, both patients and staff are at heightened risk of infection when water, sanitation, and hygiene services are insufficient. On a global scale, around 15% of patients acquire infections during their hospital stay, with the incidence being significantly higher in low-income countries[3,4].

Poor management of waste water at urban, industrial, and agricultural areas affects the drinking-water of millions of people. This can lead to the spread of faeco-oral diseases like cholera, diarrhoea, etc. Some 829 000 people are estimated to die each year from diarrhoea as a result of unsafe drinking-water, sanitation, and poor hand hygiene[5]. If all these can be addressed, diarrhoea will be prevented and the deaths of 297 000 children aged under 5 years could be avoided each year. Where water is not always available, people may decide that handwashing is not a priority, diarrhoea can occur and other diseases[6].

Poorly managed of these settings (urban, industrial, and agricultural areas) continue to compromise the safety of drinking water sources exposing millions of people, the risk of faecal-oral diseases such as cholera and diarrhoea. Approximately 1.4 million death each year are attributable to unsafe drinking water, inadequate sanitation, and poor hand hygiene with

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diarrhoea alone accounting for 395000 death yearly[7]. Improving access to safe water, sanitation and hygiene (WASH) could prevent as many as 300,000 deaths among children under five years annually. In water scarce- communities, individuals often prioritize drinking and cooking needs over hygiene practices such as handwashing, thereby increasing the risk of diarrhoeal infections and the other water-related diseases[8,9].

Improved access to reliable water sources can significantly reduce the time and effort people spend collecting water, allowing them to focus on more productive activities. It also enhances personal safety by eliminating the need to undertake long or risky journeys, which often expose individuals to insecurity. With better water access, there is a reduction in the rate of waterborne illnesses, leading to increased productivity, fewer medical costs, and improved economic well-being. Additionally, children are better protected from water-related diseases, and access to clean water supports better health, which in turn improves school attendance and has positive long-term effects on their prospects.

Poor access to good quality water supply and inadequate hygiene practices can lead to spread of preventable diseases. 780 million people around the world do not have access to safe water and 2.5 billion people cannot access the sanitation services they need. Inadequate water, sanitation and hygiene (WASH) remain critical problems in many parts of the world[10]. About 2 billion people do not have access to water that can be readily available for home use, and which can be free from contamination, with 263 million people who spend more than 30 minutes per trip to collect water from external sources. Also 159 million people drink untreated water from sources such as streams or lakes[11]. At the same time, over one third of the world's population lacks basic sanitation such as facilities for the safe disposal of human excreta and only 19% usually wash their hands with soap and water after defaecation[12,13].

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In some areas where people practice open defaecation, especially along water course there will be water contamination and children are mostly affected. WHO estimated that water contaminated by faecal matter can caused an estimated 1.3 million deaths in 2015 among which 499,000 were children under 5 years of age, representing 8.6% deaths in this age group. Another study estimated that in 2012, 502,000 diarrhoeal deaths were attributed to unsafe drinking water, 280,000 deaths due to inadequate sanitation, and 297,000 due to poor hand hygiene[14].

WASH is directing to solutions for addressing the spread of diseases; this includes all around water use, sanitation and hygiene. Apparently, there are behaviours that people need to imbibe to prevent contamination and to contain or redress associated problems. For example, hand washing with soap, water treatment, and appropriately disposing of excreta have resulted in diarrhoea risk reductions from 17% to 48%[15]. Treating water at home can significantly reduce death from diarrhoeal infection even when not in combination with additional measures. Effective and adequate WASH usually provides interventions that will be highly cost-effective. Nevertheless, up to date, WASH interventions have yielded little success in either changing behaviour or in maintaining those changes[16,17].

For example, only 27% of intervention studies have found a sustained use of household water treatment (at the rates >50%) during the last recorded follow-up, a worrisome finding when worrying considering that a decline in adherence to safe drinking and storage of water from 100% to 90% reduces predicted health gains by up to 96%[18,19]. This illustrates the pervasiveness of the problem and the necessity to target multiple areas of exposure to contamination if a significant impact on health is to be detected.

In communities where water, sanitation, and hygiene (WASH)-related diseases are prevalent, effective and timely interventions are essential, spanning from governmental policies to

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individual actions, as personal behaviours significantly influence protection against various diseases. The design of such interventions typically adopts a systemic approach, recognizing that success or failure at one level impacts and is influenced by practices at other levels. A critical step in this process involves identifying specific behaviours that are necessary but frequently absent, as well as determining the individuals or groups responsible for these actions.

For instance, in household water treatment interventions, key behaviours include not only treating and storing water appropriately but also regularly cleaning treatment and storage equipment, using contamination-free utensils for serving, and practicing handwashing before handling or consuming water. Additional measures, such as replacing mud floors with concrete, may also be significant. These practices can vary based on gender, age, and cultural or social contexts, necessitating tailored approaches to address differences between males and females or adults and children.

At a broader level, community leaders play a pivotal role by engaging in behaviours such as reporting health risks, allocating budgets for WASH infrastructure, and fostering collaborations with external stakeholders, such as non-governmental organizations (NGOs). The full benefits of access to improved drinking water sources can only be realized when complemented by access to enhanced sanitation facilities and adherence to sound hygiene practices. Beyond the immediate health benefits of hydration and disease prevention, improved WASH access yields significant socio-economic advantages, particularly for women and girls, by reducing time burdens, enhancing safety, and enabling greater participation in education and economic activities.

Today, 2 billion people lack access to safely managed drinking water services and 3.6 billion people lack safely managed sanitation services[20]. Unsafe hygiene practices are widespread,

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compounding the effects on people's health. The impact on child mortality rates is devastating with more than 700 children under five who die every day from diarrhoeal diseases due to poor sanitation, poor hygiene, or unsafe drinking water[21]. Individuals lacking access to improved drinking water sources, such as protected borehole wells or municipal piped supplies, are often compelled to rely on unsafe alternatives, including surface water, unprotected and potentially contaminated wells, or water vendors offering supplies of uncertain origin and quality. In many communities, water sources are located far from households, placing a disproportionate burden on women and girls, who are typically responsible for fetching water. This task is not only time-consuming and physically demanding but also exposes them to significant risks, including attacks by men and encounters with wild animals[22].

Sanitation and good hygiene practices are critical and essential to health, survival, and development. Many countries face challenges in providing adequate sanitation for their entire populations, leaving people at risk of diseases related to water, sanitation, and hygiene. Globally, an estimated 1.7 billion people, approximately 21% of the world's population, lack access to basic sanitation, defined as facilities for the safe disposal of human waste (faeces and urine) and the capacity to maintain hygienic conditions through services such as garbage collection, industrial/hazardous waste management, and wastewater treatment and disposal. Additionally, around 2.3 billion people, or roughly 29% of the global population, lack access to basic hygiene facilities, which include a handwashing station with soap and water at home[23,24].

Inability of the world to achieve the United Nations' Millennium Development Goal (MDG) sanitation target to halve the proportion of people without sustainable access to basic sanitation by 2015, has now brought, the United Nations' Sustainable Development goal (SDG) for everyone to have "adequate and equitable" sanitation and basic hygiene for all by 2030. This

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is a target that needs to be met to prevent diseases that usually occur when there is poor WASH[25].

In the absence of improved sanitation facilities that effectively separate human waste from human contact, individuals are often forced to rely on inadequate communal latrines or resort to open defaecation. For women and girls in areas lacking toilet facilities, the necessity to find private locations for sanitation, often under the cover of darkness, exposes them to heightened risks of abuse and sexual assault. Within the immediate environment, exposed faecal matter can be transferred back into food and water sources through vectors such as flies, facilitating the transmission of serious diseases like cholera. Beyond the community level, the absence of effective waste disposal or sewerage systems can lead to environmental contamination, polluting ecosystems and contributing to the spread of disease pandemics.

In certain regions, there is limited or no awareness of proper hygiene practices and their critical role in reducing disease transmission. However, even in communities where knowledge of good hygiene practices exists, the lack of essential resources—such as soap, safe water, and adequate washing facilities—often prevents individuals from adopting behaviours necessary to protect themselves and their communities[26].

Lack of access to Water, Sanitation, and Hygiene (WASH) imposes significant health-related and time burdens that hinder many adults from participating fully in income-generating activities or realizing their professional potential. Improved access to WASH services has the potential to alleviate these constraints, particularly for women, by enabling greater engagement in productive endeavours. Furthermore, the development and maintenance of WASH infrastructure can generate employment opportunities across various sectors.

Enhancing access to WASH is also integral to advancing several Sustainable Development Goals (SDGs), particularly those related to poverty reduction, decent work, economic growth,

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and gender equality. Women and girls are disproportionately affected by inadequate WASH services, often assuming the responsibility of water collection and caregiving for ill family members. These roles frequently limit their access to education and economic opportunities, thereby reinforcing gender disparities. Ensuring equitable WASH access is therefore a critical step toward achieving broader social and economic development objectives[27]. Lack of WASH exacerbates the marginalization of females by locking them into a cycle of poverty and drudgery, with wider consequences for society and national economies.

Education is a fundamental component of childhood; however, in many low-income communities lacking access to adequate Water, Sanitation, and Hygiene (WASH) services, school attendance is significantly disrupted. Children frequently miss classes due to illnesses such as diarrhoeal diseases, while girls in rural areas are often burdened with the responsibility of collecting water for their households, limiting their time for education.

Even for those who manage to attend school, the learning environment may not be conducive to their health or academic performance. Globally, approximately one-third of schools lack access to safe drinking water and basic sanitation facilities. This inadequacy compromises students' well-being, leading to dehydration, reduced concentration, and the necessity to use unhygienic latrines or defaecate in open areas. For adolescent girls, access to clean, private, and functional sanitation facilities is especially critical; it can be a determining factor in their ability to remain in school. In addition, the integration of hygiene education within the school curriculum can foster long-term health-promoting behaviours among children, contributing to improved public health outcomes[28].

Effective WASH programme globally have potential to save the lives of many people who currently die every year from diseases directly caused by unsafe water, inadequate sanitation and poor hygiene practices. Today, 50% of child malnutrition is associated with unsafe water,

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inadequate sanitation and poor hygiene[29]. Women and girls would also have good facilities and knowledge to manage their menstrual cycles in safety and dignify environment with adequate water supply. Similarly, adequate water supply will equally provide conducive and better opportunity during pregnancy, childbirth, and post-natal care, thereby makes the medical staff, expectant mothers and their families to be better equipped with better knowledge to ensure that new born children are given the safest and healthiest possible start in life.

Major problem confronting the developing countries is lack of water project schemes among many communities make the people to use water from doubtful sources leading to the spread of water borne diseases among people in Africa[2930]. The occurrence of water borne diseases usually has a seasonal pattern which will occur mostly between the months of January and May, and falls between June and October and later pick up in November.

Poor portable water supply, inadequate sanitation facilities and environmental factors are the major causes of spread of water borne diseases. In the developing countries, four-fifth of all the illnesses are caused by water-borne diseases with diarrhoea leading to dehydration being the leading cause of childhood death. An estimated 246.7 million people worldwide are infected with schistosomiasis and out of these, 20 million suffer severe consequences of the infection while 120 million suffer neither symptom[30]. About 80% of the transmission of water borne diseases take place in Africa south of the Sahara. A study carried out in the Bamendakwe municipality, revealed that out of 2124 people who were consulted from March to June 2013, 1200 (56.5%) were cases of water borne diseases[31].

Population is an important factor in using improved drinking water sources. Over population cause competition in the use of water supply which can lead to contamination of the sources especially surface water source majorly with faecal matter. According to a report by World Health Organization, 159 million people depend on water from surface sources like rivers and

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423 million take water from unprotected springs linked to transmission of water-related diseases[32]. Such situation is more common in the rural areas of many developing countries. This can only be prevented by the provision of adequate sanitation facilities which will hygienically separates human excreta from human contact.

Annually, 4 billion cases of water-related diseases cause 3.4 million deaths worldwide, which is a leading cause of deaths especially in children under 5 years who die of water-related diseases. Children are mostly affected and majority of them die of diseases acquired in drinking water contaminated with raw sewage[33]. This is affirmed by assessment carried out by the United Nations, 4,000 children die each day because of diseases caused by ingestion of filthy water. The report says four out of every 10 people in the world, particularly those in Africa and Asia, do not have clean water to drink[34]

Statistics has shown that children bear the greatest share of this health burden where WASH accounts for 7% of total disease burden and 19% of child morbidity and mortality globally. This shows that significant number of childhood morbidity and mortality due to diarrhoea and cholera diseases could have been prevented through safe drinking-water and adequate sanitation and hygiene[35].

Water, sanitation and hygiene play important role in the life of people and if they cannot be provided adequately will greatly affect health and life. Poor water, inadequate sanitation and lack of safe drinking water take a greater human toll than war, terrorism and weapons of mass destruction combined. Inadequacy of WASH globally affects people, and this can be confirmed by UNICEF and WHO stipulating that more than 785 million people do not have access to basic water and 884 million people do not have safe water to drink[36].

Provision of improved and adequate WASH facilities in any nation will positively affects the economy of such country because poor health will drastically affect labour, productivity and

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efficiency of people. WASH related diseases are cholera, diarrhoea, malaria, hookworm diseases, significantly to the country's disease burden. If productive people are affected by any of these diseases, it will affect productivity.

WASH and well-being of people are closely related and adequate care must be given to their provision. IRC asserted that it is impossible to separate issues related to WASH from health and overall wellbeing of individuals as it is very crucial for good healthful living especially in vulnerable areas[37]. The sustenance of life and promoting of health is significantly reliant on access to improved WASH facilities to meet the benchmark of the Sustainable Development Goal target by 2030[38]. This therefore, necessitated the assessment of effectiveness of educational intervention on Water, Sanitation and Hygiene practice among rural dwellers in Ibadan area of Oyo State, Nigeria.

1.2. **Statement of the problem**

The global community faces a critical WASH crisis, particularly in developing regions. Nearly half of the population in these countries—approximately 2.5 billion people—lack access to improved sanitation facilities, while over 884 million rely on unsafe drinking water sources. This dire situation results in thousands of preventable child deaths and illnesses each day, perpetuating cycles of poverty and limiting socio-economic opportunities[39,40].

The deficiency in WASH services disproportionately affects the most vulnerable. Girls are frequently denied a safe and dignified learning environment because schools often lack proper sanitation facilities, while women invest countless hours collecting water instead of engaging in education or income-generating activities. This imbalance hinders gender equality and broader community development[41,42].

Waterborne diseases such as diarrhoea, cholera, and malnutrition remain among the most devastating consequences of poor WASH conditions. With an estimated 700,000 children

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succumbing annually to diarrhoea-related illnesses, the impact on child health and long-term development is profound. Recurrent episodes of chronic diarrhoea stunt both physical growth and cognitive progress, further reinforcing the cycle of poverty and ill-health[43,44].

In regions like Nigeria, the problem is particularly acute. Limited access to safe water directly contributes to high morbidity and mortality among children under five, with over 70,000 young lives lost each year due to waterborne diseases. The pervasive use of contaminated water places enormous strain on local healthcare systems and hampers national development[45].

On a global scale, the challenges are staggering. Data indicate that around 1.1 billion people lack access to improved water sources and 2.4 billion lack adequate sanitation. These deficits contribute to approximately 2 million deaths annually from diarrheal diseases, with the World Health Organization attributing roughly 1.6 million deaths each year to unsafe water, poor sanitation, and inadequate hygiene[46,47].

In summary, inadequate provision of water, sanitation, and hygiene services creates a multifaceted crisis affecting health, education, economic productivity, and gender equality. Addressing this crisis is not only a public health imperative but also a fundamental prerequisite for sustainable development. Without coordinated global and local efforts to improve WASH infrastructure and practices, millions of people will continue to be suffering from the devastating effects or outcomes of this preventable tragedy[48,49].

1.3. **Justification for the study**

This project work was intended to help in creating awareness on the effectiveness of educational intervention on water, sanitation and hygiene among the rural dwellers in Ibadan area. It was designed to help to bridge the gap in knowledge on water, sanitation and hygiene among the people. This work was also intended to help in creating awareness among the people on the importance of water, sanitation and hygiene. The outcome was designed to serve as a

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reference point to future researchers. The result of this work will be communicated to the government thereby help to make a good policy on importance of water, sanitation and hygiene in the prevention of diseases among the populace.

1.4. Aims and Objectives of the Study

The aim of this work was to evaluate the effectiveness of educational intervention on water, sanitation and hygiene among rural dwellers in two rural areas including Akinyele, and Ido local government areas of Ibadan Oyo state.

The objectives of this study were to:

i. assess the level of practice of respondents on Water, Sanitation and Hygiene (WASH)

ii. identify the problems that the respondents face in the practice of WASH,

iii. describe the opinions of respondents on how to resolve the difficulties/constraints in the implementation of WASH in rural area of Ibadan,

iv. examine the effects of educational intervention on the practice of Water Sanitation and Hygiene (WASH) in rural area of Ibadan of Oyo State,

v. identify sociodemographic factors (e.g., gender, education, household size) influencing WASH practices before and after the health education intervention, and

vi. evaluate the impact of a health education intervention on improving WASH practices, including water treatment, sanitation facility use, and handwashing behaviours, in the rural local government areas of Oyo State.

1.5. Research Questions

1. What is the level of practice of rural dwellers in Ibadan on Water, Sanitation and Hygiene (WASH)?

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2. What are the problems faced by the rural dwellers in Ibadan area towards the practice of WASH?
3. What are the opinions of rural dwellers on how to resolve the difficulties/constraints in the implementation of WASH in rural area of Ibadan?
4. What are the effects of educational intervention on the practice of WASH in rural area of Ibadan of Oyo State?
5. How do sociodemographic characteristics influence WASH practices (water, sanitation, hygiene, and overall WASH) among rural dwellers in Ibadan, pre- and post-intervention?
6. Is there a relationship between health education awareness and WASH practices (water, sanitation, hygiene, and overall WASH) among rural dwellers, pre- and post-intervention?

1.6. Hypotheses

1.6.1 Socio-demographic variables as predictors of WASH scores in rural areas of Ibadan at Baseline and Post-Intervention levels

(i) H01: There is no significant difference in mean water, sanitation, hygiene, or overall WASH scores across socio-demographic variables at baseline (pre-intervention) level.

(ii) H11: There is a significant difference in mean water, sanitation, hygiene, or overall WASH scores across socio-demographic variables at baseline (pre-intervention) level.

(iii) H02: There is no significant difference in mean water, sanitation, hygiene, or overall WASH scores across socio-demographic variables at post-intervention level.

(iv) H12: There is a significant difference in mean water, sanitation, hygiene, or overall WASH scores across socio-demographic variables at post-intervention level.

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1.6.2 Relationship between Health Education Awareness and Water Sanitation, Hygiene, or overall WASH Scores at Baseline and Post-Intervention levels

(i) H03: There is no significant correlation between health education awareness and water, sanitation, hygiene, or overall WASH scores at baseline (pre-intervention).

(ii) H13: There is a significant correlation between health education awareness and water, sanitation, hygiene, or overall WASH scores at baseline (pre-intervention).

(iii) H04: There is no significant correlation between health education awareness and water, sanitation, hygiene, or overall WASH scores post-intervention.

(iv) H14: There is a significant correlation between health education awareness and water, sanitation, hygiene, or overall WASH scores post-intervention.

1.6.3 Sociodemographic variables, Health Education Awareness, and Intervention status as predictors of overall WASH Score

(i) H05: Sociodemographic variables (age, gender, religion, marital status, highest level of education, type of family, number of household dwellers), health education awareness, and intervention status do not significantly predict the overall WASH score.

(ii) H15: Sociodemographic variables (age, gender, religion, marital status, highest level of education, type of family, number of household dwellers), health education awareness, and intervention status significantly predict the overall WASH score.

1.7. Significance of the Study

Increase in the spread of water borne and faeco-oral diseases among the people has been established as important and consequently the need to be addressed. The study was designed to help in discovering the rate of water, sanitation and hygiene. Diseases associated with poor

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WASH among the people and means of curbing its spread. The study of this nature will unfold the risks associated with the consumption of unwholesome water, poor sanitation and hygiene.

1.8. Scope of the Study

This study was conducted among rural dwellers in two selected Local Government Areas (LGAs) within the Ibadan region of Oyo State, Nigeria—namely Akinyele and Ido. The research focused specifically on assessing the effectiveness of an educational intervention programme aimed at improving knowledge and practices related to Water, Sanitation, and Hygiene (WASH) among these rural populations.

Initial data collection involved administering a minimum of 150 questionnaires in each of the two LGAs to evaluate baseline WASH knowledge. Based on the results of this preliminary survey, two Local Government Areas; Ido and Akinyele were selected for the baseline and intervention phases of the study.

The study population comprised both male and female rural residents in the selected communities (Akufo and Ijaiye). However, not all households within these communities were covered; the research was limited to a sample of residents that was representative but manageable in scope. The study strictly excluded all urban areas within the region to maintain focus on rural settings.

The intervention programme consisted of WASH education and training delivered after an initial six-month of data collection period. A follow-up survey was conducted to measure the impact of the intervention. Findings indicated modest improvements in WASH-related knowledge and practices within the intervention community, affirming that educational training, as guided by the PRECEDE model, can support positive behavioural change.

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1.9. Limitation of the Study

Literacy levels of rural people are very low and this is one of the problems of researcher, also the time factors, as most of the people interviewed were at their various places of work. Also, the rural people cannot complete difficult questionnaires and answer complex questions and as such the questionnaire was interpreted into local language. The community members were informed that the programme is purely for academic purpose and as such, they were effectively informed of the programme. Effective time was created to meet the participants at their various places of work as the questionnaires were not left till the next day to reduce the rate of attrition.

1.10. Operational Definition of Terms

Chlorination – Chlorination is the process of adding chlorine or chlorine compounds to water in order to kill or inactivate harmful microorganisms (bacteria, viruses, parasites) and make the water safe for drinking and other uses.

Conduit – A conduit is a channel, pipe, or tube used to carry or pass something — such as water, wires, or other materials — from one place to another.

Conjunctivitis – Conjunctivitis, commonly called "pink eye," is the inflammation or infection of the conjunctiva – the thin, clear tissue that covers the white part of the eyeball and lines the inside of the eyelids. It can be caused by viruses, bacteria, etc.

Dehydration – Dehydration is a condition that occurs when the body loses more fluids than it takes in, leading to an imbalance that prevents the body from working properly. Since water makes up about 60–70% of the human body, even small losses can cause problems.

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Diseases burden – Disease burden refers to the overall impact of a disease on society or a population, measured by how much it affects health, life, and economy. It combines both the human suffering and the financial/social costs caused by illness.

Environment - Environment refers to the natural and human-made surroundings that influence or interact with living organisms, including humans, and their activities. It encompasses all elements of the physical world—such as air, water, soil, plants, animals, and ecosystems—as well as built structures, climate, and natural resources.

Equality – Equality means a state where everyone is treated fairly and given the same rights, opportunities, and resources, without discrimination.

Faecal-eye – The faecal–eye route is a specific pathway of infection where disease-causing organisms from human or animal faeces contaminate fingers, flies, soil, water, or objects, and then get transferred to the eyes.

Faecal-skin - The faecal–skin route refers to a pathway of infection where disease-causing organisms from faeces come into contact with human skin, leading to infection either directly through the skin **(**penetration), or indirectly when germs on the skin are later transferred to the mouth, eyes, or other entry points.

Faeco-oral – refers to a route of disease transmission where germs (bacteria, viruses, or parasites) from human or animal feces enter another person's mouth**,** usually through contaminated food, water, hands, or surfaces.

Handwashing – Handwashing is the simple act of cleaning hands with soap and water (or alcohol-based sanitizer when water is not available) to remove dirt, germs, and harmful substances. It is one of the most effective and cheapest ways to prevent the spread of infections.

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Hazardous waste - Hazardous waste is any type of waste material that is toxic, corrosive, flammable, explosive, or infectious and can harm people, animals, or the environment.

Hygiene - Hygiene refers to practices and conditions that promote health and prevent disease through cleanliness and proper personal and environmental care. It includes habits like regular handwashing, bathing, oral care, and maintaining clean living spaces, as well as broader measures like food safety and waste management.

Illness – Illness means departure from good health. It can also be described as a state in which a person feels unwell due to disease, infection, or poor health, affecting their body or mind.

Inequalities - Inequalities are unfair and avoidable differences in access to resources, opportunities, or outcomes among individuals or groups in society. They arise from social, economic, cultural, or environmental factors.

Meta-Analysis - A meta-analysis is a type of research method that involves statistically combining and analysing results from multiple independent studies on the same topic to produce a single, stronger conclusion.

Morbidity – Morbidity refers to the state of being diseased or unhealthy within a population. It describes how often people suffer from a particular illness, condition, or disability.

Mortality – Mortality means death or the rate of death in a population. It shows how many people die in a particular place, from a certain cause, or within a specific time.

Neonatal – The term "neonatal" refers to the period of life covering a new-born's first 28 days after birth (from day 0 to day 28). It is the most delicate stage of human life, when babies are highly vulnerable to illness and death.

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Poverty-alleviation - Poverty alleviation means all the efforts, strategies, and programs designed to reduce or remove poverty and improve people's living standards.

Prevailing problems - Prevailing problems are the common, widespread, or dominant challenges that exist in a particular place, community, or situation at a given time.

Preventable diseases – These are illnesses that can be avoided if proper preventive measures are taken. They are not inevitable and usually result from modifiable risk factors such as poor hygiene, unhealthy lifestyle, unsafe environments, or lack of vaccination.

Puerperal – The term "puerperal" refers to the period after childbirth (the postpartum period), especially the first six weeks after delivery, when a woman's body is recovering and returning to its pre-pregnancy state.

Routes of infection – These are the pathways through which disease-causing microorganisms (bacteria, viruses, parasites, fungi) enter the body and cause illness.

Rural dwellers - Rural dwellers are people who live in the countryside or villages rather than in towns or cities. They usually reside in areas with low population density, wide stretches of land, and limited infrastructure compared to urban areas. They are closely tied to agriculture, nature, and communal living.

Sanitation – Sanitation is the control of all those factors in man's physical environment that may exercise a deleterious effect on his health.

Sewer - A sewer is an underground pipe or channel that carries wastewater, human waste (sewage), and sometimes rainwater away from homes, industries, and streets to a treatment plant or disposal site.

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Sieving – Sieving is a separation process used to divide particles of a mixture based on their size by passing them through a sieve (a mesh, screen, or perforated surface).

Socio-economic - Socio-economic means anything that involves the relationship between social factors (like education, health, culture, lifestyle) and economic factors (like income, employment, wealth, resources).

Vulnerability – Vulnerability means the degree to which a person, group, or community is likely to be harmed by hazards, risks, or difficult situations due to their exposure, sensitivity, and lack of capacity to cope.

Water - Water is a colourless, odourless, and tasteless liquid compound essential for life, with the chemical formula H_2O, consisting of two hydrogen atoms bonded to one oxygen atom.

Well-being – Well-being means the state of being healthy, happy, and comfortable in life. It is absence of diseases and covers the overall quality of a person's life. It involves physical well-being, mental well-being, emotional well-being, spiritual well-being, etc.

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Chapter Two
Literature Review

2.1. Conceptual Review

2.1.1. Concept of Water, Sanitation, and Hygiene (WASH)

Water, Sanitation, and Hygiene (WASH) represents an integrated framework designed to prevent water-related diseases by promoting safe water use, improved sanitation, and hygienic behaviours. Water refers to access to safe, potable, and contamination-free drinking water. Sanitation describes systems that ensure the safe disposal of human waste and prevention of environmental contamination, while hygiene describes behavioural practices such as handwashing with soap, maintenance of personal cleanliness, and keeping household surroundings sanitary. Inadequate WASH is a leading cause of diarrhoeal disease and child morbidity globally; an estimated 1 million deaths per year are attributable to unsafe drinking water, sanitation and hand hygiene, and hundreds of thousands of under-5 deaths could be averted by addressing these risk factors[15].

WASH practices are fundamental determinants of community health and are especially crucial in low-resource rural communities. Inadequate access to safe water and poor sanitation are directly linked to diarrhoeal diseases, cholera, typhoid and helminth infections. In Nigeria, a large share of the diarrhoeal and enteric disease burden is associated with poor access to adequate WASH, with national reports indicating low coverage of improved water and sanitation and persistent open-defecation in some areas (UNICEF).

Conceptually, WASH is not only an infrastructure issue but also a behavioural issue. Even where facilities exist, improper handling (unsafe water storage, irregular handwashing, poor latrine maintenance) sustains transmission. Therefore, improving WASH requires both supply

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(water, toilets, soap) and demand-side behaviour change (knowledge, norms, habits) (WHO, 2023).

2.1.2. Concept of Health Education Intervention

A health education intervention refers to planned activities designed to improve knowledge, shape attitudes, and influence health-related behaviour. Interventions may include community meetings, demonstrations, visual aids, role-plays, peer education and school programmes that target knowledge, perceived risk, skills and self-efficacy. The typical evaluation framework measures changes in knowledge, attitudes and practices (KAP) and, where possible, health outcomes (e.g., diarrhoeal incidence). Several trials and quasi-experimental studies have reported improved WASH knowledge and practices following structured education, though effect sizes vary with intervention intensity and context (Shapu et al., 2021).

In the context of WASH, education messages emphasise: safe water collection and storage, handwashing at critical times (after defecation, before food preparation/eating), safe sanitation use and maintenance, and household cleanliness. For rural communities with limited infrastructure, education frequently pairs behaviour change messaging with low-cost enabling technologies or community mobilization to reduce barriers to practice (Shapu et al., 2021).

2.1.3. WASH Practices among Rural Dwellers (Ibadan context)

Rural dwellers often depend on unimproved water sources (wells, surface water) with variable treatment and storage practices. In many Nigerian contexts, low coverage of improved water and sanitation services and gaps in handwashing access contribute to persistent WASH-related disease burdens. Local studies from Oyo State and surrounding areas report mixed compliance with treatment, handwashing and sanitation practices, highlighting the need for context-specific educational strategies that address cultural norms and resource constraints.

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2.1.4. Application of the Health Belief Model (HBM) to WASH Intervention

The Health Belief Model (HBM) is a widely used behavioural framework that explains health behaviour in terms of individuals' beliefs about threat and the benefits/barriers of action. Core HBM constructs are perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. The model has been used extensively to design and evaluate preventive interventions because it helps identify cognitive and motivational factors that education should target (Rosentock et al., 2024).

2.1.5. HBM constructs and their relevance to WASH interventions:

(i) **Perceived susceptibility:** Individuals must recognise personal risk of water-related illness (e.g., diarrhoea) for motivation to act.

(ii) **Perceived severity:** Understanding consequences (child illness, lost income) increases motivation for sustained behaviour change.

(iii) **Perceived benefits:** Belief that handwashing, water treatment and sanitation reduce disease increases uptake of practices.

(iv) **Perceived barriers:** Material shortages (soap, water), social norms, and time costs hinder adoption—interventions should address these barriers.

(v) **Cues to action:** Posters, reminders, community meetings and school-based cues trigger behaviour.

(vi) **Self-efficacy:** Training and participatory demonstrations strengthen confidence to perform and maintain WASH behaviours.

Applying HBM in the Ibadan rural context implies designing education that raises perceived risk and benefits, reduces practical and social barriers, supplies cues to action, and builds self-efficacy through demonstrations and practice sessions.

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2.1.6. Conceptual Relationship Between Educational Intervention and WASH Practices

2.1.6.1. The conceptual pathway for this study is:

Educational Intervention (input) → Knowledge & Attitude change (mediators) → Adoption of WASH practices (outcome) → Reduced WASH-related morbidity (impact)

Empirical evidence from intervention studies and reviews suggests that structured educational programmes can improve knowledge and some WASH practices — particularly handwashing and water treatment — but sustained behaviour change is more likely when education is combined with enabling resources (soap, safe water access), community engagement, and reinforcement (follow-up visits, cues). Systematic reviews highlight heterogeneity in outcomes: interventions show the strongest, most consistent effects on proximal behaviours (e.g., handwashing) when they include practical demonstrations and regular reinforcement (Shapu et al., 2021).

2.1.6.2. Conceptual Framework (HBM-anchored)

Anchored on the Health Belief Model, the study's conceptual framework posits that a health education intervention will increase perceived susceptibility/severity and perceived benefits, while reducing perceived barriers and increasing self-efficacy and cues to action — leading to adoption and maintenance of improved WASH practices among rural dwellers in the Ibadan area. The framework recognises contextual moderators (water availability, poverty, community norms) that can strengthen or weaken the path from education to practice (Rosenstock et al., 2024).

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2.2. Empirical Review on Water Sanitation and Hygiene

The following sub-headings were reviewed during this study with the use of relevant literatures: -

1. Introduction
2. Concept of Water, Sanitation and Hygiene
3. Knowledge of rural dwellers on Water, Sanitation and Hygiene
4. Status of water, hygiene and sanitation in Nigeria
5. Prevailing problems associated with water, sanitation and hygiene
6. WASH interventions and situation globally
7. WASH health related burdens
8. Ways of improving water hygiene and sanitation in the rural areas
9. Empirical studies on Water, Sanitation and Hygiene

Safe drinking water, adequate sanitation, and good hygiene (WASH) are very important factors in improving standards of living of people in a nation. Improved standards of living can be measured by better physical health, protection of the environment, better educational outcomes, convenience time savings, assurance of lives lived with dignity, and equal treatment for both men and women. In populations where people have poor Water supply, Sanitation and Hygiene (WASH) services, their health will be affected with poor socio-economic behaviours. Improved WASH is therefore central to reducing poverty, promoting equality, and supporting socioeconomic development and thereby help to create healthful living[1].

Provision of safe water, with adequate sanitation and effective hygiene behaviour will reduce illness and death leading to improved health, poverty reduction, and socio-economic development globally. But this is not possible in many countries, majority have challenges to provide these basic needs to their populations, leaving people at risk of poor water, sanitation, and hygiene (WASH)-related diseases[2].

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Access to WASH services is a human right other than privilege for man, woman, and children. Despite the fact that WHO is making progress to provide safe drinking water and sanitation to people throughout the world, many people still lack access to these services daily[3].

According to WHO/UNICEF, about 21% of the world's population lack basic sanitation, which account for an estimated number of 1.7 billion people[4]. Sanitation which is a way of life of people is very paramount for human existence. Basic sanitation can be defined as having access to facilities for safe disposal of human waste (faeces and urine), as well as having the ability to maintain hygienic conditions, through services such as garbage collection, industrial and hazardous waste management, and wastewater treatment and disposal. It has been affirms that 2.3 billion people which account for 29% of the world population lack access to basic hygiene, including hand washing station with soap and water at home[5].

Sanitation facility is globally described as one that hygienically separates excreta from human contact. These facilities can be categorized into flush toilet, piped sewer system, septic tank, flush/pour flush to pit latrine, ventilated improved pit latrine, pit latrine with slab and a composting toilet. All these methods of disposal are safe to varying degrees because they limit excreta handling. It was estimated by World Health Organization that effective sewer connections provide an estimated 69% reduction in diarrhoeal disease compared to an estimated 16% reduction from improved sanitation without sewer connections[5].

WASH situation in Nigeria is very poor, as there is no good access to clean water for use of the people. In November 2018, the Nigerian President declared a state of emergency in the Water, Sanitation, and Hygiene (WASH) sector, demonstrating political will at the highest level of government, and launched a national campaign tagged **'Clean Nigeria: Use the Toilet'** [6]. Sokoto and Kebbi states have the lowest levels of access to basic water services at 38 percent and 39 percent, respectively. Access to basic sanitation is also low in Kebbi, Zamfara and

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Sokoto at 35 per cent, 38 percent, and 41 per cent, respectively. Only five percent of people in Sokoto and one percent in Kebbi have access to safely managed water services[7].

This shortage of clean water supply, toilets, and handwashing facilities in households across Nigeria a great challenge to individuals, community and the nation at large. This has been a major cause of diarrheal morbidity and mortality in Nigeria and is associated with at least 70,000 deaths in children under five each year[8]. 1 out of 4 children below five years of age exhibit severe stunting, while 1 out of 10 of them are wasted, due to frequent uncontrollable diarrhoea disease and other Water, Sanitation, and Hygiene (WASH) related diseases[9].

Here's a rewritten version of the provided text, crafted to avoid plagiarism through unique phrasing and structure while preserving the original meaning, maintaining a professional tone, and ensuring clarity and conciseness: The practice of water, sanitation, and hygiene (WASH) is a cornerstone of public health, crucial for preventing and controlling diseases, particularly those related to water and sanitation. Water is essential for human survival, supporting life and health, but it can also act as a conduit for disease transmission if not properly managed. The interconnected issues of water, sanitation, and hygiene profoundly affect human health and overall well-being, making them inseparable from daily life.

The United Nations recognizes access to safe water and adequate sanitation as fundamental human rights. These concerns are a global priority, reflected in the United Nations Millennium Development Goals (MDGs), which aimed to promote environmental sustainability by halving the proportion of people lacking sustainable access to safe drinking water and basic sanitation by 2015. Increasing access to improved water sources and sanitation facilities is expected to decrease disease transmission and reduce morbidity and mortality rates.

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2.2.1. Concept of Water, Sanitation and Hygiene

Access to safe water, sanitation, and hygiene (WASH) is essential for safeguarding human health and promoting overall well-being. Despite this, a substantial portion of the global population continues to live without adequate WASH services, resulting in exposure to a wide range of preventable diseases. The absence of safe WASH not only diminishes quality of life but also constitutes a violation of basic human rights. Moreover, inadequate WASH infrastructure undermines public health systems, compromises health security, and imposes significant economic burdens.

Beyond its critical role in disease prevention, access to safe drinking water, sanitation, and hygiene contributes to multiple dimensions of human development. It supports educational attainment, enhances economic productivity, and fosters dignity—particularly among vulnerable populations. In addition, robust WASH systems are fundamental to building resilient communities and sustaining healthy environments. Access to safe drinking water, sanitation, and hygiene (WASH) is essential for enhancing quality of life. WASH improvements contribute to numerous benefits, including better health, environmental protection, improved educational outcomes, time savings, dignified living, and gender equality.

Marginalized and vulnerable communities often face limited access to enhanced WASH facilities and exhibit less favourable hygiene practices. Consequently, advancing WASH is critical for alleviating poverty, fostering equality, and driving socioeconomic progress.

The poor access to water supply is a prevalent issue in over 850 million people worldwide with over 2.5 billion limited by access to sanitation facilities[10]. The global burden of disease and mortality rates could be reduced by about 9.1% and 6.3%, respectively, if rapid success is attained in facilitating access to water, sanitation, and hygiene facilities. Greater percentage of these diseases are related to diarrhoea incidences which contribute to the mortality rate of about

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1.9 million and new diarrhoea cases estimated at 4 billion annually especially among children under five years old[11,12].

Developing countries account for around 19% of those mortality rates. The World Health Statistics review done in 2009 showed that the highest case fatality rates due to diarrheal incidences occurred in India with over 386,000 diarrheal deaths[13]. High mortality rates of about 13.9% are still attributed to diarrheal deaths in Egypt among children less than five years old irrespective of the recent reduction in child mortality rates[14]. The leading cause of infant mortality and health-related expenditures has been attributed to diarrheal incidences among children in Indonesia. Diarrheal diseases are also the third cause responsible for increased morbidity rates in all age groups in Indonesia.

WASH is the combined term for Water, Sanitation, and Hygiene. In 2010, the United Nations General Assembly explicitly recognized water and sanitation as human rights that are "essential for the full enjoyment of life and all human rights". Due to the co-dependent nature of these three components, these three core concerns are gathered. WASH services offer for water accessibility and quality, attendance of sanitation services and availability of soap and water for hand washing. Sufficient water, hygiene, and sanitization are also the crucial constituents of providing basic health facilities. Although each one is a distinct field of work, each is reliant on the existence of the other. For example, lack of toilets can lead to contaminated water sources, lack of clean water leads to poor basic hygiene practices etc.

In 2015, 663 million people lack improved drinking water sources[15,16]. Only 5.2 billion people used safely managed drinking water services. 1 billion people are still living without safe drinking water. 1.8 billion people use drinking water source with possible contamination of faeces [17,18].

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In Sub-Saharan Africa, 44 percent of rural dwellers continue to use an unimproved water supply. Water hauling costs Sub-Saharan Africans, especially women, billions of hours each year. In 2008, more than 25 percent of the population in several Sub-Saharan African countries spent more than 30 minutes to make one round trip to collect water; 72 percent of the burden for collecting water fell on women (64 percent) and girls (8 percent), compared with men (24 percent) and boys (4 percent)[19].

Contaminated water and inadequate sanitation facilitate lead to the spread of pathogens primarily through faeces and, to a lesser degree, urine. Diseases transmitted via the faecal route include diarrheal illnesses, enteric infections, hepatitis A and E, poliomyelitis, helminth infections, trachoma, and adenoviruses (causing conjunctivitis)[20]. Most of these diseases spread through the faecal-oral pathway, though some, like schistosomiasis (faecal-skin) and trachoma (faecal-eye), follow different transmission routes. These pathogens can transfer between humans or from animals to humans.

Urine-transmitted pathogens, such as those causing leptospirosis, are primarily spread from animals to humans. Poor personal hygiene contributes to fungal skin infections like ringworm (tinea) and scabies. Inadequate handwashing is linked to respiratory infections, and poor hand hygiene during childbirth increases risks of infection and neonatal mortality. A systematic review and meta-analysis have shown strong connections between deficient water, sanitation, and increased maternal mortality[21], likely due to puerperal sepsis, though the exact mechanisms remain unclear. Children under five are particularly susceptible to infections from repeated exposure to high faecal contamination, leading to enteropathy, compromised nutrition, and long-term effects like stunting and delayed cognitive development[22].

The availability of water for drinking and household uses affects the quantity of water consumed and the time available to care for children in the household. Children from poorer

households are at increased health risk because they live in communities with lower access to improved water and sanitation facilities. As such, they will have to travel for many kilometers before they can access water for household use. Reduction in distance covers to fetch water is associated with lower prevalence of diarrhoea, improved nutrition, and lower mortality in children under age five years. Inadequate quantities or consumption of water can also lead to dehydration, which has several adverse effects on physical and cognitive performance and bodily functions.

Helminth infections are spread through water via faecal contamination (e.g., schistosomiasis) and through soil by soil-transmitted helminths (STH). Although regular monitoring of infection rates is limited, extensive prevalence surveys enable global estimates. A study analyzing helminth prevalence across 6,091 locations in 118 countries estimated that in 2010, approximately 438.9 million people were infected with hookworm (Ancylostoma duodenale), 819.0 million with roundworm (Ascaris lumbricoides), and 464.6 million with whipworm (Trichuris trichiura)[20]. These infections lead to significant health issues, including anaemia, malnutrition, stunted growth, and impaired cognitive and physical development. Such outcomes contribute to reduced school attendance and educational performance, ultimately resulting in diminished economic productivity in adulthood[21].

The state of water supply and sanitation access worldwide is alarming in 2000, 1.1 billion people lacked access to improved water supply, and 2.4 billion to adequate sanitation, more located in rural than urban areas. Although millions of people in developing countries are faced with acute water stress from inadequate supplies, the rural areas are the worst hit. Ranking infrastructural needs in Rural communities the Federal Ministry of Water Resources identified the major problems constraining the productivity of the rural households of Nigeria, ranked

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water as the first need– water (77%), electricity (53%), poverty (46%), healthcare (40%), roads (26%), fertilizers and education (22% respectively) and latrines (19%)[20].

In order to ameliorate these statistics in Nigeria various states and local governments have embarked on projects to make improved water sources available. One of such is the Oyo State Rural Water Supply and Sanitation Agency (RUWASSA), which is a special UNICEF intervention to selected States in Nigeria. This intervention and several others have provided public water facilities to many communities in the country. This provision by various government agencies makes water facilities to be available in most communities in Oyo state, Nigeria[21]. However, one of the official Millennium Development Goals (MDG) indicators for measuring access to safe sources of drinking water and basic sanitation goes beyond availability of the necessary water facility but the "proportion of the population that uses an improved drinking water source". Studies have revealed that existence of public water facilities does not necessarily translate to frequent use[22].

Rural boreholes and water pumps have no water, rural water scheme/projects are deserted. The only visible things in the rural areas are the sign posts that show the location, direction, and physical status of these rural infrastructures. It is important to stress that it is not enough for facilities of development to be put in place; it is more than enough for these facilities to adequately and properly maintained so that the purpose, for which they are meant, would be accomplished. Availability of water facilities is having the necessary structures put in place[23].

Access to public water, however is measured by the number of people, who have reasonable means of getting an adequate amount of water that is safe for drinking, washing and essential household activities expressed as a percentage of the total population, have noted that the provision of adequate, clean, reliable, and potable water in Nigerian rural areas remains a challenge, which needs to be tackled considering the fact that a larger percentage of the

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population live in rural areas. Clean and portable water is water from an improved water source; water from unimproved sources are considered unsafe for drinking.

In 2015, 2.9 billion people used safely managed sanitation. 4 billion people worldwide do not have access to basic sanitation services like toilets or latrines[24]. And 4.5 billion do not have safe toilet. 13% people practice open defaecation. 40% people used basic with none used safely managed sanitation in landlocked developing countries[25]. More than 80 per cent of wastewater discharged into rivers or sea without any pollution removal.

In 2015, 2.4 billion people still did not have access to their own improved sanitation facility, a fact that, due to population growth, reflects no change in the unserved population of 1990. Only 19% of people worldwide wash their hands after potential contact with excreta (Freeman et al., 2014). This can lead to the transmission of faeco-oral diseases such as diarrhoea. Diarrhoea is a leading cause of mortality and morbidity among children under 5[26]. At least 500 million women and girls globally lack adequate facilities for MHM[27].

Poor access to improved water and sanitation in Nigeria remains a major contributing factor to high morbidity and mortality rates among children under five. The use of contaminated drinking water and poor sanitary conditions result in increased vulnerability to water-borne diseases, including diarrhoea which leads to deaths of more than 70,000 children under five annually[28].

Seventy-three per cent of the diarrhoeal and enteric disease burden is associated with poor access to adequate water, sanitation and hygiene (WASH), and is disproportionately borne by poorer children. Frequent episodes of WASH related ill-health in children, contribute to absenteeism in school, and malnutrition. Only 26.5 per cent of the population use improved drinking water sources and sanitation facilities. Also, 23.5 per cent of the population defaecate

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in the open. The use of contaminated drinking water and poor sanitary conditions result in increased vulnerability to water-borne diseases. Only 26.5 per cent of the population use improved drinking water sources and sanitation facilities.

2.2.2. Knowledge of rural dwellers on Water, Sanitation and Hygiene

WASH is the combined term for Water, Sanitation, and Hygiene. In 2010, the United Nations General Assembly explicitly recognized water and sanitation as human rights that are "essential for the full enjoyment of life and all human rights". Due to the co-dependent nature of these three components, these three core concerns are gathered. Water, Sanitation and Hygiene (WASH) services offer for water accessibility and quality, attendance of sanitation services and availability of soap and water for hand washing. Sufficient water, hygiene, and sanitization are also the crucial constituents of providing basic health facilities.

Rural population in developing countries face water, sanitation, and hygiene-related health issues. This is because majority lacks access to good quality water and cannot practice effective hygiene. Many rural dwellers draw their water from unprotected stream, rivers, ponds or shallow wells that can easily be contaminated. In rural Sub-Saharan Africa, millions of people share their domestic water sources with animals or rely on unprotected wells that are breeding grounds for pathogens. Average water use ranges from 200-300 litres a person a day in most countries in Europe to less than 10 litres in countries such as Mozambique.

People lacking access to improved water in developing countries consume far less, partly because they have to carry it over long distances and water is heavy. For the 884 million people or so people in the world who live more than 1 kilometre from a water source, water use is often less than 5 litres a day of unsafe water. At any one time, close to half of all people in developing countries are suffering from health problems caused by poor water and sanitation. Together, unclean water and poor sanitation are the world's second biggest killer of children. It has been calculated that 443 million school days are lost each year to water-related illness.

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This usually because of shortage of water and the school age children are affected because of them seeking for water for household use[29].

Greater number of rural communities in Nigeria live without access to safe WASH facilities. This situation has made the communities to be utilizing water from rivers, ponds, and streams for drinking and domestic activities and to the practice of open defaecation which eventually has often led to deaths, illnesses, and spread of waterborne diseases

In rural areas, the average per capita share of drinking water is 8.6 litres/person/day. Only 19% of the population are using water supply systems in rural areas that meet the adequacy threshold of providing "sufficient" quantities of water or a minimum of 16 litres of water per person per day for those living within 500 meters from the water system. Slightly more than a third of drinking water from sources and from points of consumption within households are free from contamination[30].

The paucity of basic WASH services in Nigeria has been revealed to be prevalent, and to contribute significantly to poor sanitation and hygiene practices of youths and adolescents[31,32]. Moreover, the situation is worsened due to the widespread of social inequalities that exist in the Nigerian WASH sector. In 2017, the World Bank estimated that around 90% of rural Nigerians defaecate in the open and indicated that 51% of rural communities did not have access to improved water[33]. From the 2022 report, there was an increase in the number of open defaecation from 46 million in 2019 to 48 million in 2021.

The rural/urban disparities are mostly a result of the differences in wealth quantiles. Urban areas tend to have a higher number of wealthier households and stronger economic power. Hence, the political will for providing basic WASH and social infrastructure in rural areas tends to be relatively lower[34]. Another study that monitored the progress made in WASH in sub-Saharan Africa revealed that rural poor households were 29 times less likely to access improved

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water and 25 times less likely to access improved sanitation facilities when compared to the urban poor[35]. Moreover, wealthier households in these rural areas have better WASH services when compared to other households[36]. In addition, unhealthy sanitation and hygiene practices among Nigerian youths and adolescents have also been associated with inadequate knowledge and negative attitude towards proper hygiene and sanitation[37].

The provision of safe WASH facilities has been greatly influential on people's health status and livelihood; however, the availability of these facilities remains critical in Nigeria especially in the rural areas. A large percentage of rural communities in Nigeria live without access to safe WASH facilities[38]. The situation has thus subjected the communities to the utilization of water from rivers, ponds, and streams for drinking and domestic activities and to the practice of open defaecation which consequently has often led to deaths, illnesses, and spread of waterborne diseases[39].

The few improved water facilities from boreholes and wells with hand pumps available are largely insufficient; women and children mostly travel far distances to access water, which is energy and time consuming, thus affecting children's education and women's household and economic productivity. On the other hand, hygiene facilities such as excreta disposal (toilets) have also been inadequate for usage at community households and public places such as schools, markets, and even hospitals, which left people with no alternative but to defaecate openly and sometimes in and around water sources with no use of soap or any cleaning agents for protection[40].

Moreover, toilet facilities available were poorly maintained and mostly shared among numerous people with no consideration of gender segregation and women integrity. However, government failures have led to the intervention by organizations such as UNICEF and WHO

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for aid through their programs known as WASH. UNICEF's WASH team works in over 100 countries globally to provide water and sanitation facilities[41].

The effects of poor Water, Sanitation, and Hygiene (WASH) affect every aspect of health and development, hinder economic and social development, and constitute a major hurdle to poverty alleviation. Many communicable diseases can be effectively managed by improving WASH practices. Waterborne disease prevalence can be reduced through implementing the three key WASH practices. Safe disposal of faeces and hand washing with soap at critical times can reduce prevalence of waterborne diseases by 30% and 40%, respectively. Likewise, safe treatment and storage of drinking water can reduce the prevalence of waterborne diseases by 30–50% [42].

Globally, 2.3 billion people do not have sanitation (892 million people are practicing open defaecation), 844 million people lack basic drinking water, and 2.5 million people do not have improved sanitation. In developing countries, WASH is one of the most important felt needs in public health in this 21st century. However, about 842,000 people die as a result of inadequate WASH each year, representing 58% of the total diarrheal deaths. In sub-Saharan Africa, WASH remains one of the major public health challenges with very low coverage[43].

Nearly, half of the population (319 million) does not use WASH facilities, 58% in sub-Saharan Africa lack basic drinking water, and only 15% have handwashing facilities with soap and water. In Ethiopia, the 2016 Demographic and Health Survey (DHS) report indicated that only 57% of the households (HHs) in rural areas obtain their drinking water from improved sources and 39% have no toilet facility. The prevalence of diarrhoea episodes in the community was reported to be 12%. Lack of knowledge on WASH is one of the most imperative causes for transmission of infectious diseases[44]. Effectiveness of WASH depends not only on the

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provision of WASH facilities but also, and most importantly, on the compliance of individuals[45].

The knowledge, attitudes, and practices (KAP) related to water, sanitation, and hygiene (WASH) are critical for the successful and sustainable implementation of WASH programs in communities. Inadequate WASH knowledge, negative attitudes, and unhygienic practices contribute significantly to the prevalence of waterborne diseases. These factors can lead to water contamination and the spread of illnesses within communities[46]. Such inadequate WASH knowledge leads to wrong perception of quality of water resulting in large dependence on surface waters for drinking[47], open defaection practices being perceived normal and commonly practiced, minimal household water purification practices to prevent diseases[48] and poor water collection and storage behaviours contaminating water and causing illnesses[48,49].

Poor household and environmental hygiene, coupled with the common misconception that children's stool is harmless, often leads to its neglect in sanitation programs. This oversight heightens the risk of disease transmission within communities[50], all due to limited WASH understanding and poor attitudes and practices towards WASH. Therefore, there is need to provide hygiene education programs and increased awareness towards promoting good WASH practices and ensuring good public health in the communities. In Nigeria, it is expected that there is currently a dearth of data on the status of WASH; thus, it is increasingly becoming difficult to plan any meaningful WASH program to improve health and well-being.

In 2012, an estimated 842,000 deaths occurred due to diarrheal disease from inadequate water, sanitation, and hygiene; this disease burden can be reduced by increasing access to safe water and sanitation and promoting basic hygiene behaviours (WASH). A well-targeted and well-executed intervention to improve water or sanitation can reduce the prevalence of diarrheal

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disease by about a third. The provision of a piped or on-premises water service can further reduce the disease burden.

Availability of clean water and soap enables and encourages people to wash their hands, reducing the likelihood of disease transmission. Safely managed sanitation can control flies and other insects that spread disease, and prevent contact with infectious organisms shed in faeces, such as helminth ova and diarrhoea-genic pathogens. An adequate and continuous supply of safe drinking-water on-premises can interrupt waterborne disease transmission. Together these factors reduce rates of diarrhoea, malnutrition, and dehydration, leading causes of death in low- and middle-income countries.

Open defaecation and the proximity of tethered livestock to human dwellings in rural Nigerian communities significantly contribute to water supply contamination, increasing the risk of diarrheal disease outbreaks. These practices, coupled with limited understanding and poor WASH attitudes, exacerbate public health challenges, which are further compounded by a lack of comprehensive WASH data, hindering effective intervention planning. Ensuring microbiologically safe drinking water requires understanding contamination mechanisms and implementing targeted strategies, such as hygiene education, improved sanitation infrastructure, systematic data collection, and livestock management practices, to prevent contamination and promote sustainable public health improvements in Nigeria.

Safe water is one of the most important felt needs in public health in developing countries in the twenty first century. The year 2005 marked the beginning of the "International Decade for Action: Water for Life" and renewed effort to achieve the Millennium Development Goal (MDG), to reduce by half the proportion of the world's population without sustainable access to safe drinking water and sanitation by 2015. It is estimated by World Health Organization (WHO) and United Nations International Children's Emergency Fund (UNICEF) that 1.1

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billion people lack access to improved water supplies and 2.6 billion people lack adequate sanitation[51].

In resource-limited countries, particularly in Sub-Saharan Africa, water-borne diseases driven by unsafe water, inadequate sanitation, and poor hygiene practices are significant contributors to morbidity and mortality. In peri-urban areas, access to safe drinking water is severely constrained due to rapid urbanization, with influxes of rural populations exacerbating poverty, poor sanitation, and substandard housing conditions. These factors create environments conducive to water contamination, leading to high incidences of diarrheal diseases. The lack of reliable WASH data, as noted in the Nigerian context, further complicates the planning of effective interventions. Addressing these challenges requires targeted strategies, including improved water and sanitation infrastructure, hygiene education to shift behavioural practices, and robust data collection to inform evidence-based WASH programs, all aimed at reducing the burden of water-borne diseases and improving public health in peri-urban settings.

The use of improved sanitation increased from 54 percent in 1990 to 68 percent in 2015, but those gains fell short of meeting the global MDG target. In 2015, 2.4 billion people still did not have access to their own improved sanitation facility, a fact that, due to population growth, reflects no change in the unserved population of 1990. However, these numbers mask the fact that since 1990, 2.1 billion people have gained access to improved sanitation. Regional breakdowns in progress between 1990 and 2015. Globally, the proportion of population practicing open defecation declined from 24 percent in 1990 to 13 percent in 2015[52].

In South Asia, open defecation remains a critical public health issue, with 34% of the population practicing it, compared to 23% in Sub-Saharan Africa, contributing significantly to water-borne diseases such as diarrhoea, which are major causes of morbidity and mortality in resource-limited settings. Globally, 638 million people (9% of the population) share sanitation

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facilities with other households, increasing the risk of pathogen transmission due to inadequate hygiene conditions. Disparities in sanitation access are stark, with only 51% of rural dwellers having access to improved sanitation facilities compared to 82% of urban dwellers, exacerbating contamination risks in rural areas and peri-urban settings where rapid urbanization, poverty, and poor housing conditions further limit access to safe water and sanitation.[53].

These challenges, compounded by insufficient WASH data, as seen in contexts like Nigeria, hinder effective intervention planning. To address these issues, strategies such as expanding access to improved sanitation infrastructure, promoting hygiene education, implementing livestock management practices to reduce water contamination, and enhancing data collection for evidence-based WASH programming are essential to mitigate water-borne diseases and improve public health outcomes in both South Asia and Sub-Saharan Africa.

2.2.3. Status of Water Sanitation and Hygiene (WASH) in Nigeria

Water, sanitation, and hygiene (WASH) are three interdependent pillars of preventive health. In Nigeria, poor sanitation and hygiene practices are highly prevalent; evidence of this is seen from the country's recent status as the world's open defecation capital. UNICEF's Chief of Water, Sanitation, and Hygiene (WASH) in Nigeria, Dr Jane Bevan, has disclosed that approximately 48 million Nigerians lack access to toilet and sanitation facilities, stressing the urgency for the government, agencies and private sector to commit to ending open defaecation and improving sanitation standards across the country[54].

In 2017, the World Bank reported that 90% of rural Nigerians practiced open defaecation, far exceeding rates in South Asia (34%) and Sub-Saharan Africa (23%), while only 51% of rural communities had access to improved water sources, contributing to high incidences of water-borne diseases like diarrhoea[55]. These rural-urban disparities stem from wealth inequalities,

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with urban areas benefiting from greater economic power and political will for WASH infrastructure, leaving rural areas underserved. Addressing this requires equitable investment in rural sanitation, hygiene education, livestock management to prevent contamination, and improved WASH data collection to support evidence-based interventions for better public health[56,57].

In Sub-Saharan Africa, rural poor households face severe WASH disparities, being 29 times less likely to access improved water and 25 times less likely to access improved sanitation compared to urban poor households, exacerbating water-borne diseases like diarrhoea. In rural Nigeria, 90% of people practiced open defecation in 2017, with only 51% accessing improved water, driven by wealth inequalities and limited political will for rural infrastructure. Targeted interventions, including equitable WASH investments, hygiene education, livestock management to prevent contamination, and enhanced data collection, are essential to reduce health disparities and improve public health outcomes[58]. Moreover, wealthier households in these rural areas have better WASH services when compared to other households[59].

In addition, unhealthy sanitation and hygiene practices among Nigerian youths and adolescents have also been associated with inadequate knowledge and negative attitude towards proper hygiene and sanitation[60]. In rural areas, 39% of households lack access to at least basic water supply, while only half have access to improved sanitation and almost a third (29%) practice open defaecation – a fraction that has marginally changed since 1990.

In 2018, Nigeria's Water, Sanitation and Hygiene (WASH) sector was declared to be in a state of emergency by the Government. In 2019, a combination of inadequate infrastructure, a lack of required human capital, poor investment, and a deficient enabling regulatory environment – amongst other challenges – meant that approximately 60 million Nigerians were living without

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access to basic drinking water. 80 million people had no access to improved sanitation facilities, while 167 million could not access basic handwashing facilities[61].

Women and girls are disproportionately affected by inadequate access to water, sanitation, and hygiene (WASH) services. They often shoulder the responsibility of collecting water over long distances—an activity linked to adverse impacts on physical and mental well-being, reduced school attendance, and increased vulnerability to gender-based violence (GBV). Improved access to WASH services can significantly enhance educational outcomes by reducing time spent on water collection, lowering the incidence of waterborne diseases that contribute to absenteeism, and fostering a safer, healthier learning environment.

In response to these challenges, the Government of Nigeria has demonstrated a strengthened commitment to improving WASH access. In 2018, President Muhammadu Buhari declared a State of Emergency in the WASH sector and launched the National Action Plan (NAP)—a 13-year strategic framework aimed at revitalizing Nigeria's water supply, sanitation, and hygiene systems. The NAP seeks to achieve universal access to sustainable and safely managed WASH services by 2030, in alignment with the Sustainable Development Goals (SDGs)[62].

A report released by the World Bank on Monday, August 28, 2017, said Nigeria provided clean water to fewer than 10 per cent of its city dwellers in 2015, down from 29 per cent in 25 years earlier i.e. 1990. One of the troubling paradoxes in life in Nigeria is that social infrastructure such as potable water supply, adequate electricity, availability of health care facilities, good road networks, and so on cannot match the pace of the country's population growth[63].

In recent years, the Federal Government of Nigeria has strengthened its commitment towards improving access to WASH services, spurred on by the need for Nigeria's WASH sector to catch up with its regional counterparts. This led to the Government declaring a State of

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Emergency in 2018 and launching the NAP aimed at ensuring universal access to sustainable and safely managed WASH services by 2030, commensurate with the SDGs[64].

Inadequate water supply and sanitation cost the Nigerian economy approximately 1.3% of its Gross Domestic Product (GDP) annually—equivalent to about NGN 1.9 trillion. These economic losses stem from reduced productivity due to water- and sanitation-related illnesses, time lost in accessing essential services, and avoidable expenditures by both government and households to treat preventable diseases. Additionally, poor WASH conditions contribute to malnutrition and mortality, resulting in diminished human capital. In some cases, limited access to water resources has also been linked to conflicts in the North-Central region of the country[65].

Access to water, sanitation, and hygiene (WASH) is a fundamental human right and essential for positive outcomes in health, nutrition, education, gender equality, livelihoods, and overall socio-economic development. The absence of these basic life-saving services has far-reaching consequences, affecting nearly every dimension of human development and disproportionately limiting the life opportunities of women and girls. Goal 6 of the United Nations Sustainable Development Goals (SDGs) underscores the importance of ensuring inclusive and equitable access to safe and affordable drinking water, sanitation, and hygiene for all[66].

However, in low- and middle-income countries such as Nigeria, millions of people remain without access to clean water and adequate sanitation. According to the Water, Sanitation and Hygiene National Outcome Routine Mapping (WASHNORM), approximately 55 million Nigerians lack access to safe water supply, 110 million are without improved sanitation facilities, and over 47 million still practice open defaecation[67].

In Nigeria, high rates of illness and death among children under five years of age has been linked to poor access to WASH facilities. Over 70,000 children under five years die annually

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as a result of their increase vulnerability to water-borne diseases[68]. Estimates has shown that over 73% of enteric disease and diarrheal disease burden is largely associated with poor access to WASH facilities. The practice of open defecation and use of inadequate communal latrine often results from lack of access to improved sanitation facilities[69].

These practices predispose women and girls to sexual assault and abuse in their immediate environments especially in very remote areas. Beyond the community, the lack of effective waste disposal or sewage systems can degrade the ecosystem and fuel disease outbreaks. It has been documented that approximately 892 million people still practice open defaecation and 61.5% use unimproved toilet facilities such as hanging latrine, bucket, open pit, pit latrine without slabs, pit latrines[70].

2.2.4. Prevailing problems associated with Water, Sanitation and Hygiene

The poor access to water supply is a prevalent issue in over 850 million people worldwide with over 2.5 billion limited by access to sanitation facilities. The global burden of disease and mortality rates could be reduced by about 9.1% and 6.3%, respectively, if rapid success is attained in facilitating access to water, sanitation, and hygiene facilities[71]. A large proportion of these diseases are related to diarrhoea incidences which contribute to the mortality rate of about 1.9 million and new diarrhoea cases estimated at 4 billion annually especially among children under five years old[72].

The consequences of inadequate water, sanitation, and hygiene (WASH) are far-reaching, impacting health, hindering economic and social development, and posing a significant barrier to poverty reduction. Many communicable diseases can be effectively controlled through the adoption of improved WASH practices. Implementing three key interventions—safe disposal of faeces, handwashing with soap at critical times, and safe treatment and storage of drinking water—has been shown to significantly reduce the prevalence of waterborne diseases.

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Specifically, handwashing with soap can reduce disease incidence by up to 40%, safe faeces disposal by 30%, and proper water treatment and storage by 30–50%[73].

Developing countries account for around 19% of those mortality rates. The World Health Statistics review done in 2009 showed that the highest case fatality rates due to diarrheal incidences occurred in India with over 386,000 diarrheal deaths[74]. High mortality rates of about 13.9% are still attributed to diarrheal deaths in Egypt among children less than five years old irrespective of the recent reduction in child mortality rates[75]. The leading cause of infant mortality and health-related expenditures has been attributed to diarrheal incidences among children in Indonesia. Diarrheal diseases are also the third cause responsible for increased morbidity rates in all age groups in Indonesia.

Extensive literature has documented the significant impact of inadequate water facilities, poor handwashing, and hygiene practices on child health outcomes. Long-term effects of infections—such as diarrhoea, helminth infections, and dehydration—commonly linked to poor WASH conditions, include impaired cognitive development and reduced academic performance.

Evidence suggests that repeated diarrheal episodes during early childhood can cause stunt growth by up to 8 cm and lead to a measurable reduction in IQ by the age of 7 or 8. Furthermore, approximately 75% of all school absences are attributed to illness. Data from middle- and high-income countries indicate that such absenteeism is closely associated with poor academic achievement, social development challenges, increased dropout rates, and diminished learning outcomes[76].

Although the evidence base remains largely qualitative in nature, it is increasingly accepted that inadequate access to WASH can expose vulnerable groups—particularly women and

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girls—directly to violence. This may cause psychosocial stress due to the perceived threat of such violence, adding to other causes of psychosocial stress such as the perceived threat of harassment, or the threat of being unable to meet basic needs; WASH plausibly affects maternal and new-born health through multiple direct and indirect mechanisms, and WASH coverage in delivery settings in low and middle-income countries is extremely low. There is a consensus that safe WASH in health facilities—and in other delivery settings—is critical for accelerated progress on maternal and new-born health.

Poor WASH contribute to poor personal hygiene especially among the female gender. As many people would contest that a girl or woman without access to water, soap, and a toilet facilities, whether at home, school, or work, will face great difficulties in managing her menstrual hygiene effectively and with dignity. Furthermore, there is consensus on what is required to enable safe, dignified management of menstrual hygiene: knowledge, materials and facilities; In many countries, it has been reported that poor WASH facilities act as a barrier to student attendance and enrolment.

Poor access to improved water and sanitation facilities remains a significant contributor to the high morbidity and mortality rates among children under five in Nigeria. The consumption of contaminated water and exposure to unsanitary conditions heighten the risk of waterborne diseases, particularly diarrhoea, which is responsible for the deaths of over 70,000 children under five each year. Approximately 73% of the diarrhoeal and enteric disease burden is linked to inadequate water, sanitation, and hygiene (WASH), with the poorest children disproportionately affected. Frequent WASH-related illnesses not only increase vulnerability to malnutrition but also lead to prolonged school absenteeism. Despite the critical importance of safe WASH access, only 26.5% of the population in Nigeria use improved drinking water sources and sanitation facilities, while 23.5% still practice open defecation[77].

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Contaminated water and poor sanitation are linked to transmission of diseases such as cholera, diarrhoea, dysentery, hepatitis A, typhoid and polio. Absent, inadequate, or inappropriately managed water and sanitation services expose individuals to preventable health risks[78]. This is particularly the case in health care facilities where both patients and staff are placed at additional risk of infection and disease when water, sanitation and hygiene services are lacking. Globally, 15% of patients develop an infection during a hospital stay, with the proportion much greater in low-income countries[79].

The inadequate management of urban, industrial, and agricultural wastewater has resulted in the widespread contamination of drinking water sources, putting the health of hundreds of millions of people at serious risk. In addition to anthropogenic pollutants, naturally occurring chemicals—particularly in groundwater—such as arsenic and fluoride, can also pose significant health threats. Furthermore, hazardous substances like lead may be present at elevated levels in drinking water due to leaching from water supply infrastructure and components that come into contact with the water.

Some 829, 000 people are estimated to die each year from diarrhoea because of unsafe drinking-water, sanitation and hand hygiene. Yet, diarrhoea is largely preventable, and the deaths of 297, 000 children aged under 5 years could be avoided each year if these risk factors were addressed. Where water is not readily available, people may decide handwashing is not a priority, thereby adding to the likelihood of diarrhoea and other diseases[80].

Diarrhoea is the most widely known disease linked to contaminated food and water but there are other hazards. Contaminated water and poor sanitation are linked to transmission of diseases such as cholera, diarrhoea, dysentery, hepatitis A, typhoid and polio. Absent, inadequate, or inappropriately managed water and sanitation services expose individuals to preventable health risks[81].

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Diarrhoeal diseases remain a leading cause of death among children under the age of five, particularly in low-income countries where the poorest populations are disproportionately affected. In both low- and middle-income countries, diarrhoea is the second leading cause of morbidity and mortality in this age group and is the primary cause of child mortality in sub-Saharan Africa. In 2012 alone, approximately 1.5 million children under the age of five died from diarrhoeal diseases[82].

Diarrhoeal disease can also affect a child's nutritional status, with the associated health and socio-economic consequences (discussed in the following section). One multiple country study found that 25% of stunting in children under the age of two could be due to five or more diarrhoeal episodes[83]. Long-term exposure to faecal pathogens may also partially explain environmental enteric dysfunction (EED)[84].

While most diarrhoeal diseases associated with poor WASH tend to be endemic, some are epidemic in nature – notably, cholera and typhoid fever. Cholera is an acute diarrhoeal disease that can kill within hours if left untreated, and it is a continual public health problem in many parts of the world. Researchers have estimated that every year there are roughly 1.4 million to 4.3 million cases, and 28,000 to 142,000 deaths per year worldwide. Most reported cholera cases and deaths occur in Africa[85]. Furthermore, the continent suffers from explosive outbreaks that result in high levels of both morbidity and mortality[86,87,88].

Episode of cholera occurred in Nigeria between January and June and stem from lack of water supply, open defaecation and poor hygiene practices. This has affected several states in the country. The Nigeria Centre for Disease Control and prevention reported that at least 3000 cases, with 65 confirmed and 30 deaths across the 96 local government areas in the 33 states [89]. In 2017, over 220 million people required preventative treatment for schistosomiasis – an

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acute and chronic disease caused by parasitic worms contracted through exposure to infested water[90].

In many regions of the world, water-related insect vectors play a significant role in the transmission of diseases such as dengue fever. Notably, some of these vectors breed in clean rather than polluted water, making household drinking water containers common breeding sites. A simple yet effective intervention—covering water storage containers—can significantly reduce vector breeding and may also help prevent faecal contamination of water at the household level, thereby improving overall water safety and public health[91].

2.2.5. WASH interventions and situation globally

Water is the most important resource for sustaining ecosystems, which provide life-supporting services for people, animals, and plants. Because contaminated water is a major cause of illness and death, water quality is a determining factor in human poverty, education, and economic opportunities. Unfortunately, declining water quality threatens the health of ecosystems and humans worldwide. Various factors influence this deterioration, including population growth, rapid urbanization, land use, industrial discharge of chemicals, and factors resulting from climate change.

Today, hundreds of millions of people do not have access to improved sources of drinking water, leaving them at risk for water-, sanitation-, and hygiene- (WASH) related diseases. Worldwide in 2015, 500,000 children died from diarrheal illnesses, most of which are caused by unsafe water, poor sanitation, and inadequate hygiene[92]. Devastating epidemics of cholera, such as the epidemics that have swept through Africa causing more than 71,176 cases of illness and 937 deaths in 2015 alone, are only the “tip of the iceberg,” as most waterborne diseases, illnesses, and deaths are never reported[93].

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Responding to these challenges requires a spectrum of interventions. The prevention or minimization of water pollution is critical to improving drinking water quality. Interventions to improve drinking water quality range from disinfecting water at the household level [point-of-use (POU) treatment] to water management at the community level Water Safety Plans (WSPs). In some situations, more than one type of intervention is needed. For example, both POU treatment and WSPs may be needed for piped water systems with intermittent service. When this happens, the different interventions are complementary, not competitive.

Inadequate water, sanitation, and hygiene (WASH) conditions exist in a range of settings, from temporary refugee camps to permanent homes in large cities. CDC's global WASH program provides expertise and interventions aimed at saving lives and reducing illness by improving global access to healthy and safe water, adequate sanitation, and improved hygiene. The WASH program works on long-term prevention and control measures for improving health, reducing poverty, and improving socio-economic development as well as responding to global emergencies and outbreaks of life-threatening illnesses. These improvements reduce the lethal impact of WASH-related diseases ranging from cholera to typhoid fever to hepatitis.

The latest data from WHO and UNICEF on access to clean water, adequate sanitation, and hygiene reveals that 2 billion people lack access to safely managed drinking water at home. Of those, 1.2 billion people have basic drinking water service. Between 2015 and 2020, 107 million people gained access to safely managed drinking water at home, and 115 million people gained access to safe toilets at home. 8 out 10 people who continue to lack basic drinking water services live in rural areas[94].

Report on Sanitation shows that 3.6 billion people, nearly half the world's population, do not have access to safely managed sanitation in their home. Of those, 1.9 billion people live with basic sanitation services, and 494 million people practice open defecation[95]. Hygiene - 2.3

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billion people lack basic hygiene services, including soap and water at home. This includes 670 million people with no hand washing facilities at all. In 28 countries, at least 1 in 4 people have no hand washing facility at home. In rural settings, only 1 in 3 people have access to basic hygiene services (such as soap and water at home)[96].

The latest information from WHO and UNICEF on how lack of access to adequate sanitation and clean water results in gender inequality. Lack of adequate sanitation facilities for girls reaching puberty makes them more likely to miss school than boys. In 2018 and 2019, between 15% and 25% of girls in West Africa missed school due to menstruation[97].

Women and girls are more likely to be responsible for collecting water for their family. In 2017, women and girls were responsible for water collection in 8 out of 10 households without onsite water supply. These responsibilities make it difficult for girls to attend school during school hours[98].

Although global deaths from diarrhoea have declined significantly over the past 20 years, poor water supply, sanitation, and hygiene are still responsible for a significant disease burden. An estimated 842,000 global deaths in 2012 were due to diarrhoea caused by poor WASH. Other less well-quantified but important long-term health consequences of poor WASH, such as helminths and enteric dysfunction, remain[99]. Those diseases affect children's nutritional status, thereby inhibiting growth and mental development. Overall, the health impacts of poor WASH lead to economic consequences of several percent of GDP and continue to significantly affect quality of life and the environment. Furthermore, water stress is a growing phenomenon that will affect at least 2.8 billion people in 48 countries by 2025 (UN, 2021). Climatic factors are harder to control, but water scarcity can be mitigated by changing water use patterns and reducing pollution of surface waters[100].

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The increase in temperature, even if restricted to 1.5°C, is expected to result in significant changes in precipitation patterns. These changes in precipitation will impact local hydrology and consequently groundwater. More frequent extreme weather events with land-use change, are likely to lead to increase in frequency of flood events and with growth of settlements, to increase exposure of people to these events. Worldwide, in 2019, there were 396 disasters that killed 11,755 people and affected 95 million others. Floods and storms accounted for 68% of the number of affected people worldwide[101].

There is more uncertainty when considering the impacts on water resource availability. Global projections often suggest greater scarcity, because of changes in precipitation, increasing temperature, increasing demand, and reduced quality of resources due to pollution. These assessments, however, do not account for the available groundwater storage and the growing evidence that groundwater recharge may increase in future climate scenarios. Population growth, economic growth, and urbanization will all place greater pressure on water resources. It was concluded that, for Africa, at least, these other drivers will be more significant than climate change.

As the magnitude and complexity of the threats to water resources posed by climate change become increasingly well-understood and documented, there is increasing emphasis on more adaptive management. However, relatively little attention has been placed on how these threats will impact drinking water and sanitation services and their management, despite their importance to human health.

2.2.6. **WASH related burden**

The burden of disease from inadequate drinking water, sanitation and hygiene (WASH) behaviours has been estimated at various times in previous decades[102,103,104,105,106]; inadequate drinking water that includes unsafe water and water with insufficient access. While some of

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these assessments focused on diarrhoeal disease[107,108] others also assessed the WASH-attributable disease burden of other health outcomes such as soil-transmitted helminth infections, malaria, trachoma, schistosomiasis, lymphatic filariasis, lower respiratory infections, and protein energy malnutrition. These assessments present very different burden of disease estimates because of differences in methods used, scope of the estimates, and ongoing improvements in WASH in many regions[109,110,111,112].

Despite improvements, inadequate WASH remains a major global risk factor: In 2015, 844 million people lacked a basic drinking water service, i.e., a drinking water source protected from recontamination within 30 min' round-trip to collect water, and nearly 30% of the global population did not use a safely managed drinking water service—a drinking water source located on premises, available when needed and free from contamination[113].

In terms of access to sanitation, 2.3 billion people were lacking a basic sanitation service—an improved sanitation facility that is not shared with other households—and more than 60% were not using a safely managed sanitation service—a sanitation facility that safely disposes excreta in-situ or that ensures that excreta are safely treated off-site[114]. Estimates suggest that one in four persons worldwide does not have access to a hand washing facility with soap and water on premises and that only 26% of potential faecal contacts are followed by handwashing with soap. Furthermore, only 45% of the population live in communities in which coverage with basic sanitation services is above 75%[115].

The World Health Organization has released the publication titled, 'Safer Water, Better Health,' which estimates the burden of 12 major diseases and adverse health impacts due to inadequate Water Sanitation and Hygiene (WASH). The report also provides evidence for links between WASH and another 14 conditions, such as antimicrobial resistance (AMR), that are not yet quantified[116].

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The report serves as an update and builds on the WHO's previous analysis of environmental disease burdens and interventions. The agency's findings showed that, globally, "1.9 million deaths and 123 million disability-adjusted life years (DALYs) could have been prevented with adequate WASH. The WASH-attributable disease burden amounted to 3.3% of global deaths and 4.6% of global DALYs." Sub-Saharan Africa remains the region with the largest disease burden from inadequate WASH[117].

The publication highlights the relationship between improper disposal of excreta, lack of hand washing facilities, and pathogens in drinking water on the prevalence of diarrhoeal diseases and respiratory infections. It describes how standing and wastewater are breeding grounds for mosquitoes, which serve as additional disease vectors.

For the following diseases – diarrhoeal diseases; respiratory infections; soil-transmitted helminthiasis; malaria; trachoma; schistosomiasis; lymphatic filariasis; onchocerciasis; dengue; Japanese encephalitis; protein-energy malnutrition; drowning; arsenicosis ; fluorosis ; legionellosis; leptospirosis; hepatitis A and hepatitis E; methaemoglobinaemia; cyanobacterial toxins; lead poisoning; scabies; spinal injury; poliomyelitis; and adverse neonatal conditions and maternal outcomes – the report gives a detailed account of links to inadequate WASH. Where possible, it also describes interventions and gives economic evaluations.

The report draws particular attention to the impacts of inadequate WASH on young children, noting that, "among children under 5 years, WASH-attributable deaths represent 13% of deaths and 12% of disability adjusted life years (DALYs)," an outcome that could be prevented with existing prevention strategies and interventions[118]. These interventions would include implementation of: water safety planning; guidelines for drinking-water quality; guidelines for safe recreational water environments; guidelines for drinking-water quality; guidelines for safe

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use of wastewater, excreta and greywater; and sanitation safety planning to prevent exposure to excreta along the sanitation chain.

2.2.7. Ways of improving Water Hygiene and Sanitation in the Rural areas

Access to clean water, adequate sanitation, and good hygiene practices is fundamental to human health and community development. In many rural areas, however, poor infrastructure, limited resources, and low awareness contribute to waterborne diseases and poor living conditions. Improving water, hygiene, and sanitation (WASH) in rural communities therefore requires an integrated approach that combines infrastructure development, health education, community participation, and policy support[1].

One of the most effective ways to improve WASH in rural areas is through the provision of safe and reliable water sources**.** Constructing and maintaining boreholes, protected wells, and spring systems ensures access to clean water. Communities can also benefit from simple water treatment methods such as chlorination, filtration, and solar disinfection. Regular testing of water quality is essential to ensure safety, while measures like fencing water sources and managing waste disposal around them help prevent contamination. In addition, rainwater harvesting systems can be introduced to supplement water supply during dry seasons[149].

Improving sanitation infrastructure is another crucial step. Encouraging households to build and use affordable, hygienic latrines reduces open defecation and contamination of water sources. Community-led total sanitation (CLTS) programs have been successful in motivating collective action against open defecation. Public facilities, such as toilets in schools and markets, should also be constructed and properly maintained. Safe disposal of human waste, as well as effective drainage and waste management systems, are vital for maintaining a clean and healthy environment[145].

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Equally important is the promotion of hygiene education and behaviour change**.** Rural populations need continuous awareness campaigns emphasizing the importance of handwashing with soap at critical times—after using the toilet, before eating, and before preparing food. Training local health educators or WASH champions can help sustain these messages at the community level. Schools can serve as effective platforms for hygiene promotion, while programs on menstrual hygiene management can empower girls and women to maintain dignity and health[148].

The involvement of community members is essential for the sustainability of WASH interventions. Establishing local WASH committees enables communities to manage, monitor, and maintain their own facilities. Capacity building for local artisans and volunteers ensures that repairs and maintenance can be done promptly without reliance on external support. When people participate in decision-making and contribute resources, they develop a sense of ownership that enhances the long-term success of projects[124].

Furthermore, strong policy and institutional support is needed to coordinate and sustain WASH improvements. Local governments should integrate WASH initiatives into their development plans, enforce sanitation laws, and support community programs through funding and partnerships with non-governmental organizations. Regular monitoring and evaluation of WASH programs help to identify gaps and ensure accountability[146].

Lastly, improving WASH in rural areas should also involve environmental sanitation and innovation**.** Regular community clean-up exercises, proper waste segregation, and the adoption of ecological sanitation can minimize environmental pollution. Low-cost technologies such as tippy taps for handwashing and biosand filters for household water treatment are practical and sustainable solutions that rural communities can adopt[147].

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In conclusion, improving water, hygiene, and sanitation in rural areas requires a holistic and participatory approach. By combining infrastructure development, education, community involvement, policy support, and technological innovation, rural communities can achieve better health outcomes, enhance productivity, and enjoy a higher quality of life.

2.2.8 Empirical Studies on Water, Sanitation and Hygiene

The Millennium Development Goal (MDG) related to water and sanitation serves as a critical framework for monitoring global, regional, and national progress toward expanding access to safe drinking water and adequate sanitation facilities. Access to potable water and effective sanitation services is essential for promoting public health, fostering socio-cultural development, and achieving economic stability. However, in recent years, the prevalence of water, sanitation, and hygiene (WASH) challenges has become increasingly evident across numerous West African countries, with Nigeria facing particularly acute issues. According to global estimates, approximately 6.6% of the global burden of disease is attributable to inadequate water, sanitation, and hygiene conditions[119].

The burden of inadequate water, sanitation, and hygiene (WASH) conditions is disproportionately concentrated in low-income settings, significantly impacting vulnerable populations such as the poor and marginalized groups in developing countries. This exacerbates the cycle of poverty, perpetuating socio-economic disparities. The persistence of these challenges can be attributed to several factors, including the lack of responsiveness from government institutions at various levels toward low-income communities, insufficient financial planning, limited sustainability of modern water and sanitation infrastructure, inadequate hygiene practices, and the lack of proper sanitation facilities in public spaces[120].

The deficiency in providing adequate water and sanitation infrastructure has profound implications for various dimensions of human development, including life expectancy at birth, access to quality education, and sufficient economic returns. In low-income settings, a

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significant portion of the population faces heightened vulnerability to social exclusion, resulting in limited participation in the economic, social, political, and cultural activities within urban environments. Furthermore, access to safe water and sanitation, recognized as a fundamental human right, is critical for fostering economic development, enhancing educational outcomes, and improving children's nutritional standards. Nevertheless, the most vulnerable populations are frequently subjected to deplorable living conditions and severe environmental constraints, exacerbating their marginalization and hindering overall development[121].

Despite the implementation of water and sanitation programs across numerous communities in Nigeria, the promotion of water, sanitation, and hygiene (WASH) initiatives continues to receive inadequate attention and funding. This observation is supported by evidence indicating that, despite Nigeria's commitments to international agreements and the development of local policy initiatives at various governmental levels, the coverage of water supply and sanitation services remains insufficient, with no substantial progress achieved[122].

The existing literature on WASH often lacks rigorous analytical frameworks for examining these challenges within the context of cultural communities. Most studies fail to incorporate indigenous and contextually relevant concepts that could enhance understanding and facilitate effective solutions. This gap limits the ability to grasp the complexities of WASH issues, rendering many analyses less effective in addressing real-world conditions. Scholars have argued that relying solely on scientific logic to address water and sanitation challenges is insufficient. Instead, integrating cultural perspectives—rooted in local beliefs, values, and practices—would provide a more meaningful approach to designing intervention programs aimed at reducing health risks in cultural communities. Many local settlements are characterized by poor health outcomes and heightened vulnerability to health risks, exacerbated

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by inadequate toilet facilities, substandard environmental sanitation, and insufficient waste recycling and disposal systems[123].

The persistent challenges of inadequate water supply, poor sanitation, and insufficient hygiene practices continue to pose significant health risks in developing countries. Consequently, the active involvement of health professionals is essential to accelerate efforts aimed at improving public health outcomes. It was observed that a substantial portion of the health benefits derived from improved water supply is mediated through enhanced water availability and the adoption of effective hygiene practices[124].

Access to safe water, sanitation, and hygiene (WASH) facilities is a fundamental human necessity critical for survival and well-being. The absence of these essential services jeopardizes the health of millions, particularly children. Globally, approximately 2.3 billion people lack access to basic drinking water, and 844 million lack access to adequate sanitation facilities, resulting in an estimated 842,000 deaths annually—a significant public health concern. WASH services serve as both a potential source of disease transmission and a critical means of disease prevention. Research indicates that approximately 9% of the global burden of disease could be mitigated through improvements in WASH infrastructure and practices. Children, especially those under five years of age in developing countries, are among the most vulnerable populations, with high mortality rates from diarrheal diseases primarily attributable to inadequate WASH facilities[125].

The provision of safe WASH facilities significantly impacts public health and livelihoods. However, access to these facilities remains severely limited in Nigeria, particularly in rural areas, where a substantial proportion of communities lack safe WASH infrastructure. As a result, these populations are compelled to rely on water sources such as rivers, ponds, and streams for drinking and domestic purposes, alongside widespread practices of open

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defaecation. These conditions contribute to high rates of mortality, morbidity, and the proliferation of waterborne diseases within affected communities[126,127].

The limited availability of improved water facilities, such as boreholes and wells equipped with hand pumps, remains grossly inadequate in many Nigerian rural communities. Consequently, women and children are often required to travel long distances to access water, a process that is both time-consuming and physically demanding. This burden significantly disrupts children's education and undermines women's household management and economic productivity[128].

Inadequate hygiene infrastructure, particularly excreta disposal systems such as toilets, remains a significant challenge in Nigerian communities, affecting households and public spaces including schools, markets, and hospitals. The scarcity of functional sanitation facilities often forces individuals to resort to open defaecation, frequently in or near water sources, without the use of soap or other cleansing agents for hygiene protection. Where toilet facilities exist, they are often poorly maintained, overcrowded, and lack gender-segregated provisions, compromising women's dignity and privacy. Persistent governmental shortcomings in addressing these issues have necessitated interventions by international organizations such as UNICEF and WHO through their WASH programs. UNICEF's WASH initiatives, active in over 100 countries, focus on providing essential water and sanitation infrastructure to underserved communities[129,130].

Knowledge, attitudes, and practices (KAP) related to WASH are critical determinants of the sustainable and effective implementation of WASH programs within communities. Inadequate knowledge, negative attitudes, and poor practices concerning WASH significantly contribute to the prevalence of waterborne diseases. Insufficient understanding of WASH principles often

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leads to unhygienic behaviours and attitudes that result in water contamination and the spread of illnesses, exacerbating public health challenges in affected communities[131].

Such inadequate WASH knowledge leads to wrong perception of quality of water resulting in large dependence on surface waters for drinking, open defaection practices being perceived normal and commonly practiced, minimal household water purification practices to prevent diseases, and poor water collection and storage behaviours contaminating water and causing illnesses[133,132].

Household and environmental hygiene standards in many Nigerian communities are often inadequate, with children's faecal matter frequently disregarded in sanitation programs due to perceptions of its harmlessness, thereby heightening the risk of disease transmission. This issue is largely driven by limited knowledge, poor attitudes, and inadequate practices related to water, sanitation, and hygiene (WASH). Consequently, there is an urgent need for targeted hygiene education programs and enhanced awareness campaigns to promote effective WASH practices and improve public health outcomes in these communities. However, the scarcity of comprehensive data on the current state of WASH in Nigeria poses a significant challenge, hindering the development and implementation of impactful WASH programs aimed at enhancing health and well-being[133].

Poor sanitation has long been a pervasive issue across Africa, yet it has not received adequate prioritization in many African nations. The critical role of robust sanitation policies and practices in supporting socio-economic development and environmental sustainability remains insufficiently acknowledged. Nigeria has been identified as the least advanced country in Africa regarding sanitation access, primarily due to the widespread lack of water for drinking and other domestic purposes in households. Access to clean and safe water is thus fundamental to achieving effective sanitation and hygiene standards. While Nigeria has made notable strides

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in formulating policies and strategies to enhance water supply and sanitation service delivery, significant challenges persist in their implementation. As a result, in 2013, approximately 70 million of Nigeria's 171 million people lacked access to safe drinking water, and over 110 million lacked access to improved sanitation facilities[134].

Poor hygiene and sanitation have serious implications on human's health and socio-economic wellbeing with children paying the most price in lost lives, missed schooling, in diseases, malnutrition and poverty. The aforementioned is occasioned by the transfer of bacteria, viruses and parasites found in human excreta which otherwise contaminate water resources, soil and food. Poor water supply, sanitation and personal and domestic hygiene ranked among the highest risk factors, being responsible for 5.3% of deaths and 6.8% of disease burden[135].

The predisposing factors to disease outbreak especially in unhygienic areas include overcrowding, lack of sanitary excreta disposal facilities, high water-tables, lack of safe drinking water, poor food hygiene in markets (vendors and purchases), and inadequate solid waste disposal. These factors are more prominent and pronounced in both slum areas of the urban centres and most rural communities and hence, the dwellers suffer a greater incidence of malaria, diarrhoea outbreaks, and death. However, Nigeria DHS posited that across rural and urban areas, the WASH deprivation is about 1.5 times more in rural areas than urban areas. Unfortunately, Nigeria is ranked as one of the countries with more rural populace than urban[136].

The disparity in access to water and sanitation services is more pronounced in rural regions of Nigeria compared to urban areas, indicating a higher prevalence of water and sanitation poverty in these settings. Addressing the challenges of water access, sanitation, and hygiene in Nigeria necessitates intensified and coordinated efforts from diverse stakeholders beyond current initiatives. Furthermore, achieving sustainable water, sanitation, and hygiene (WASH) interventions requires a shift from supply-driven models to community-led approaches, which

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have proven effective in fostering behavioural change in numerous projects targeting improved WASH practices[137].

Thus, community-led approach therefore suggests that communities are allowed to steer their Water, Sanitation and Hygiene (WASH) development initiatives while the necessary support or assistance are provided by the government or other development agencies. Achieving this goal therefore requires an understanding of local efforts and challenges faced in solving their WASH related problems.

2.3. Theoretical Framework of the Study

Another model that was employed during this research work is PRECEDE Model. The overriding principle of this model is that behaviour change is voluntary in nature. This framework seeks to empower individuals with knowledge, understanding, skills, motivation and community involvement to improve their quality of life. It offers a framework for identifying intervention strategies for addressing behavioural antecedents and thus facilitating health behaviour change.

2.3.1. The Precede Model

Precede model was used for this work. It was developed by Lawrence Green and his colleagues in the year 1980 and stands for Predisposing, Reinforcing and Enabling causes of behaviour, which can also be used in carrying out health education intervention program. The component of the model affirms that an educational diagnosis is needed to design a health promotion intervention, just as a medical diagnosis is needed to design a treatment plan. It is stated in the model that, the factors that influence human behaviour can be categorised into three; Predisposing, Enabling and Reinforcing factors.

(i) **Predisposing factors** – these factors refer to those factors that can influence people's motivation to the choice of household use of water from either well or the stream and the use of sanitary excreta disposal.

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(ii) **Enabling factors** – these are the skills and resources that will make it possible for the desired change to take place such as personal skill, routine training on the importance of wholesome water, water treatment and the availability of good quality water for safety of people; provision of good excreta disposal.

(iii) **Reinforcing factors** – this refers to the influence that the significant others have on people's behaviour. These significant others are friends, family members, peer groups, neighbours, community, or local authorities that may promote or hinder the choice of people in the use of water from well or stream.

There are five types of diagnosis within the context of the PRECEDE which can be used to yield valuable information for health education programme planning. These are social, epidemiological, behaviour, educational and administrative diagnosis (Green and Kreuter, 1999).

The social diagnosis applies to the tool of social needs assessment aimed at determining people's perception of their own needs or quality of life and other aspirations for the common good of the community. The epidemiological diagnosis refers to the pinpointing of the important health problems of the target community. It is usually conducted to establish two main things; important health problems or concerns and behaviours and epidemiological factors which contribute to the problems.

The behavioural diagnosis deals with the systematic analysis of the behaviour linked to the goals or problems that were identified, in the epidemiological and social diagnosis. The administrative diagnosis refers to the analysis of the policies, resources and circumstances prevailing in the organizational situation that can facilitate or hinder the development of a health programme.

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The aspects of the PRECEDE model important to this study are the educational, behavioural and epidemiological diagnosis. As a diagnostic tool, the framework explores the reasons behind why an individual would choose to adopt a particular practice and by that same token explain why he/she may not adopt the practice. The major area of focus of this study is on the knowledge, attitude and practices of the study group as it relates to water, sanitation and hygiene. The application of the PRECEDE model to facilitate the understanding of the factors and their interrelationship is presented in Fig. 2.1.

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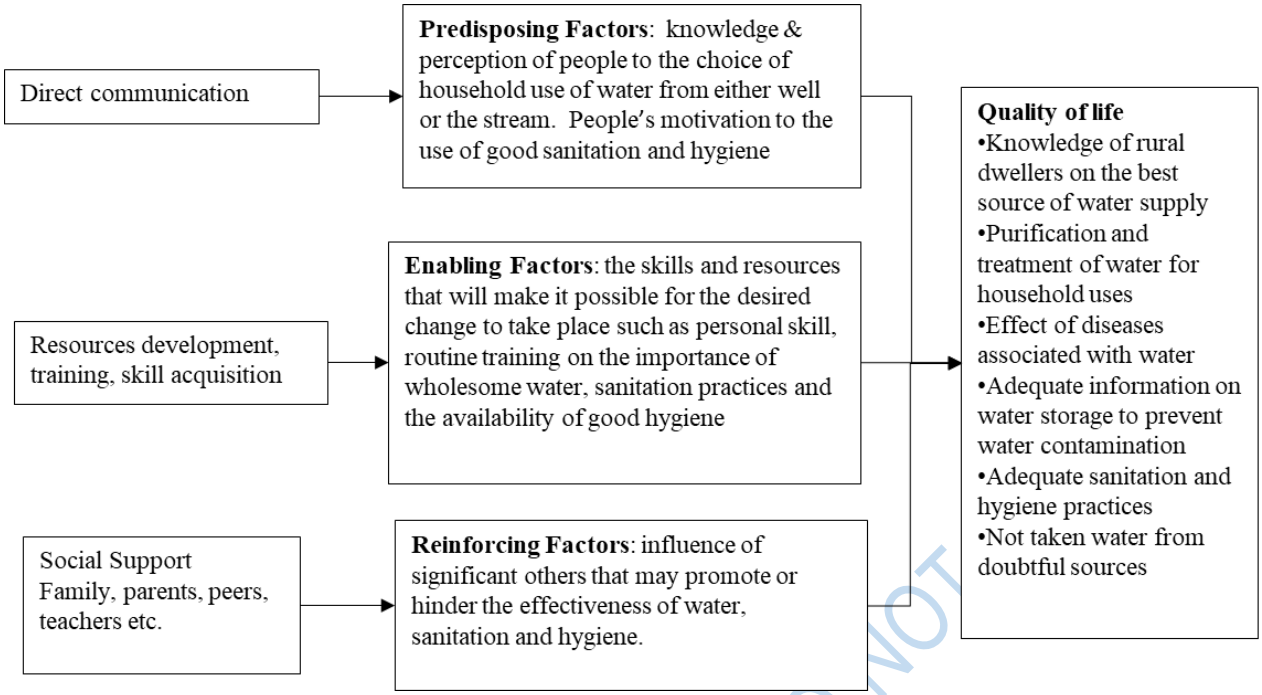


Figure 2.1: PRECEDE Model applied to effectiveness of water, sanitation and hygiene (WASH).

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2.3.2. The Health Belief Model

The Health Belief Model (HBM) was also employed in this work. It is a classic psychological model developed in the 1950s by social psychologists at the U.S. Public Health Service (notably Hochbaum, Rosenstock, and Kegels). It was created to explain and predict health-related behaviours, especially regarding the uptake of preventive health services (like screening, vaccination, sanitation, or hygiene practices).

The Health Belief Model explains that people's beliefs about health problems, perceived benefits of action, and barriers to action can predict health-related behaviours. Individuals are more likely to take a health-related action if they believe they are at risk, believe the condition has serious consequences, believe the action will reduce the risk, and believe the benefits outweigh the barriers.

2.3.2.1. Example of Application:

(i) **Educational interventions** increase perceived susceptibility and severity (awareness of disease risks).

(ii) Demonstrations or training increase self-efficacy.

(iii) **Community campaigns** serve as cues to action.

(iv) Subsidies or infrastructure support help reduce perceived barriers.

2.3.2.2. Advantages of Health Belief Model

(i) Useful for designing health promotion and behaviour change interventions.

(ii) Focuses on individual motivation and perceptions.

(iii) Has been successfully used in areas like immunization, sanitation adoption, HIV prevention, and hygiene promotion.

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2.3.2.3. Components of the Health Belief Model

(i) **Perceived Susceptibility** - People will not change their health behaviours unless they believe that they are at risk. they belief about the chances of getting a disease or health problem. For example: A rural dweller believes they could get diarrhoea from drinking unsafe water. Research suggests that perceived susceptibility to illness is an important predictor of preventive health behaviours

(ii) **Perceived Severity** - The probability that a person will change their health behaviours to avoid a consequence depends on how serious they believe the consequences will be. They belief about how serious a condition and its consequences are. For example: the rural dwellers believe diarrhoea can lead to dehydration or even death in children. The severity of an illness can have a major impact on health outcomes.

(iii) **Perceived Benefits** - It is difficult to convince people to change a behaviour if there is nothing in it for them. People do not want to give up something they enjoy if they do not also get something in return. This is the belief of someone in the efficacy of the advised action to reduce the risk or seriousness of impact. For example: They believe using a clean latrine and handwashing with soap prevents disease.

(iv) **Perceived Barriers** - One of the major reasons people do not change their health behaviours is that they think doing so will be hard or difficult. Changing health behaviours can require effort, money, and time. One's belief about the tangible and psychological costs or obstacles of taking the advised action. Commonly perceived barriers to action include: amount of effort needed, danger, discomfort, expenses, inconvenience, social consequences. Perceived barriers to healthy behaviours have been shown to be the single most powerful predictor of whether people are willing to engage in healthy behaviours. For example: they may think fetching clean water is time-consuming or costly.

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(v) **Cues to Action** - Cues to action are external events that prompt a desire to make a health change. A cue to action is something that helps move someone from wanting to make a health change to actually making the change. Something that trigger people to positive actions for example: Health education, community campaigns, or witnessing a neighbour fall ill.

(vi) **Self-Efficacy** - This is confidence in one's ability to take the action successfully. Self-efficacy looks at a person's belief in their ability to make a health-related change. It may seem trivial, but faith in your ability to do something has an enormous impact on your actual ability to do it. Finding ways to improve individual self-efficacy can have a positive impact on health-related behaviours. For example: Confidence in building or maintaining a household latrine properly.

2.3.2.4. How the Health Belief Model Applies to WASH (Water, Sanitation, and Hygiene)?

The model helps explain why some individuals or households adopt WASH practices (like handwashing, latrine use, or water treatment) while others do not despite knowing their benefits.

The Health Belief Model (HBM) can be applied to Water, Sanitation, and Hygiene (WASH) intervention training by designing the training to address individuals' perceived susceptibility and severity of WASH-related diseases, perceived benefits of good hygiene, perceived barriers to adopting new practices, and cues to action and self-efficacy. Training sessions can focus on increasing awareness of the risks associated with poor WASH, highlighting how improvements lead to better health outcomes, and building confidence in the ability to perform new behaviours.

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2.3.2.5. Application of Health Belief Model components to WASH Training

(i) Perceived Susceptibility**:** Make the connection between poor WASH practices and the specific health risks, such as diarrheal diseases, that are particularly concerning for community members. Training can emphasize the likelihood of getting sick from contaminated water or improper sanitation.

(ii) Perceived Severity: Educate on the serious consequences of WASH-related illnesses, including impacts on child mortality, quality of life, and economic costs. Provide concrete examples and data to show the gravity of the problem.

(iii) Perceived Benefits: Clearly explain how specific actions, like washing hands at critical times, treating water, and using latrines, will lead to positive health outcomes. Show how these practices directly prevent diseases and improve overall well-being.

(iv) Perceived Barriers: Address and reduce any perceived obstacles to practicing good hygiene, such as the cost of supplies, lack of clean water access, or cultural norms. Training can help identify solutions, like demonstrating how to build a simple handwashing station or suggesting cost-effective water treatment methods.

(v) Cues to Action: Integrate prompts and reminders into the training. This can include using health messages from trusted sources like community health workers, friends, or media. The goal is to trigger the immediate decision to act on good hygiene practices.

(vi) Self-Efficacy: Build participants' confidence in their ability to perform the new behaviours successfully and consistently. Training should include hands-on demonstrations and practice sessions to increase their belief in their own capability to adopt and maintain WASH practices.

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2.3.3. Participatory Hygiene and Sanitation Transformation MODEL

Participatory Hygiene and Sanitation (PHAST) model, is a community–based approach used to promote hygiene behaviour change and improve sanitation practices. It uses participatory learning so community members analyse their own sanitation and hygiene problems, identify disease transmission routes, and plan solutions collectively. It is a participatory behaviour-change approach designed to improve hygiene and sanitation practices through community involvement, problem identification, decision-making, and action.

The Participatory Hygiene and Sanitation Transformation (PHAST) approach, developed by WHO, WSSCC and UNDP, enables community members to analyze their hygiene problems, identify disease-transmission routes, and plan collective actions to improve sanitation[143]. Rather than giving instructions, the facilitator guides the community through activities that make them *discover* the health risks associated with poor sanitation and agree on solutions they can own and maintain. It aims to:

(i) Reduce diarrhoeal and waterborne diseases by improving hygiene and sanitation.

(ii) Build community ownership and sustainability of WASH interventions.

(iii) Encourage households to adopt latrine use, handwashing, and safe water handling.

2.3.3.1. Application of Participatory Hygiene and Sanitation Transformation (PHAST) Model to the Effectiveness of Educational Intervention on WASH among Rural Dwellers

In the context of this study, effectiveness of educational intervention on WASH among rural dwellers in Ibadan area of Oyo State, the PHAST model supports the intervention process as follows:

(i) Problem Identification (Community Mapping and Discussion)

Before the educational sessions, rural dwellers participate in activities such as mapping

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their water sources, toilets, and waste disposal points. This helps them visualize their current WASH situation and understand how poor practices contribute to diseases.

(ii) Problem Analysis (F-diagram and Cause–Effect Analysis)

Through participatory tools like the **F–diagram** (faecal–oral transmission route), participants discover how diseases such as diarrhea, cholera, and typhoid spread in their own environment. This stage motivates them by creating *a* sense of urgency and risk perception.

(iii) Planning Improvements (Behaviour and Practice Change Decisions)

Instead of being told what to do, the community **lists possible actions** (handwashing with soap at critical times, safe water storage, consistent toilet use, etc.). These actions are prioritized based on feasibility and local resources.

(iv) Selecting Best Options (Local Ownership)

Community members collectively choose which WASH changes they can adopt immediately and identify those that need support from external partners (e.g., access to soap or building simple latrines).

(v) Implementation (Household or Group Level Actions)

After deciding on preferred actions, the community sets roles, responsibilities, and timelines. This creates a sense of ownership and accountability, which increases the likelihood of sustained behaviour change.

(vi) Monitoring and Evaluation (Community-Led)

Progress is reviewed by looking at observable behaviour change—presence of handwashing stations, toilet use, proper water storage, and cleaner surroundings.

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Table 2.1 - How PHAST Strengthens Educational Intervention

Component of PHAST	Contribution to WASH Educational Intervention
Participatory learning	Makes learning practical and context-specific
Community decision-making	Increases ownership and sustainability of WASH practices
Visual and interactive tools	Breaks the literacy barrier common in rural settings
Local solution planning	Reduces resistance to change because solutions come from the community
Monitoring by community	Sustains practice beyond the study/intervention period

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2.3.3.2. **Why PHAST is Suitable for Rural Dwellers in Ibadan**

(i) Rural communities respond better to participatory approaches than lecture-based teaching.

(ii) Many community members may have low literacy; visual tools used in PHAST address this challenge.

(iii) It helps reduce cultural barriers, such as resistance to stopping open defecation.

(iv) It encourages collective action — important in Yoruba community social structures.

2.3.3.3 Conceptual Pathway:

PHAST-based Educational Intervention

↓

Community Participation + Problem Awareness

↓

Improved Knowledge + Change in Attitude

↓

Adoption of WASH Practices

Thus, the PHAST model operationalizes the educational intervention in a participatory manner that increases the likelihood of sustainable behaviour change.

2.3.3.3. Thesis-Friendly Application Paragraph

The PHAST model supports this study by guiding the educational intervention phase. Using PHAST tools such as community mapping, problem analysis, transmission-route diagrams, and action planning, rural dwellers are actively involved in identifying their own WASH problems and agreeing on feasible solutions. This participatory learning increases ownership, improves knowledge, and encourages sustained WASH behaviour change. Therefore, PHAST enhances

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the effectiveness of the educational intervention by moving rural dwellers from passive recipients of information to active decision-makers in improving hygiene and sanitation.

2.4. Summary of the Three Models used in this Research work

This study utilized three complementary models; the Health Belief Model (HBM), the Participatory Hygiene and Sanitation Transformation (PHAST) Model**,** and the Precede Model**,** to guide the planning, implementation, and evaluation of the educational intervention on WASH among rural dwellers.

2.4.1. Health Belief Model (HBM)

The HBM provided the behavioural explanation for why individuals adopt or reject WASH practices. The model helped identify how perceptions of susceptibility to water-related diseases, perceived severity of health risks, perceived benefits of hygiene, and perceived barriers influenced adoption of improved WASH behaviours. Cues to action (training, posters, demonstrations) and self-efficacy (confidence to perform handwashing and sanitation practices) were used to motivate sustained behaviour change.

2.4.2. Participatory Hygiene and Sanitation Transformation (PHAST) Model

PHAST guided the participatory component of the intervention. It emphasized community involvement, allowing participants to identify their own sanitation challenges, analyze the causes of poor WASH outcomes, and collaboratively develop practical solutions. Through group discussions, mapping exercises, and role-plays, community members took ownership of the intervention, which increased motivation and sustainability of WASH practices.

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2.4.3. Precede Model

The PRECEDE model served as *the* planning and diagnostic framework for designing the intervention. It guided identification of community needs (social assessment), the magnitude of WASH-related health problems (epidemiological assessment), and the factors influencing behavior — predisposing (knowledge, attitudes), enabling (availability of water, soap, latrines), and **reinforcing** (community leader support and peer influence). This ensured that the intervention was evidence-based, context-specific, and feasible.

2.4.4. How the Three Models Work Together in This Study

(i) **Health Belief Model -** Explains why individuals change behavior and Influences beliefs, motivation, and perceived benefits of WASH

(ii) **PHAST Model -** Shows how communities can take action. It ensures Community participation and ownership of sanitation improvement

(iii) **Precede Model** - Ensures what needs to be addressed is known and Structured planning based on needs assessment and determinants of behaviour

Together, these models ensured that the intervention was Behaviourally grounded **(**HBM**),** Community-driven and participatory **(**PHAST**),** Systematically planned and need-based **(**PRECEDE**).** This integration strengthened the effectiveness of the educational intervention and increased the likelihood of sustainable WASH behaviours among rural dwellers.

2.5. Summary of Research Gap

Although several studies have examined Water, Sanitation and Hygiene (WASH) interventions in Nigeria and other developing countries, most existing studies have major limitations. Many focused on children, school settings, or urban communities, and only few investigated rural adult populations**,** especially in Southwest Nigeria. Additionally, a majority of past studies measured only knowledge improvement, without assessing whether increased knowledge translated into sustained behaviour change in sanitation, handwashing, and safe water handling.

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Evidence also shows that interventions were mostly information-based**,** whereas participatory models (such as PHAST) that actively involve community members in problem identification and solution planning are rarely applied and evaluated in rural Ibadan.

Furthermore, limited studies have used a pre- and post-intervention experimental design**,** making it difficult to attribute observed WASH behavior changes directly to educational intervention. Therefore, there is insufficient empirical evidence on the effectiveness of structured and participatory health education interventions on improving WASH practices among rural dwellers in Ibadan area of Oyo State.

2.5.1. **This study addresses these gaps by:**

1. Using a participatory educational intervention model (PHAST).
2. Assessing not only knowledge, but actual **behavioural change** in WASH practices.
3. Applying a pre- and post-intervention design tailored to rural communities.

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Chapter Three

Methodology

3.1. Research Design

A pre-post study design without control was employed. It assessed the practice of water sanitation and hygiene (WASH) before and after an intervention was implemented.

3.2. Study Area

The study was carried out in two rural Local governments in Oyo state. Oyo State is made up of thirty-three (33) Local Government Areas in which six (6) of them formed rural and five (5) urban Local Government Areas in Ibadan. The rural areas include Lagelu, Akinyele, Ona-ara, Ido, Egbeda and Oluyole.

The city of Ibadan is located approximately on longitude $3^{0}5^{'}$ East of the Greenwich Meridian and latitude $7^{0}23^{'}$ North of the Equator at a distance some 145 kilometres worth east of Lagos. Ibadan is directly connected to many towns in Nigeria, as its rural hinterland by a system of roads, railways and air routes. The physical setting of the city consists of ridges of hills that run approximately in northwest – southeast direction. The largest of these ridges lies in the central part of the city and contains such peaks as Mapo, Mokola and Aremo. These hills range in elevation from 160 to 275 metres above sea level and thus affords the visitor a panoramic view of the city.

Of the six rural Local Government Areas, two Local Government Areas were randomly selected for the conduct of this work and they are Akinyele and Ido Local Governments. All the two LGAs share the same characteristics as rural Local Governments. Akinyele has population of 140,116 and Ido has population of 53,584. All according to 2006 population census[1].

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3.2.1. Akinyele Local Government Area

Akinyele LGA is one of Oyo State Local Government Areas. It is one of the eleven local governments that make up Ibadan metropolis. It is a rural council with its headquarter in Moniya. The local government area is subdivided into 12 wards: Ikereku, Olanla/Oboda/Labode, Arulogun/Eniosa/Aroro, Olode/Amosun/Onidundu, Ojo-Emo/Moniya, Akinyele/Isabiyi/Irepodun, Iwokoto/Talonta/Idi-oro, Ojoo/Ajibode/Laniba, Ijaye/Ojedeji, Ajibade/Alabata/Elekuru, Olorisa-Oko/Okegbemi/Mele, and Iroko.

The local government is governed by an elected chairman and 12 councillors, one elected from each of the wards. Agriculture is the main occupation of the people of Akinyele area. This provides income and employment for over 90 percent of the people. The Local Government falls within the forest and derived savannah zones of the country.

3.2.2. Ido Local Government Area

Ido local government area is situated in Oyo state, South-west Nigeria and has its headquarters in the town of Ido. Towns and villages that make up Ido LGA include Omi-Adio, Apete, Apata, Bakatari, Akufo, Odetola, and Tade. Ido LGA shares borders with the Oluyole, Ibarapa East, Akinyele, Ibadan southwest and Ibadan Northwest LGAs. The estimated population of Ido LGA is 139,658 inhabitants with the most prominent tribe in the area being the Yoruba ethnic group. The Yoruba and English languages are commonly spoken in the area while Islam and Christianity are the widely practiced religions in the LGA. Notable landmarks in Ido LGA include the Nigerian Mining Corporation office.

Farming is a major occupation for the people of Ido LGA with crops such as cocoa, oil palm, maize, rice, and kolanut grown in fairly large quantities within the area.

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Table 3.1:Population and land area of the Ido and Akinyele local government areas

S/No.	Local Government Area	Headquarters	Population (2006)	Population (2025)	Area (km^2)
001	Akinyele	Moniya	140,116	370,500	427.26
002	Ido	Ido	53,584	181,000	865.49
		Total	**193,700**	**551,500**	**1,292.75**

Source: National Population Census of 2006

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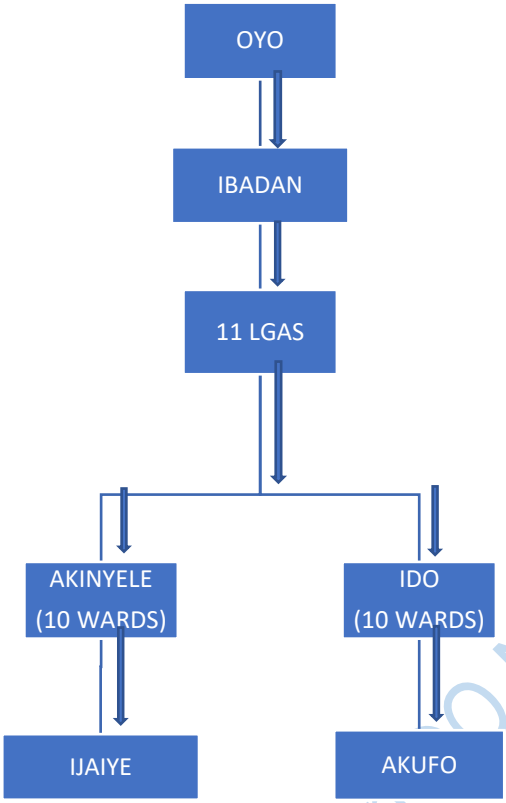


Figure 3.1 – Chart showing the selection of communities for the work[5]

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3.3. Study Population

The study population included both male and female adult rural dwellers in two Local Government areas in Ibadan communities in Oyo State. The Local Government Areas are Ido and Akinyele.

3.4. Sample Size Determination

Effective sample Size (ss) was estimated using the formula below[2] (Krejcie & Morgan, 1970):

$$Sample\ size\ (ss) = \frac{X^2 \mathrm{NP}(1-\mathrm{P})}{d^2(N-1) + X^2 P(1-P)}$$

Where ss= required sample size

X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.81)

N = the population size (551,500)[1]

P = the population proportion (assumed to be 0.25 since this would provide the maximum sample size)

d = the degree of accuracy expressed as a proportion (.05)

Therefore,

$$ss = \frac{3.81 \times 551{,}500 \times 0.25 \times (1-0.25)}{\left(0.05^2 \times (551500-1)\right) + \left(3.81 \times 0.25 \times (1-0.25)\right)}$$

$$ss = \frac{393977.8125}{1378.75 + 0.714375}$$

$$ss = 285.60 \approx 300$$

316 respondents were targeted but 300 were eventually surveyed. Hence, based on krejcie & morgan method of sample size estimation, the study area with population size 551,500 requires

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an approximate minimum sample size of three hundred and sixteen (316) respondents to take care of attrition and loss in transit.

3.5. Sampling Techniques and Procedure

The sampling technique used is multi-stage sampling technique which involved the selection of three hundred and sixteen (316) rural dwellers in Ibadan to represent all the people of the area using three stages. The stages are:

Stage 1: Two Local Governments were randomly selected out of the six (6) LGAs in the area

Stage 2: One community each was purposefully selected from each of the LGAs. The communities were chosen because they were remote and had limited access to WASH facilities in their communities.

Stage 3: Systematic random sampling was used to target one hundred and fifty-eight (158) adults' male and female from each of the communities.

3.6. Instrument for Data Collection

Qualitative and quantitative methods of data collection were used. Focus Group Discussion (FGD) (qualitative) and questionnaire (quantitative) were used as instruments in data collection for the work.

3.6.1. Qualitative

Focus group discussion (FGD) was used as qualitative method of data collection. A total of four Focus Group Discussion sessions (FGDs) (two in each of Ijaiye and Akufo communities) were conducted. Places used for the discussions were selected randomly by balloting. Self-introduction was made by the researcher to the leaders of the two communities. Other key community leaders were reached through the two main leaders for permission to conduct the research in their communities. These leaders assisted in recruiting the discussants and making

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arrangement for the venue. The venues were open spaces in compounds selected by the community leaders; they were conducive and free from distractions.

3.6.2. Each of the FGD sessions was conducted as follow

The researcher introduced herself and the members of the team. She discussed the purpose of the discussion and obtained a verbal consent from the participants to record the discussion sessions on tape. The participants were assured that opinion expressed by them would be kept secret and so were encouraged to share their views freely on the issue raised for discussion. The discussion sessions were flexible in nature with a view of bringing and exploring points that were not originally in the FGD guide. The discussion covered an average of fifteen minutes in duration and refreshments were served at the end of each discussion. At the end, the discussion on the audio tape recorder was played, carefully listened to and then transcribed. The results from the FGDs were used to modify questions in the questionnaire.

There were average of eight participants in a discussion group, with minimum of eight and maximum of twelve participants per group. The team which conducted the discussions consisted of persons who played different roles. A moderator asked different questions using the prepared FGD guide, facilitated the harvesting of the different ideas and opinions from the discussants, clarifications were sought where necessary, and the discussants were guided appropriately. A recorder used audio tape recorder to record the discussions to prevent loss of important information. There was an observer in the team who noted the verbal and non-verbal reactions of the discussants.

3.6.3. Quantitative

Semi-structured questionnaire was developed using WHO/UNICEF joint monitoring programme WASH standardized core questionnaire for household template to elicit information from the respondents. The questionnaire contained six (6) sections.

(i) Section A elicited information on socio-demographic characteristics of the respondents,

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(ii) Section B collected information on level of awareness of rural dwellers on water, sanitation and hygiene (WASH),

(iii) Section C identified the problems that rural dwellers face in the practice of water, sanitation and hygiene (WASH) while

(iv) Section D determined the opinions of rural dwellers on how to resolve difficulties/constraints in the implementation of water, sanitation and hygiene (WASH) and

(v) Section E collected information on the effects of educational intervention on the practice of water, sanitation and hygiene (WASH) among the rural dwellers in Ibadan area of Oyo State.

(vi) Section F evaluate the impact of a health education intervention on improving WASH practices, including water treatment, sanitation facility use, and handwashing behaviours in the rural local government areas of Oyo State.

The health education intervention model employed for this research is the Participatory Hygiene and Sanitation Transformation (PHAST) model, supplemented by elements of the Health Belief Model (HBM). It is a community-based, participatory approach (evidenced by FGDs and questionnaire Sections C, D, and F), with focus on practical WASH behaviours (e.g., water treatment, handwashing), and emphasis on health risks and benefits, which led to significant improvements in WASH practices (e.g., 63.6% found training beneficial, regression coefficient = -54.35). The model targeted rural dwellers in Akinyele and Ido, addressing local barriers and leveraging community engagement to promote sustainable behaviour change.

3.7. **Measurement of Variables**

Following the scoring criteria specified by the Joint Monitoring Programme (by WHO and UNICEF) questionnaire adapted for this research, scores for water, sanitation, hygiene, and overall WASH scores were calculated for each respondent at baseline and after intervention.

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The adapted questionnaire's scoring system assigns lower values (1) to best practices and higher values for worst practices (99). This provides a basis for the interpretation of the overall scores for water, sanitation, hygiene, and overall WASH with lower scores indicating good practices and higher scores indicating bad practices. This is the scoring system adopted in the WHO/UNICEF joint monitoring programme WASH standardized core questionnaire for household template adapted for this study

3.8. Validity and Reliability of Instrument

To ensure the validity and reliability of the semi-structured instrument (with Cronbach's alpha of approximately 0.784), the questionnaire was subjected to undergo:

(i) Peer review- The instrument was presented for scrutiny by experts in the same field (peers) and was considered necessary to ensure academic scientific quality.

(ii) Pre-test of instrument was carried out among the people in Ona Ara local government area of Oyo State for they share the same characteristics with the people in Akinyele and Ido Local Government areas of Oyo State.

(iii)The result of the pre-test was used to modify the instrument used for this work.

3.9. Educational Intervention

The health interventions carried out was the training of respondents in the two communities Akufo and Ijaiye. The training program was divided into different components including safety practices in water collection, storage and treatment, behavioural health and appropriate methods of sanitation and hygiene practices including handwashing at household level using WHO Water Hygiene and Safety plan. The safety training programme was delivered by the principal investigator with the support of professional health instructors over a period of three months. Posters, fliers and other info graphics addressing ways of ensuring optimal water, sanitation and hygiene practices, harmful effect of drinking poor water, and good water

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treatment practices were made available, distributed and displayed in strategic places in the communities.

3.10. Data Analysis and Management

To ensure qualitative data management and analysis, the following steps were taken

(i) Each answered questionnaire was carefully cleaned and coded. A coding guide was developed and used for the questionnaires.

(ii) The data generated from the copies of the questionnaire were carefully entered and analysed using the Statistical Package for Social Sciences (SPSS) software version 27.

(iii) The quantitative analysis was carried out using descriptive and inferential statistics using Independent Samples T test (used to measure influence of gender on WASH Practice), Spearman rank correlation measured association between health education and WASH), Analysis of Variance (ANOVA measured level of education on WASH practice) and multiple linear regression measured the intervention's effects on overall WASH.

(iv) The qualitative analysis was also carried out by transcription of the FGD, reviewed and analysed thematically.

3.11. Ethical Consideration

It is an established ethical principle to obtain informed consent from the participants in any research[3]. The study followed the ethical principles guiding the use of human participants in research. During this project, the under listed steps were taken to ensure that the work was ethically carried out:

(i) Oral informed consent was sought from each of the research participants. This was done after they had been briefed about the nature of the study and their right to participate or not to participate.

(ii) A letter of introduction of the investigator was sent to the Oyo State Commissioner of Health by the Department of Health Public Health, Faculty of Basic and Applied

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Sciences, Lead City University, Ibadan requesting that the candidate be allowed to carry out this study (Appendix IV).

(iii) Proposal for the conduct of the study was submitted to the Ethical Review Committee of Oyo State Ministry of Health, Ibadan for review and a formal letter of approval was received (Appendix V).

(iv) The participants were given the choice to withdraw their consent freely if they so choose at any time.

(v) Assurance of confidentiality of participants' responses were maintained during and after the conduct of the interview.

(vi) To ensure anonymity of responses, names of respondents or any forms of identifications were not included in the questionnaire.

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Chapter Four

Results and Discussions of Findings

4.1. Introduction and Arrangement of Chapter

This chapter presents the findings of the study conducted to evaluate the effectiveness of educational intervention on water, sanitation and hygiene among rural dwellers in rural areas in Ibadan area of Oyo state, Nigeria.

The research was carried out in two local government areas (LGAs): Akinyele and Ido. Baseline data were collected from all the two LGAs; Akufo (Ido LGA) and Ijaiye (Akinyele LGA). Treatment was administered to both communities as intervention through Health Education and training on WASH practices.

The chapter is organized as follows:

1. **Baseline Findings**: Analysis of socio-demographic data and initial WASH practices in both communities, Akufo and Ijaiye
2. **Post-Intervention Results**: Examination of the changes observed after intervention in the two communities following the educational program.
3. **Comparison of the two communities**: Evaluation of differences between the two intervention communities to highlight the program's impact.
4. **General Discussions**: Insights into the challenges, successes, and recommendations for improving WASH practices in rural communities.

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For Ijaiye community, Table 4.1a below indicates that 18.0% of the respondents were below 21 years of age, 38.7% were between 21 and 40 years, 30.0% were aged between 41 and 60 years, and 12.7% fell within the 61 to 80-year range. Additionally, 1.3% also recorded as older than 80 years. Overall, most respondents (38.0%) were within the 21 to 40-year age group. In terms of gender distribution, females constituted a slightly higher proportion of the respondents (54.0%) compared to males (46.0%).

Regarding ethnicity, the vast majority of respondents (86.7%) identified as Yoruba. Other ethnic representations included Hausa (1.3%), Igbo (2.0%), Igede (7.3%), Tiv (0.7%), and small proportions from neighbouring West African countries: Burkina Faso (0.7%), Cotonou (0.7%), and Togo (0.7%). Religious affiliation revealed that 65.3% of the respondents were Christians, 33.3% practiced Islam, while 1.3% adhered to traditional religions. This suggests that Christianity was the predominant religion among respondents in the Ijaiye community. Marital status data indicated that 64.7% were married, 26.7% were single, 8.0% were widowed, and 0.7% were divorced.

In Akufo community, Table 4.1a shows that 18.7% of respondents were younger than 21 years old, while 49.3% of them were between 21 and 40 years. Respondents aged 41 to 60 years constituted 21.3%, those between 61 and 80 years made up 8.7%, and 1.3% were above 80 years. Additionally, 0.7% of participants did not disclose their age. As with Ijaiye community, the majority of respondents (49.3%) fell within the 21 to 40-year age range. Female respondents also outnumbered males, accounting for 58.7% compared to 41.3%.

Ethnic composition in the Akufo community was predominantly Yoruba (94.7%). Other ethnicities included Hausa (1.3%), Igbo (0.7%), Igede (2.5%), and Cotonou nationals (1.3%). In terms of religious affiliation, most respondents (62.7%) identified as Muslims, while 35.3% were Christians and 2.0% were traditionalists. This indicates that Islam was the dominant

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religion within the Akufo community. Regarding marital status, 64.7% of respondents were married, 27.3% were single, 6.7% were widowed, and 1.3% were divorced.

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4.2. Socio-Demographic Characteristics of the Respondents in Ijaiye and Akufo Communities

Table 4.1a: Socio-Demographic Characteristics of the respondents of Ijaiye and Akufo

Socio-Demographic Characteristics	Ijaiye Community		Akufo Community	
	Freq.	Percentage (%)	Freq	Percentage (%)
Age of respondents				
< 21 years' old	27	18.0	28	18.7
21-40 years' old	58	38.7	74	49.3
41-60 years' old	45	30.0	32	21.3
61-80 years' old	19	12.7	13	8.7
Older than 80 years	1	0.3	2	1.3
Undisclosed	-	-	1	0.7
Sex				
Male	69	46.0	62	41.3
Female	81	54.0	88	58.7
Religion				
Christianity	98	65.3	51	34.0
Islam	50	33.3	96	64.0
Traditional religion	2	1.3	3	2.0
Ethnic group				
Yoruba	132	86.7	142	94.7
Hausa	2	1.3	2	1.3
Igbo	3	2.0	1	0.7
Others	13	7.3	5	3.3
Marital status				
Single	40	26.7	40	26.7
Married	97	64.7	97	64.7
Widowed	12	8.0	10	6.7
Divorced	1	0,7	3	2.0

Source: Researcher's fieldwork, 2022

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In Ijaiye community, data from Table 4.1b show that 16.3% of respondents had no formal education, 18.3% attained only primary education, 54.7% had not more than secondary education, while 11.3% had received tertiary education. In terms of occupation, 24.0% of respondents were farmers, 4.0% were civil servants, 19.3% were traders, and 24.0% were artisans. Other occupational groups included food sellers (4.7%), apprentices (10.7%), students (5.3%), retired civil servants (2.7%), individuals combining farming and artisan work (2.0%), and clergy (2.0%). These figures suggest that farming was the predominant occupation among respondents in Ijaiye community.

Family structure analysis revealed that 74.0% of respondents belonged to nuclear families, while 25.3% were part of extended family settings. Regarding household size, 36.7% reported having between 1 and 4 members in their household, 48.7% had between 5 and 9 members, 10.0% had between 10 and 14 members, and 3.3% lived with more than 14 individuals. A small proportion (1.3%) did not provide information on household size. These findings indicate that the majority of households consisted of 5 to 9 individuals.

In Akufo community, the data indicate that 18.0% of respondents had no formal education, 19.3% had attained only primary education, 56.0% had not more than secondary education, while 6.7% had completed tertiary education. Regarding occupational status, 18.3% were farmers, 3.3% were civil servants, 32.0% were traders, and 28.7% were artisans. Additional categories included food sellers (4.0%), apprentices (10.0%), students (2.0%), contractors (0.7%), and retired individuals (0.7%). These data highlight trading and artisan work as the most common occupations in this community.

In terms of family structure, 61.3% of respondents lived in nuclear family settings, while 38.7% lived in extended family arrangements. Household size distribution revealed that 22.0% of respondents had 1 to 4 members in their household, 54.7% had 5 to 9 members, 17.3% had 10

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to 14 members, and 4.0% lived with more than 14 individuals. A small portion (2.0%) did not disclose the number of household members. This suggests that the majority of respondents in Akufo also resided in households with 5 to 9 people.

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Table 4.1b: Socio-Demographic Characteristics of the respondents of both communities

Socio-Demographic Characteristics	Ijaiye Community		Akufo Community	
	Freq.	Percentage (%)	Freq.	Percentage (%)
Highest level of Education				
None	24	16.3	27	18.0
Primary	27	18.0	29	19.3
Secondary	82	54.7	84	56.0
Tertiary	17	11.3	10	6.7
Occupation				
Farming	36	24.0	27	18.3
Civil servant	6	4.0	5	3.3
Trading	29	19.3	48	32.0
Artisan	36	24.0	43	28.7
Food seller	7	4.7	6	4.0
Apprentice	16	10.7	15	10.0
Student	8	5.3	3	2.0
Contractor	-	-	1	0.7
Retired	4	2.7	1	0.7
Farming and Artisan	3	2.0	1	0.7
Clergy	3	2.0	-	-
Type of Family				
Nuclear	111	74.0	92	61.3
Extended	38	25.3	58	38.7
No response	1	0.7	-	
Size of Family				
1-4 people	55	36.7	33	22.0
5-9 people	73	48.7	82	54.7
10-14 people	15	10.0	26	17.3
More than 14 people	5	3.3	6	4.0
No response	2	1.3	3	2.0

Source: Researcher's fieldwork, 2022

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According to data presented in Table 4.2a below, 39.3% of respondents in Ijaiye community reported obtaining their drinking water from wells. Borehole installations served as the drinking water source for 18.7% of respondents, while 6.0% relied on stream water. Additionally, 1.3% drank stored rainwater, and 2.0% consumed packaged (pure) water. Several respondents reported using multiple sources: 4.0% drank water from both well and borehole installations, 20.7% from a combination of borehole and packaged water, 6.0% from both borehole installations and stored rainwater, 1.3% from borehole installations and streams, and another 2.0% from stored rainwater and pure water.

Table 4.2a provides information on the proximity of water sources to respondents' households. A significant majority (72.7%) indicated that a well was the closest source of water to their homes, 21.3% reported borehole installations as the nearest source, 4.7% noted proximity to a stream, and 1.3% indicated that both borehole and well were nearby.

Regarding water used for domestic purposes, 14.7% of Ijaiye community reported using stream water, while 84.7% relied on either well or borehole water. Only 0.7% did not respond to this question. These figures suggest that most respondents in this community depended primarily on well and borehole water for household use.

In Akufo community, the data revealed a different distribution. Specifically, 20.7% of respondents reported drinking water from wells, while 48.7% relied on borehole installations. Stream water was consumed by 13.3%, stored rainwater by 2.0%, and packaged (pure) water by 1.3%. A small percentage of respondents reported using multiple sources: 1.3% drank from both well and borehole installations, another 1.3% from borehole and pure water, 2.7% from borehole installations and stored rainwater, and 8.7% from both borehole installations and streams.

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Table 4.2a also shows that in terms of proximity, 22.0% of respondents in this community had a well near their homes, 56.7% had access to nearby borehole installations, and 21.3% reported a nearby stream. These findings indicate that the majority had a borehole installation in close proximity. With respect to domestic water usage, 32.0% of respondents in this community used stream water, 62.0% used water from wells or boreholes, 4.0% used a combination of stream and borehole water, and 2.0% used both borehole and stored rainwater for household purposes. This suggests a higher reliance on borehole and well water, although a notable proportion also utilized stream water for domestic needs.

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4.3. Results of Baseline Data of the two Communities

Table 4.2a: Water usage and water hygiene in households of both communities

Water for household use	Ijaiye Community		Akufo Community	
	Freq.	Percentage (%)	Freq.	Percentage (%)
Source of Drinking water				
Well	57	38.0	31	20.7
Borehole	28	18.7	73	48.7
Stream	9	6.0	20	13.3
Rain	2	1.3	3	2.0
Pure water	3	2.0	2	1.3
Well and borehole	6	4.0	2	1.3
Borehole and Pure water	31	20.7	2	1.3
Borehole and rain water	9	6.0	4	2.7
Borehole and Stream	2	1.3	13	8.7
Rain water and pure water	3	2.0	-	-
Closest source of drinking water				
Well	109	72.7	33	22.0
Borehole	32	21.3	84	56.0
Stream	7	4.7	33	22.0
Well and borehole	2	1.3	-	-
Water source for other domestic purposes				
Stream/spring	20	13.3	48	32.0
Aquifer	129	86.0	93	62.0
Stream and borehole	-		6	4.0
Borehole and rain	-		3	2.0
Undisclosed	1	0.7	-	-

Source: Researcher's fieldwork, 2022

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In Ijaiye community, Table 4.2a reveals that majority of the respondents (74.7%) reported that their primary water source was located less than 15 minutes from their households. In contrast, 13.3% indicated that their water source was more than 20 minutes away. Additionally, 5.3% were unsure of the distance, while 6.7% did not respond to the question. Seasonal variation in water availability was also reported by 66.0% of respondents, who indicated that their water sources fluctuated with the seasons. Conversely, 29.3% stated that their water sources did not fluctuate seasonally, and 4.7% did not respond.

Regarding drinking water treatment practices, 8.0% of respondents reported boiling their water, 7.8% used chlorination, and 24.0% added alum. Sieving was practiced by 14.0% of the respondents. However, a significant proportion (40.7%) reported not treating their drinking water at all. Other treatment methods included adding salt (1.3%), combining chlorination and alum (1.3%), boiling and adding alum (0.7%), and sieving combined with alum (0.7%).

In Akufo community, responses were more varied. While 45.3% of participants indicated that their water source was located less than 15 minutes from their homes, 43.3% reported having to travel more than 20 minutes. Another 8.0% were uncertain of the distance, and 3.3% did not respond. These findings suggest that, although a plurality of respondents had relatively close access to water sources, a significant portion experienced longer distances.

With respect to seasonal availability, 40.7% of the respondents acknowledged that their water sources fluctuated seasonally, whereas a majority (54.7%) disagreed. Additionally, 2.0% were unsure, and 2.5% did not respond to this question.

Water treatment practices among the people in Akufo differed somewhat from those in Ijaiye community. Specifically, 6.0% of respondents reported boiling their drinking water, 4.7% used chlorine, and 26.0% added alum. Sieving was used by 5.3%, while 53.3% reported not treating

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their drinking water. Less common practices included adding salt (1.3%), combining chlorination and alum (1.3%), and a combination of boiling and chlorination (1.3%).

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Table 4.2b: Water usage and water hygiene in households of both communities

Water for household use	Ijaiye Community		Akufo Community	
	Freq.	Percentage (%)	Freq.	Percentage (%)
Required time to get water				
Less than 15 minutes	112	74.7	68	45.3
More than 20 minutes	20	13.3	65	43.3
Do not know	8	5.3	12	8.0
No response	10	6.3	5	3.3
Seasonality				
Water fluctuate seasonally	99	66.0	61	40.7
Does not fluctuate seasonally	44	29.3	82	54.7
Do not know	7	4.7	3	2.0
No response	-	-	4	2.7
Drinking Water Treatment				
Boiling	12	8.0	9	6.0
Chlorination	12	7.9	7	4.7
Addition of Alum	39	24.0	38	25.3
Sieving	21	14.0	8	5.3
I don't treat my drinking water	60	40.6	82	54.7
Salt	2	1.3	2	1.3
Chlorination and Addition of Alum	2	1.3	2	1.3
Boiling and Chlorination	-	-	2	1.3
Boiling and addition of Alum	1	0.7	-	-
Sieving and Addition of Alum	1	0.7	-	-

Source: Researcher's fieldwork, 2022

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In Ijaiye community, Table 4.3 indicates that 20.7% of respondents had access to water closet facilities, 12.7% used pit latrines, and 10.7% relied on pour-flush toilets. However, a majority (56.0%) reported having no excreta disposal facility and practiced open field defecation. When asked about the reasons for using their current excreta systems, 8.7% cited affordability, 30.0% mentioned ease of maintenance, and 57.3% attributed it to financial constraints that prevented them from constructing improved facilities. An additional 2.7% noted that their toilets were under construction, while 1.3% attributed their usage to lack of education.

Toilet sharing was also prevalent. Among 68.0% respondents who shared facilities, 2.7% shared with fewer than five households, 2.7% with 5 to 10 households, and 55.3% with more than 10 households. 8.7% respondents did not answer this question. Conversely, 30.0% respondents reported exclusive use of their toilet facilities, 0.7% was unsure, and 2.0% did not respond. Public use of toilets was also examined: 50.7% of respondents allowed public access to their toilets, while 36.7% restricted such use. Meanwhile, 2.0% were unsure, and 10.0% did not respond. Among respondents practicing open field defecation, 55.3% expressed willingness to adopt safer excreta disposal methods, while 1.3% were unwilling to change. Additionally, 44.0% of all respondents reported having some form of excreta facility in their households. Regarding toilet hygiene, 28.0% of respondents cleaned their toilets daily, 9.3% cleaned every other day, 3.3% cleaned weekly. However, 55.3% did not have any excreta facility at all.

In Akufo community, 18.7% of respondents used water closet facilities, 22.7% had pit latrines, and 3.3% utilized pour-flush toilets. A slightly higher proportion (52.7%) than in Ijaiye community that reported having no sanitation facility and engaged in open field defaecation. When asked why they used their current sanitation systems, 2.7% indicated cost-effectiveness, 25.3% cited ease of maintenance, and 71.3% reported financial incapacity to build improved facilities. An additional 0.7% mentioned that their toilet was under construction. Toilet-sharing was also common in Akufo community. Of 70.0% respondents who shared toilet facilities,

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2.7% shared with fewer than five households, 6.0% with 5 to 10 households, and 54.7% with more than 10 households. 1.3% respondents did not know how many households shared the facility, while 6.0% did not respond. Meanwhile, 28.7% respondents did not share their toilets, and 1.3% failed to respond.

Regarding public access to toilets, 64.0% of respondents permitted general public use of their facilities, 34.0% did not, 0.7% were uncertain, and 1.3% did not respond. Among those who practiced open field defaecation, 54.0% expressed willingness to transition to improved sanitation methods, 0.7% were unwilling to change, 0.7% were unsure, and 47.3% of respondents reported having a form of sanitation facility in their households. Toilet maintenance habits varied: 29.3% of respondents cleaned their toilets daily, 5.3% cleaned every other day, 4.0% weekly, 0.7% twice daily, and 0.7% three times daily. Additionally, 3.3% did not respond, and 55.3% had no sanitation facility in their homes.

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Table 4.3: Excreta facility usage and hygiene in households of Ijaiye and Akufo Communities

Excreta facility for household use	Ijaiye community		Akufo community	
	Freq.	Percentage (%)	Freq.	Percentage (%)
Usage of Excreta Facility				
Water Close	31	20.7	28	18.7
Pit latrine	19	12.7	34	22.7
Pour flush	16	10.7	5	3.3
Open field defecation	84	56.0	83	55.3
Reason				
Cheap	13	8.7	4	2.7
Easy to maintain	45	30.0	38	25.3
Cannot afford to build a better one	86	57.3	107	71.3
Toilet under construction	4	2.7	1	0.7
Illiteracy	2	1.3	-	-
Excreta facility sharing				
Share excreta facility with	102	68.0	105	70.0
<5 households	4	2.7	4	2.7
5 – 10 households	4	2.7	9	6.0
>10 households	81	55.3	82	54.7
Do not know	-	-	2	1.3
No response	13	8.7	8	5.3
Do not share excreta facility	45	30.0	43	28.7
No response	3	2.0	2	1.3
Accessibility to Public				
Accessible to the Public	76	50.7	96	64.0
Not accessible to the Public	56	37.3	51	34.0
Do not know	3	2.0	1	0.7
No response	15	10.0	2	1.3

Source: Researcher's fieldwork, 2022

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Table 4.3: Excreta facility usage and hygiene in households of Ijaiye and Akufo Communities Cont'd

Excreta facility for household use	Ijaiye community		Akufo community	
	Freq.	Percentage (%)	Freq.	Percentage (%)
Willingness to change				
Willing to change	83	55.3	81	54.0
Unwilling to change	1	0.7	1	0.7
No response	-	-	1	0.7
Have excreta facility in household	66	44.0	67	44.7
Wash time of excreta facility				
Once daily	43	28.0	44	29.3
Every other day	14	9.3	8	5.3
Weekly	5	3.3	6	4.3
Twice a day	-	-	1	0.7
Three times a day	-	-	1	0.7
When dirty	-	-	-	-
No response	4	2.7	5	3.3
Does not have excreta facility	84	56.0	83	53.3

Source: Researcher's fieldwork, 2022

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In Ijaiye community, Table 4.4 indicates that handwashing practices varied among respondents. Specifically, 18.7% reported washing their hands before meals, while 6.0% washed their hands after defaecation. A small proportion (5.3%) stated that they did not know when they washed their hands. The majority (66.7%) reported practicing handwashing at multiple critical times—before meals, after defecation, and after cleaning children. Additionally, 0.7% stated that they washed their hands before meals, after defaecation, and after cleaning children.

A further 0.7% washed their hands before meals and after defaecation, and 2.0% reported handwashing before meals, after defaecation, and after working. About hand hygiene following defaecation, 100% respondents indicated that they washed their hands immediately. Of these, 19.3 used water only, while 77.3 used both water and soap. A small number employed alternative methods: 1.3% respondents used ashes, 0.7% used water and paper/cloth, and 1.3% used water, with ashes and paper/cloth. These findings suggest that while a large proportion engaged in some form of post-defaecation hand hygiene, soap use was not universal.

In Akufo community, handwashing practices were more varied. According to Table 4.4, 20.0% of respondents reported washing their hands before meals, 14.0% after defecation, 2.0% after cleaning children, and 0.7% after handling faeces. An additional 7.3% stated they did not know when they typically washed their hands. Nearly half (48.0%) reported washing their hands before meals, after cleaning children, and after handling faeces.

A smaller percentage (4.0%) practiced handwashing before meals, after defecation, and after cleaning children, while others mentioned combinations such as washing before meals and after defecation (4.0%), and before meals, after cleaning children, and after handling faeces (0.7%). Another 0.7% reported washing hands before meals, after defaecation, and before cooking. In terms of hand hygiene after defaecation, 99.3% respondents reported washing their hands immediately, while 0.7% respondent did not and went about other activities instead. Among

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those who washed their hands, 22.7% used water only, and 72.0% used water and soap. 0.7% respondent used ash, while 2.7% used paper or cloth. 0.7% respondent used water and paper/cloth, and another used a combination of water, ash, and paper/cloth. Additionally, 0.7% respondent reported engaging in other activities apart from handwashing after defaecation.

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Table 4.4: Handwashing Practice in both communities

Handwashing Practice	Ijaiye Community		Akufo Community	
	Freq.	Percentage (%)	Freq.	Percentage (%)
Moment				
Before meal	28	18.7	30	20.0
After meal	9	6.0	21	14.0
After cleaning the children	-	-	3	1.3
Feaces	-	-	1	0.7
Do not know	8	5.3	11	7.3
Before meal, after defecation, after cleaning the children, and after packing feces	100	66.7	72	48.0
Before meal, after defecation, and after cleaning the children	1	0.7	-	-
Before meal, after cleaning the children, and after packing feces	-	-	6	4.0
Before meal, after defecation, and before cooking	-	-	1	0.7
Before meal and after defecation	1	0.7	1	0.7
Before meal, after defecation, and after working Activity	1	0.7	4	2.7
Go my way	-	-	1	0.7
Wash hands	150	100	149	99.3
Water only	29	19.3	34	22.7
Water with soap	116	77.3	108	72.0
Water with ashes	2	1.3	1	0.7
Paper/cloth	-	-	4	2.7
Water and Paper/cloth	1	0.7	1	0.7
Water with ashes and paper/cloth	2	1.3	1	0.7

Source: Researcher's fieldwork, 2022

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In Ijaiye community, Table 4.5 reveals respondents' understanding of personal hygiene. A small proportion (4.0%) defined personal hygiene solely as bathing, 0.7% as cutting of nails, and 15.3% as brushing of teeth. However, the majority (76.7%) provided a more comprehensive definition that included bathing, haircutting or plaiting, nail cutting, cloth washing, and brushing of teeth. Additionally, 2.0% of respondents understood personal hygiene as a combination of bathing, washing clothes, and brushing of teeth, while another 1.3% mentioned bathing, nail cutting, and brushing of teeth. In terms of household hygiene, 8.7% of respondents understood it as regular sweeping of the house, 1.3% as cleaning the kitchen, 0.7% as proper disposal of wastewater, and another 2.0% as regular cleaning of toilets. Only 4.0% identified proper solid waste disposal as a component of household hygiene. A large proportion (80.7%) demonstrated a holistic understanding of household hygiene, including regular sweeping, toilet and kitchen cleaning, and proper disposal of both solid and liquid waste. Others mentioned sweeping and kitchen cleaning (1.3%) or a combination of sweeping, kitchen cleaning, and wastewater disposal (1.3%).

Regarding environmental cleanliness, 59.3% of respondents reported cleaning their compound or environment once daily, 24.7% twice daily, 9.3% every other day, and 4.7% weekly. A small percentage (2.0%) did not respond. Refuse disposal practices in Ijaiye were varied. Over half (58.0%) disposed of refuse at designated dumpsites, 28.0% resorted to burning waste, 8.0% dumped waste in bushes, and 4.0% used garbage pits. Additionally, 1.3% disposed of refuse in gutters. A small proportion combined methods—0.7% used both dumpsite and burning.

In Akufo community, 7.3% of respondents defined personal hygiene simply as bathing, 1.3% as haircutting or plaiting, and 0.7% each identified cutting of nails or washing of clothes. A notable 32.0% described personal hygiene as brushing of teeth, while 48.7% understood it comprehensively encompassing bathing, haircutting or plaiting, nail cutting, clothes washing, and brushing of teeth. Additional responses included bathing combined with haircutting and

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nail cutting (0.7%), bathing, clothes washing, and brushing (4.0%), and other unspecified combinations (4.0%). One respondent (0.7%) did not provide a response.

Household hygiene was understood by 26.0% of respondents as regular sweeping, while others identified kitchen cleaning (1.3%), wastewater disposal (2.7%), and solid waste disposal (8.7%) as components. A majority (53.3%) identified all key components—regular sweeping, toilet and kitchen cleaning, and solid and liquid waste disposal. Others noted sweeping and toilet cleaning (2.7%), sweeping with kitchen and toilet cleaning (0.7%), and sweeping with kitchen cleaning and proper wastewater disposal (4.0%). One respondent (0.7%) mentioned sweeping and solid waste disposal. Regarding frequency of environmental cleaning, 64.7% of respondents cleaned their environment once daily, 19.3% twice daily, 6.0% every other day, and 6.0% weekly. A few reported cleaning more frequently—0.7% three times daily, another 0.7% continuously, and 1.3% only when the compound appeared dirty. Additionally, 1.3% did not respond.

Refuse disposal practices showed similar patterns. Specifically, 39.3% disposed waste at dumpsites, 34.0% resorted to burning, 12.0% used bushes, and 3.3% used garbage pits. Others disposed waste in gutters (4.7%), while 2.7% used both burning and bush disposal, and another 2.7% used dumpsite combined with burning. A small proportion (1.3%) did not respond.

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Table 4.5a: Understanding of Personal and Environmental Hygiene in both communities

Understanding of Personal and Environmental Hygiene	Ijaiye Community		Akufo Community	
	Freq.	Percentage (%)	Freq.	Percentage(%
Personal hygiene				
Bathing	6	4.0	11	7.3
Cutting/plaiting of hairs	1	0.7	2	1.3
Cutting of nails	23	15.3	1	0.7
Washing clothes	-	-	1	0.7
Brushing teeth	-	-	48	32.0
Bathing, hair cutting or plaiting, nail cutting, cloth washing, and brushing of teeth	115	76.7	73	48.7
Bathing, cutting/plaiting of hairs, and cutting of nails	3	2.0	1	0.7
Bathing, washing of clothes, and brushing of teeth	2	1.3	6	4.0
Bathing, cutting of nails, and brushing teeth	-	-	6	4.0
No response	-	-	1	0.7
Household Hygiene				
Sweeping the house regularly	13	8.7	39	26.0
Cleaning the kitchen	2	1.3	2	1.3
Proper disposal of waste water	1	0.7	4	2.7
Proper disposal of solid waste	6	4.0	13	8.7
Cleaning of toilet regularly	3	1.3	-	-
Regular sweeping of house, regular cleaning of toilet and kitchen, and regular disposal of solid waste and waste water	121	80.7	80	53.3
Sweeping the house regularly, and cleaning the kitchen	2	1.3	4	2.7
Sweeping the house regularly and cleaning the toilet regularly	-	-	1	0.7
Sweeping the house regularly, cleaning the kitchen, and proper disposal of waste water	2	1.3	6	4.0
Sweeping the house regularly and proper disposal of solid waste	-	-	1	0.7

Source: Researcher's fieldwork, 2022

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Table 4.5b: Understanding of Personal and Environmental Hygiene in both communities

Understanding of Personal and Environmental Hygiene	Ijaiye Community		Akufo Community	
	Freq.	Percentage (%)	Freq.	Percentage (%)
Habit of keeping compound or environment clean				
Once daily	89	59.3	97	64.7
Every other day	14	9.3	9	6.0
Weekly	7	4.7	9	6.0
Twice a day	37	24.7	29	19.3
Every time	-	-	1	0.7
Three times a day	-	-	1	0.7
When dirty	-	-	2	1.3
No response	3	2.0	2	1.3
Refuse disposal method				
Dump site	87	58.0	59	39.3
Gutter	2	1.3	7	4.7
Garbage pit	6	4.0	5	3.3
Burning	42	28.0	51	34.0
Bush	12	8.0	18	12.0
Burning and Bush	-	-	4	2.7
Dumpsite and Burning	1	0.7	4	2.7
No response	-	-	2	1.3

Source: Researcher's fieldwork, 2022

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The table below shows in Ijaiye community, 97.3% of respondents reported observing WASH (Water, Sanitation and Hygiene) practices, while 2.7% did not respond. Among those who observed WASH, 23.3% did so by maintaining personal and household hygiene, 4.7% maintained personal and water hygiene, 44.7% focused on personal hygiene alone, 0.7% washed toilet facilities regularly, 2.7% practiced environmental sanitation, and another 2.7% reported regular handwashing. In addition, 12.7% regularly treated water used in the household, and 5.3% did not specify how they observed WASH.

Regarding challenges, 66.7% of respondents in Ijaiye community encountered problems while practicing WASH. The most frequently reported challenge was water scarcity, cited by 26.0%. Other issues included irregular power supply (0.7%), long distance to water sources causing stress and time loss (1.3%), lack of water treatment materials (5.3%), lack of toilet facilities and inadequate water supply (5.3%), indiscriminate defecation (18.7%), a combination of seasonal water fluctuation and indiscriminate defecation (4.0%). Conversely, 27.3% of the respondents did not experience any problems, and 6.0% did not respond.

Focusing on the 80.0% of respondents who experienced problems in Ijaiye, 11.3% attributed the issues to insufficient water, 3.3% to irregular electricity supply, 2.0% to poverty, and 1.3% to government failure in providing adequate water infrastructure. Seasonal fluctuation in water supply was reported by 10.7%, unproductive wells by 1.3%, and long distances to water sources by 5.3%. A further 1.3% cited the unavailability of water treatment chemicals, 0.7% mentioned ignorance, 15.3% pointed to the absence of toilets, 6.0% indicated both water scarcity and lack of toilets, 1.3% reported overexploitation of available water sources, and 6.7% did not respond.

In comparison, Akufo community had 90.0% of respondents who reported observing WASH practices, 8.7% who did not, and 1.3% who gave no response. Among those practicing WASH, 22.7% maintained both personal and household hygiene, 6.0% combined personal and water

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hygiene, and 34.0% engaged in personal hygiene only. Regular toilet cleaning was reported by 4.7%, 3.3% practiced environmental sanitation, 8.0% consistently washed their hands, 1.3% combined handwashing and toilet cleaning, another 1.3% ensured the cleanliness of toilets and surroundings, 3.3% treated household water regularly, and 5.3% did not specify their WASH practice method.

Concerning challenges, 60.0% of Akufo respondents reported encountering problems in practicing WASH. The primary issue was water scarcity, affecting 47.3% of the respondents. Other challenges included financial difficulty (1.3%), lack of dumping sites and toilet facilities (1.3%), irregular power supply (1.3%), time and energy required to access distant water sources (0.7%), absence of water treatment materials (2.7%), combined water shortage and toilet inadequacy (0.7%), and seasonal water fluctuation with indiscriminate defaecation (0.7%). Additionally, 2.7% did not specify the problem. Meanwhile, 33.3% of respondents experienced no challenges, 0.7% were unsure, and 7.3% did not respond.

Among the 86 respondents in Akufo community who reported challenges, 28.7% identified insufficient water as the main cause. Poor drinking water quality was mentioned by 2.0%, irregular power supply by 5.3%, poverty by 2.7%, and lack of government intervention by 1.3%. Seasonal fluctuation in water supply was cited by 6.7%, long distances to water sources by 4.0%, and indifferent attitudes within the community by 0.7%. A further 0.7% mentioned the lack of water treatment chemicals, and 4.7% gave no response.

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Table 4.6: Problems associated with the Practice of WASH among dwellers of Akufo and Ijaiye community

Practice of WASH	Ijaiye Community		Akufo Community	
	Freq.	Percentage (%)	Freq.	Percentage (%)
Practice of WASH				
Observe WASH	146	97,3	135	90.0
By maintaining personal and household hygiene	35	23.3	34	12.7
By maintaining personal and water hygiene	7	4.7	9	6.0
By practicing personal hygiene	67	44.7	51	34.0
By washing toilet facility always	1	0.7	7	4.7
By practicing environmental sanitation	4	2.7	5	3.3
By always washing hands	4	2.7	12	8.0
By washing hands and toilets	-	-	2	1.3
By making sure toilets and surroundings are clean	-	-	2	1.3
By always treating the water used in the household	20	13.3	5	3.3
No response	8	5.3	8	5.3
Do not observe WASH	-	-	13	8.7
No response	4	2.7	2	1.3

Source: Researcher's fieldwork, 2022

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Table 4.6: Problems associated with the Practice of WASH among dwellers of Akufo

Practice of WASH	Ijaiye Community		Akufo Community	
	Freq.	Percentage (%)	Freq.	Percentage (%)
Problem encountered during the practice of WASH				
Encountered problem	100	66.7	88	60.0
Water scarcity	39	26.0	71	47.3
Financial constraint	-	-	2	1.3
Absence of dumping site and toilet facility	-	-	2	1.3
Irregular power supply	1	0.7	2	1.3
Time wastage and stress resulting from distance to water source	2	1.3	1	0.7
Lack of water treatment materials	8	5.3	4	2.7
Lack of toilet facility and inadequate water supply	8	5.3	1	0.7
Indiscriminate defaecation	28	18.7	-	-
Seasonal fluctuation of water and indiscriminate defecation	6	4.0	-	-
Inadequate power supply and water scarcity	2	1.3	1	0.7
No response	5	3.3	4	2.7
Do not encounter problem	41	27.3	50	33.3
Do not know	-	-	1	0.7
No response	9	6.0	11	7.3
Inadequate power supply and water scarcity	28	18.7	88	60.0
Reasons for the encountered problems	6	4.0		
Insufficient water	17	11.3	37	28.7
Uncleanliness of water	-	-	3	2.0
Irregular power supply	5	3.3	15	5.3
Poverty	3	2.0	4	2.7
Failure of government to provide good water source	2	1.3	2	1.3
Seasonal fluctuation of water	16	10.7	10	6.7
Distance to water source	8	5.3	6	4.0
Nonchalant attitude	-	-	1	0.7
Unavailability of water treatment chemicals	2	1.3	1	0.7
Ignorance	1	0.7	-	-
Not eligible to answer	50	33.3	62	41.3
No response	10	6.7	7	4.7
Over exploitation of water sources	2	1.3	-	-
Lack of toilet facility	23	15.3	-	-
Water scarcity and absence of toilet facility	9	6.0	-	-
Most wells are unproductive in the area	2	1.3	-	-

Source: Researcher's fieldwork, 2022

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In Ijaiye community, respondents identified several difficulties or constraints to the implementation of Water, Sanitation and Hygiene (WASH). Specifically, 20.7% reported the absence of toilet and improved water sources as a challenge, 32.0% pointed to water scarcity, 2.0% attributed difficulties to ignorance and illiteracy, and 0.7% cited epileptic power supply. Poverty was identified by 2.0%, while 1.3% mentioned lack of training on water treatment, and 0.7% referenced the absence of water treatment chemicals. Additionally, 2.0% noted time wastage and stress due to long distances to water sources, 3.3% reported indiscriminate refuse dumping and defecation, and 26.0% highlighted the absence of toilet facilities in households. A smaller percentage cited combinations of issues such as water scarcity and power supply (1.3%), poverty and water scarcity (0.7%), bad leadership (1.3%), and unclean water (1.3%). Meanwhile, 2.7% of the respondents did not provide a response.

When asked how these challenges could be addressed, 11.3% of respondents suggested providing toilet facilities and improved water sources in the community. Awareness creation on the importance of WASH was recommended by 2.7%, and 24.7% emphasized the need for improved water sources. A larger proportion, 31.3%, advocated for government intervention, particularly in the provision of social amenities. Regular power supply was seen as a solution by 5.3%, communal participation was mentioned by 0.7%, and 0.7% recommended the provision of water treatment chemicals. Additionally, 0.7% called for better waste disposal methods, 12.7% supported ensuring every house has an excreta disposal facility, and 2.0% believed in a combined approach of improved water source and electricity. Only 1.3% admitted they did not know what could be done. Overall, most respondents emphasized the role of government—especially state and local authorities—in resolving WASH challenges through infrastructure and amenity provision. Furthermore, 80.0% of respondents in Ijaiye believed that the constraints to WASH implementation were common to all households in their community. In contrast, 1.3% disagreed, 6.7% were unsure, and 12.0% did not respond.

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In Akufo community, 12.0% of respondents cited the absence of toilet facilities and improved water sources as a major challenge to WASH implementation. A significant proportion—54.7%—reported water scarcity, while 24.0% attributed the constraints to ignorance and illiteracy. Other challenges included epileptic power supply (3.3%), poverty (2.0%), lack of training on water treatment (1.3%), lack of water treatment chemicals (0.7%), and nonchalant attitudes (0.7%). A minority (0.7%) claimed not to face any constraints, and another 0.7% were uncertain.

In terms of suggested solutions, 14.0% of respondents supported the provision of toilets and improved water sources. Community awareness initiatives, especially by leaders and government bodies, were suggested by 22.0%, while 32.0% emphasized the provision of improved water sources as the primary solution. Government intervention in social amenities was recommended by 18.0%, and 4.0% advocated for regular electricity supply. Another 5.3% favoured communal participation and effort. Only 0.7% believed there was no solution, while the same proportion supported the provision of water treatment chemicals and improved waste disposal methods, respectively. Lastly, 2.0% did not respond. Regarding the universality of these challenges, 89.3% of respondents agreed that the difficulties were common to all households in the community. Only 0.7% disagreed, 8.7% were unsure, and 2.7% did not respond.

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Table 4.7a: Resolution to the constraints/difficulties to the implementation of WASH in households of both communities

Resolution of WASH	Ijaiye Community		Akufo Community	
	Freq.	Percentage (%)	Freq.	Percentage (%)
Difficulties/constraints to the implementation of WASH				
Absence of toilet and improved source of water	35	20.7	18	12.0
Water scarcity	47	32.0	82	54.7
Ignorance and Illiteracy	3	2.0	36	24.0
Electricity problem	-	-	5	3.3
Poverty/Financial constraint	2	1.3	3	2.0
No constraint or difficulty or problem	5	3.3	1	0.7
Lack of training on water treatment	1	0.7	2	1.3
Lack of water treatment chemicals	-	-	1	0.7
Nonchalant attitude	-	-	1	0.7
Time wastage and stress resulting from the distance to water source	3	2.0	-	-
Indiscriminate refuse dumping and defecation	5	3.3	-	-
Absence of toilet facility in houses	39	26.0	-	-
Water scarcity and irregular power supply	2	1.3	-	-
Financial constraints and water scarcity	1	0.7	-	-
Bad leadership in the community	2	1.3	-	-
Water uncleanliness	2	1.3	-	-
No response	4	2.7	1	0.7

Source: Researcher's fieldwork, 2022

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Table 4.7a: Resolution to the constraints/difficulties to the implementation of WASH in households of both communities Cont'd

Resolution of WASH	Ijaiye Community		Akufo Community	
	Freq.	Percentage (%)	Freq.	Percentage (%)
Solutions to constraints to the implementation of WASH				
Provision of toilet and improved water source	17	11.3	21	14.0
Creation of awareness	4	2.7	33	22.0
Provision of improved water source	37	24.7	48	32.0
Government Intervention	47	31.3	27	18.0
Regular power supply	8	5.3	6	4.0
Communal participation and effort	1	0.7	8	5.3
No solution	-	-	1	0.7
Provision of water treatment chemicals	1	0.7	1	0.7
Provision of better waste disposal method	1	0.7	1	0.7
Not applicable	9	6.0	2	1.3
No response	-	-	3	2.0
Do not know	2	1.3	-	-
Individual should construct toilet	19	12.7	-	-
Provision improved water source and power supply	4	2.7	-	-
Commonness of constraints to households				
Yes, common all households	129	80.0	134	89.3
No, not common to all households	2	1.3	1	0.7
Do not know	10	6.7	11	8.7
Not applicable	18	12.0	4	2.7

Source: Researcher's fieldwork, 2022

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In Ijaiye Community (Table 4.7b), respondents suggested various strategies to improve WASH (Water, Sanitation, and Hygiene) implementation at the community level. Among them, 7.3% recommended health education and awareness creation, another 6.7% suggested the provision of improved water sources, and 54.7% advocated for direct intervention from the government or the community. Community development was mentioned by 4.0% of the respondents, while 5.3% emphasized individual responsibility, particularly in the construction of toilet facilities. A small portion, 0.7%, proposed proper awareness and provision of waste bins, another 0.7% suggested regular power supply as a supporting measure, and 0.7% stated that there was no solution. Meanwhile, 1.3% of respondents did not provide any response.

Regarding their willingness to have WASH-related difficulties resolved, 67.3% of the community expressed the desire for these issues to be addressed. In contrast, 3.3% of them did not want the difficulties resolved, 2.0% were uncertain, and 26.0% did not respond.

In Akufo Community, 32.7% of the respondents believed that the constraints to WASH implementation could be improved through health education and sensitization campaigns, while 26.7% suggested government or communal intervention. Additionally, 8.7% recommended providing improved water sources, and 0.7% proposed facilitating community development through the efforts of community leaders. A small portion of respondents—2.0%—pointed to regular power supply as a supportive factor, while 1.3% believed that the provision of water treatment materials would be effective. Furthermore, 4.7% recommended establishing specific days for sanitation and hygiene practices as a motivational strategy, and 0.7% mentioned regular hygiene habits combined with reliable power supply. However, 6.0% of the respondents expressed pessimism, stating that there was no viable way to improve the situation, and 5.3% of them did not respond.

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In terms of willingness to have the constraints resolved, 69.3% of the community members wanted the difficulties removed, 14.0% indicated they did not want any intervention, 2.0% were uncertain, and 14.7% provided no response.

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Table 4.7b: Resolution to the constraints/difficulties to the implementation of WASH in households both communities

Resolution of WASH	Ijaiye Community		Akufo Community	
	Freq.	Percentage (%)	Freq.	Percentage (%)
Improvement strategies among community members				
Through health education and sensitization	11	7.3	49	32.7
Government or Community Intervention	82	54.7	40	26.7
Provision of improved water sources	10	6.7	13	8.7
Community development	6	4.0	1	0.7
By regular supply of electricity	-	-	3	3.2
No solution	-	-	10	6.7
Provision of water treatment materials	-	-	2	1.3
Keeping a day for WASH in the community	-	-	7	4.7
Regular hygiene and power supply	1	0.7	1	0.7
Individual should construct toilet	7	5.3	-	-
Proper awareness and provision of waste bins	1	0.7	-	-
Not applicable	30	20.0	30	10.7
No response	2	1.3	8	5.3
Willingness of members of the communities to resolve constraints				
Willing to resolve	101	67.3	104	69.3
Unwilling to resolve	5	3.3	21	14.0
Do not know	3	2.0	3	2.0
No response	41	27.3	22	14.7

Source: Researcher's fieldwork, 2022

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In Ijaiye Community (From Table 4.8a), 47.3% of respondents agreed that the knowledge of WASH (Water, Sanitation, and Hygiene) helped to improve people's health, while 49.3% strongly agreed. A minimal 0.7% disagreed, and 2.7% were undecided. Similarly, when asked whether the practice of WASH prevents diseases, 45.3% agreed and 50.0% strongly agreed. In contrast, 2.0% disagreed and 2.7% remained undecided. Regarding training on the importance of WASH at the household level, 41.3% of the respondents agreed that households should be trained, and 52.0% strongly agreed. Only 1.3% disagreed, while 6.7% were undecided. Furthermore, 56.0% of the respondents agreed that community members in general need training on the importance of WASH, 37.3% strongly agreed, 0.7% disagreed, and 6.0% were undecided.

In Akufo Community, 50.0% of the respondents agreed that the knowledge of WASH improved people's health, and 43.3% strongly agreed. A small fraction—2.0%—disagreed, and 4.7% were undecided. Regarding the preventive role of WASH practices in relation to disease, 52.0% of respondents agreed and 43.3% strongly agreed, while 2.0% disagreed, while 0.7% were undecided. When asked about training households on WASH, 66.0% agreed that households should be trained on its importance, while 31.3% strongly agreed. A small portion—2.0%—disagreed, and 0.7% undecided. Finally, when considering community-wide training, 58.7% agreed that community members need training on the importance of WASH, 36.7% strongly agreed, 2.0% disagreed, 0.7% strongly disagreed, and 2.0% remained undecided.

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Table 4.8a: Effects of Educational Intervention

Effects of Health Educational intervention	Ijaiye Community		Akufo Community	
	Freq.	Percentage (%)	Freq.	Percentage (%)
Knowledge of WASH and Improvement of health of community members				
Agreed	71	47.3	75	50.0
Strongly agreed	74	49.3	65	43.3
Disagreed	1	0.7	3	2.0
Undecided	4	2.7	7	4.7
Prevention of diseases and the Practice of WASH				
Agreed	68	45.3	78	52.0
Strongly agreed	75	50.0	68	43.3
Disagreed	3	2.0	4	2.7
Undecided	4	2.7	-	-
Importance of training on WASH				
Agreed	62	41.3	99	66.0
Strongly agreed	76	52.0	47	31.3
Disagreed	2	1.3	3	2.0
Undecided	10	6.7	1	0.7
Need for training on the importance of WASH for community members				
Agreed	84	56.0	88	58.7
Strongly agreed	56	37.0	55	36.7
Disagreed	1	0.7	3	2.0
Strongly disagreed	-	-	1	0.7
Undecided	9	6.0	3	2.0

Source: Researcher's fieldwork, 2022

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In Ijaiye Community (From Table 4.8b), 41.3% of respondents agreed that households need to be trained on water treatment, drinking wholesome water, and disease prevention, while 49.3% strongly agreed. Only 1.3% disagreed, 0.7% strongly disagreed, and 5.3% were undecided. On the need for training on toilet facility provision to reduce disease spread under WASH, 51.3% agreed and 39.3% strongly agreed. A small proportion—1.3%—disagreed, 2.0% strongly disagreed, and 6.7% were undecided. Regarding the importance of hygiene knowledge in WASH, 53.3% agreed, 41.3% strongly agreed, and 5.3% were undecided. Furthermore, 60.0% agreed that rural dwellers should be knowledgeable on good hygiene practices, 34.0% strongly agreed, 0.7% disagreed, and 5.3% were undecided.

In Akufo Community, 59.3% of respondents agreed that households should be trained on water treatment, drinking safe water, and disease prevention, while 35.3% strongly agreed. Only 2.7% disagreed, and 2.7% were undecided. Regarding training on toilet facility provision to curb disease spread, 60.7% agreed, and 33.3% strongly agreed. A slightly higher 4.0% disagreed, and 2.0% were undecided. When asked about the importance of WASH knowledge, 66.7% agreed, 32.0% strongly agreed, 0.7% disagreed, and 0.7% were undecided. Lastly, 64.0% of respondents agreed that rural dwellers should be knowledgeable on good hygiene practices, 32.7% strongly agreed, 2.7% disagreed, and 0.7% were undecided.

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Table 4.8b: Effects of Health Educational Intervention in both communities

Effects of Health Educational intervention	Ijaiye Community		Akufo Community	
	Freq.	Percentage (%)	Freq.	Percentage (%)
Need for training on water treatment, drinking wholesome water and disease prevention				
Strongly agreed	62	41.3	89	59.3
Agreed	74	49.3	53	35.3
Disagreed	2	1.3	4	2.7
Strongly disagreed	1	0.7	-	-
Undecided	11	7.3	4	2.7
Importance of the training on provision of toilet facility to curb the spread of disease under WASH				
Agreed	77	51.3	91	60.7
Strongly agreed	59	39.3	50	33.3
Disagreed	1	0.7	6	4.0
Strongly disagreed	3	2.0	-	-
Undecided	10	6.7	3	2.0
Importance of knowledge of hygiene on WASH				
Agreed	80	53.3	100	66.7
Strongly agreed	62	41.3	48	32.0
Disagreed	-	-	1	0.7
Undecided	8	5.3	1	0.7
Importance of the training on provision of toilet facility to curb the spread of disease under WASH				
Agreed	90	60.0	96	64.0
Strongly agreed	51	34.0	49	32.7
Disagreed	1	0.7	4	2.7
Undecided	8	5.3	1	0.7

Source: Researcher's fieldwork, 2022

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In Ijaiye (From Table 4.9), At baseline, 38.0% take their drinking water from well but it rose to 74.0% at post intervention while borehole account for 8.7%. Whereas, in Akufo, drinking water from well accounted for 20.7% at baseline and increased to 27.3% at post intervention. The use of stream for other purposes decrease in Akufo from 32.0% to 26.7% after intervention. This implies that the intervention is effective in source of water supply for drinking.

In terms of distance to the water source, majority in Ijaiye 88.0% reported their source was less than 15 minutes away at post intervention contrary to baseline report of 74.7% while in Akufo 67.3% reported they use less than 15 minutes against 45.3% at baseline. But 22.7% claimed they use less than 20 minutes against 43.3% at baseline. Seasonal variation in water availability was reported in Ijaiye by 56.0% of respondents post intervention against 66.0% at baseline. Seasonal water fluctuation was acknowledged by 39.3% in Akufo as against 40.7% at baseline. of respondents, while 40.0% disagreed that water fluctuated seasonally, and 4.0% did not respond.

Regarding water treatment, majority (87.3%) in Ijaiye now treat their water before drinking against 59. 4%. The treatment includes boiling, sieving, chlorination, etc. Whereas water treatment in Akufo increased from 45.9% at baseline to 89.7% post intervention. This shows that the intervention is most effective on water treatment in the two communities.

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4.4. Results of Post-Intervention Data of Ijaiye and Akufo Communities

Table 4.9: Water usage and water hygiene in households

Water for household use	Ijaiye community		Akufo community	
	Pre	**Post**	**Pre**	**Post**
Sources of drinking water				
Well	57	111	31	41
	38.0%	74.0%	20.7%	27.3
Borehole	28	13	73	63
	18.7%	8.7%	48.7%	42.0%
Sources for other purposes				
Stream	2	8	48	40
	1.3%	5.3%	32.0%	26.7%
Required time to get water				
Less than 15 minutes	112	132	68	101
	74.7%	88.0%	45.3%	67.3%
More than 20 minutes	20	14	65	34
	13.3	9.3%	43.3%	22.7%
Seasonality				
Water fluctuate seasonally	99	84	61	59
	66.0%	56.0%	40.7%	39.3%
Does not fluctuate	44	60	82	86
	29.3%	40.0%	54.7%	57.3
Drinking water treatment				
Treat water	74	131	67	138
	59.4%	87.3%	45.9%	89.7%
Do not treat water	60	19	82	17
	40.6%	12.7%	54.7%	10.3%

Source: Researcher's fieldwork, 2022

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In Ijaiye Community (From Table 4.10), 21.3% of respondents reported having a water closet in their households against 20.7% at baseline while14.7% had a pit latrine at post intervention against 12.7% and 7.3% had pour flush system against 10.7 at baseline. However, a majority 56.7% did not have access to a toilet and practiced open defaecation. Whereas, in Akufo community, 32.0% of respondents reported having a water closet against 18.7% at baseline, 21.3% had a pit latrine, and 4.0% had a pour flush system. A substantial portion 43.3% reported practicing open field defaecation which decreased from 55.3% at baseline.

When asked why they used their current excreta disposal system, 10.0% of respondents in Ijaiye cited affordability at post intervention against 8.9% in baseline, 23.3% said ease of maintenance against 30.0% in baseline, and 66.0% against 57.3% at baseline explained that they could not afford to build a better system. Whereas in Akufo, as for reasons behind using their current toilet type, 6.7% at post intervention cited affordability against 2.7%, 38.0% against 25.3% at baseline noted ease of maintenance, and 55.3% against 71.3% at baseline said they could not afford a better facility.

Out of the respondents in Ijaiye community, 64.0% against 68.0% at baseline reported sharing their toilet facilities. Meanwhile, 32.0% respondents at post intervention against 30.0% in baseline stated they did not share their toilet facilities. And about 42.7% of respondents in Akufo community against 64.0% at baseline allowed others to use their toilet while 52.7% at post intervention against 70.0% in the baseline did not allow public to use their toilets.

Regarding hygiene practices, 43.3% reported washing their toilets between daily to every other day at post intervention in Ijaiye community compared to baseline while 2.7% clean their excreta facility weekly compared to 3.3% at baseline and 56.7% do not have excreta disposal facility at post intervention as against 56.0% at baseline. While in Akufo community, 48.0% washed between

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daily and every other day as against 34.6% in baseline, while 7.3% against 4.3 at baseline cleaned weekly and 43.3% against 53.3 at baseline do not have excreta disposal facility. Overall, the findings reveal that limited toilet access, affordability challenges, and high rates of toilet-sharing are common, yet there is improvement the use of excreta disposal facility decrease in the practice of open field defaecation.

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Table 4.10: Excreta facility usage and hygiene in households of both communities

Excreta facility for household use	Ijaiye community		Akufo community	
	Pre	Post	Pre	Post
Usage of Excreta Facility				
Water closet	31	32	28	48
	20.7%	21.3%	18.7%	32.0%
Pit latrine	19	22	34	31
	12.7%	14.7%	22.7%	20.7%
Pour flush	16	11	5	6
	10.7%	7.3	3.3%	4.0%
Open field defaecation	84	85	83	65
	56.0%	56.7	55.3%	43.3%
Reason				
Cheap	13	15	4	10
	8.7%	10.0%	2.7%	6.7%
Easy to maintain	45	35	38	57
	30.0%	23.3	25.3%	38.0%
Cannot afford a better one	86	99	107	83
	57.3%	66.0%	71.3	55.3%
Toilet under construction	4	1	1	-
	2.7%	0.7%	-	
Illiteracy	2	-	-	-
	1.3%	-	-	-
Excreta facility sharing				
Share with other household	102	96	105	79
	68.0%	64.0%	70.0%	52.7
Do not share with others	45	48	43	65
	30.0%	32.0%	28.7%	43.3%
Accessibility to public				
Accessible	76	72	96	64
	50.7	48.0%	64.0%	42.7%
Not accessible to public	56	64	51	79
	37.3	42.7	34.0%	52.7%
Wash time of excreta				
Daily to every other day	57	59	52	72
	37.3%	43.3%	34.6%	48%
Weekly	5	4	6	11
	3.3%	2.7%	4.3%	7.3%
Do not have excreta facility	84	85	83	65
	56.0%	56.7%	53.3%	43.3%

Source: Researcher's fieldwork, 2022

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In Ijaiye (From Table 4.11), 24.0% of respondents at post intervention reported washing their hands before meals against 18.7% at baseline, 6.0% against 3.3% at baseline washed their hands after defaecation, and a majority 66.7% against 2.0% at baseline wash their hands before meal, after cleaning the children, and after packing faeces. While in Akufo, 37.3% of respondents at post intervention said they washed their hands before meals compared to 20.0% at baseline, 14.3% against 9.3% at baseline claimed after defaecation, and 48.3% followed a comprehensive routine of washing hands before meals, after defaecation, after cleaning children, and after packing faeces. This indicates that there is predominant handwashing behaviour that included multiple critical hygiene points.

In Ijaiye all the respondents (100%) at post intervention usually practice hand washing at different points against 98.7% at baseline. 88.0% against 77.3% at baseline wash hand with water and soap while 8.0% against 19.3% at baseline wash hand with water only. Nearly all the respondents in Akufo 99.3% at post intervention against 97.3 at baseline claimed they wash hand all the time. Among those who did wash their hands, 11.3% at post intervention used only water while 86.0% used water and soap against 72.0% at baseline. These findings demonstrate that a large proportion of respondents practiced proper hand hygiene after defaecation.

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Table 4.11: Handwashing Practice in both communities

Handwashing Practice	Ijaiye Community		Akufo Community	
	Pre	Post	Pre	Post
Moment				
Before meal	28	36	30	56
	18.7	24.0%	20.0%	37.3%
After defaecation	5	9	14	21
	3.3%	6.0%	9.3%	14.0%
Before meal, after defaecation, after cleaning the children, and after packing faeces	3	100	72	72
	2.0	66.7%	48.0%	48%
Activity				
Wash hand	148	150	146	149
	98.7%	100%	97.3	99.3%
With water and soap	116	132	108	129
	77.3%	88.0%	72.0%	86.0%
Wash with water only	29	12	34	17
	19.3%	8.0%	22.7%	11.3%

Source: Researcher's fieldwork, 2022

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In Ijaiye community (From Table 4.12), 6.0% of respondents at post intervention understood personal hygiene as bathing when compared to 4.0% at baseline, 13.3% associated it with brushing of teeth against 0.7% at baseline, while a significant majority 80.7%, a little above baseline of 80.0% described it comprehensively as bathing, haircutting or plaiting, nail cutting, cloth washing, and brushing of teeth. While in Akufo, Akufo, 6.7% of respondents against 7.3% at baseline understood personal hygiene as bathing, 2.0% as haircutting or plaiting and a majority 91.3% at post intervention described it comprehensively to include bathing, haircutting/plaiting, nail cutting, cloth washing, and brushing of teeth, this is against 58.0% at baseline.

For household hygiene, 9.3% against 8.7% at baseline in Ijaiye community understood it as sweeping the house regularly, and a large number 90.7% as against 81.3% at baseline understood household hygiene as regular sweeping, cleaning of toilets and kitchens, and proper disposal of both solid and liquid waste. Household hygiene in Akufo community, 26.0 respondents at post intervention identified it as regular sweeping as against 20.0% of respondents while a majority 80.0% identified household hygiene to include all major elements such as sweeping, cleaning toilets and kitchens, and proper solid and wastewater management.

Regarding environmental cleanliness, 72.0% of Ijaiye community cleaned their compound or environment within daily to every other day which is against 69.6% at baseline, 2.7% weekly, 24.7% twice a day which is the same as baseline. Post intervention in Akufo community reveals that 79.3% cleaned their surroundings within daily to every other day as against 70.7% at baseline, 4.0% weekly, and 16.7% twice a day. 74.7% used dumpsites, 0.7% disposed of refuse in gutters, another 0.7% used garbage pits, 22.0% burned their refuse, 0.7% disposed of waste in bushes, and 1.3% used a combination of dumpsite and burning.

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Regarding refuse disposal methods, 76.0% of respondents in Ijaiye community disposed their refuse at dumpsites against 63.3% at baseline while 24.0 burned their refuse. In the same vein, in Akufo community, 68.7% of the respondents at the post intervention claimed they dump their refuse at dump sites against 40.4% while few of them 31.3% against 61.4% at baseline burn their refuse.

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Table 4.12: Understanding of Personal and Environmental Hygiene in both communities

Understanding of Personal and Environmental Hygiene	Ijaiye Community		Akufo Community	
	Pre	Post	Pre	Post
Personal hygiene				
Bathing	6	9	11	10
	4.0%	6.0%	7.3%	6.7%
Cutting/plaiting of hairs	1	20	2	3
	0.7%	13.3%	1.3%	2.0%
Bathing, hair cutting or plaiting, nail cutting, cloth washing, and brushing of teeth	120	120	86	138
	80.0%	80.7%	58.0%	91.3%
Household Hygiene				
Sweeping the house regularly	13	14	30	39
	8.7%	9.3%	20.0%	26.0%
Regular sweeping of house, regular cleaning of toilet and kitchen, and regular disposal of solid waste and wastewater	125	136	111	120
	83.3%	90.7%	74.0%	80.0%
Habit of keeping compound or environment clean				
Daily to every other day	103	108	106	119
	69.6%	72%	70.7%	79.3%
Twice a day	37	37	29	25
	24.7%	24.7%	19.3%	16.7%
Weekly	7	4	9	6
	4.7%	2.7%	6.0%	4.0%
Refuse disposal method				
Dump site	95	114	65	103
	63.3%	76.0%	40.4%	68.7%
Burning	43	36	77	47
	28.7	24.0%	61.4%	31.3%

Source: Researcher's fieldwork, 2022

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In Ijaiye (From Table 4.13), 97.3% respondents reported observing WASH practices at post intervention against 92.6 at baseline. Among them, 75.4% at post intervention claimed they practice WASH by maintaining both personal and household hygiene as against 58.0% at baseline while 15.3% at post intervention claimed by keeping their toilets and surroundings clean. However, 6.7% respondents at baseline did not observe WASH. While in Akufo community, 90.0% respondents at post intervention said they observed WASH. Of these, 90.0% claimed they maintained both personal and household hygiene as against 87.3% at baseline. However, 8.7% of the respondents did not observe WASH as against 10.0% at baseline.

From those 66.7% respondents who faced WASH-related problems at post intervention in Ijaiye, 8.7% attributed them to insufficient water and absence of chemical for treatment as against 23.3% at baseline, 22.0% attributed it to seasonal fluctuation of water, 10.7% attributed it to lack of toilet facilities as against 21.3% at baseline and 4.0% to irregular power supply, nonchalant attitude and ignorance against 7.3% at baseline. Whereas in Akufo community, of the 49.3 respondents who experienced challenges, 15.3% blamed insufficient water and absence of chemical for treatment as against 32.0% at baseline, 7.3% to lack of toilet facilities and 9.3 attributed it to irregular power supply nonchalant attitude and ignorance.

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Table 4.13: Problems associated with the Practice of WASH among dwellers of Akufo and Ijaiye communities

Practice of WASH	Ijaiye Community		Akufo Community	
	Pre	Post	Pre	Post
Practice of WASH				
Observe WASH	139	146	131	135
	92.6%	97.3%	60.0%	90.0%
By maintaining personal and household hygiene	87	113	131	135
	58.0%	75.4%	87.3%	90.0%
By maintaining clean toilets and surroundings	5	23	16	-
	3.3%	15.3%	10.6%	-
Do not observe WASH	10	-	15	13
	6.7%	-	10	8.7%
Problem encountered during the practice of WASH				
Encountered problem	134	100	88	74
	89.3%	66.7%	60.0%	49.3%
Do not encounter problem	5	41	50	62
	3.3%	27.3%	33.3%	41.3%
Reasons for the problem encountered				
Insufficient water and absence of chemical for treatment	35	13	47	23
	23.3%	8.7%	32.0%	15.3%
Seasonal fluctuations	16	33	10	-
	10.7	22.0%	6.7	-
Lack of toilet facility	32	18	-	11
	21.3%	10.7%	-	7.3%
Irregular power supply, nonchalant attitude and ignorance	11	6	21	25
	7.3%	4.0%	9.3%	9.3%

Source: Researcher's fieldwork, 2022

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Among the Ijaiye respondents (From Table 4.14), at post intervention 27.5% claimed water scarcity and poor water supply as major difficulties to implementing WASH in their communities as against 35.3% at baseline, 38.0% claimed absence of toilet facility in their houses as against 52.7% at baseline, 6.0% claimed electricity problem and poor living condition which is the same at baseline. In comparison, the Akufo community identified similar but more nuanced constraints. 34.1% claimed water scarcity and poor water supply as contrary to 56.7% at baseline, 11.3% claimed absence of latrine facility in houses against 12.0% mentioned at baseline, 10.0% claimed electricity problem and poor living condition and 8.7% claimed no condition or difficulty.

To address these challenges, 28.0%% of the in Ijaiye community suggested the provision of toilet facilities as against 24.7% at baseline, 8.0% suggested the provision of improved water sources as against 24.7% at baseline. 8.0% suggested creation of awareness on community efforts while 9.3% recommended government intervention as against 36.6 at baseline. To resolve these challenges in Akufo, 6.7% of the respondents suggested e provision of toilet facility in all houses at post intervention as against 14.7% at baseline, while 30.0% cited provision of improved water sources against 32.7% at baseline, 10.6% suggested creation of awareness on community effortsagainst5.3% at baseline and 8.0% cited government intervention against 22.0% at baseline.

More than half, 67.5% of the Ijaiye community at post intervention believed these challenges were common to all households in the community as against 80.0% at baseline. while 48.0% of respondents of Akufo community believed they were common to all households as against89.3% at baseline.

Regarding strategies for improvement among community members, 40.7% of respondents in Ijaiye community claimed through government intervention and sensitization,13.3% claimed improvement in water sources, and 13.3% claimed community development and participation at

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post intervention. Whereas, 28.7% of respondents of Akufo community suggested government intervention and sensitization against 61.7%, 15.4% claimed provision of improved water against 15.4% at baseline and 3.3% suggested community participation and participation against 7.4% at baseline.

In Ijaiye community, 66.0% of the respondents at post intervention are willing to resolve in contrary to67.3% at baseline while 69.3% of Akufo respondents are willing to resolve at post intervention contrary to 46.7% at baseline.

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Table 4.14: Resolution to the constraints/difficulties to the implementation of WASH in households of Ijaiye and Akufo communities

Resolution of WASH	Ijaiye Community		Akufo Community	
	Pre	Post	Pre.	Post
Difficulties/constraints to the implementation of WASH				
Water scarcity and poor water supply	53 35.3%	40 27.5%	85 56.7%	51 34.1%
Absence of toilet facility in houses	79 52.7%	57 38.0%	18 12.0%	17 11.3%
Electricity problem and poor living condition	9 6.0%	9 6.0%	44 29.3%	15 10.0%
No constraint or difficulty or problem	5 3.3%	- -	1 0.7%	13 8.7%
Solutions to constraints to the implementation of WASH				
Provision of toilet facility in all households	37 24.7%	42 28.0%	22 14.7%	10 6.7%
Provision of improved water source	42 28.1%	37 24.7%	49 32.7%	43 30.0%
Creation of awareness on community efforts	1 0.7%	12 8.0%	8 5.3%	16 10.6%
Government Intervention	55 36.6%	14 9.3%	33 22.0%	12 8.0%
Commonness of constraints to households				
Yes, common all households	129 80.0%	101 67.5%	134 89.3%	72 48.0%
No, not common to all households	2 1.3%	1 0.7%	3 0.7%	2.0%
Strategies for improvement among community members				
Through government intervention and sensitization	74 62.3%	61 40.7%	96 64.7%	43 28.7%
Provision of improved water sources	10 6.7%	20 13.3%	23 15.4%	22 14.7%
Community development and participation	13 9.3%	20 13.3%	11 7.4%	5 3.3%
Willingness of members of the communities to resolve constraints				
Willing to resolve	101 67.3%	99 66.0%	70 46.7%	104 69.3%
Unwilling to resolve	5 3.3%	1 0.7	21 14.0%	1 0.7

Source: Researcher's fieldwork, 2022

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From table 4.15 above, 77.3% of the respondents in Ijaiye community said that the WASH training was beneficial. Out of the 77.3% respondents that confirmed that the WASH training was beneficial, 63.9% respondents said that the benefits of WASH enhanced knowledge of water treatment, provision of toilet accommodation and effective method of handwashing, while 6.7% respondents learnt the knowledge on provision of toilet accommodation. Also from the table, 70.0% of the respondents in Akufo said that the WASH training was beneficial. Out of this, 62.6% of them that said the WASH training was beneficial claimed that the WASH training was beneficial learnt the knowledge of water treatment, provision of toilet accommodation, and effective handwashing from the WASH training while 7.4% claimed they acquire knowledge on provision of toilet accommodation.

In conclusion, majority of the respondents in the two communities learnt the knowledge of water treatment, provision of toilet accommodation, and effective handwashing from the WASH training.

It can also be revealed in the table, 67.3% of the respondents in this community (Ijaiye) had taken steps after the training. Out of the 67.3% respondents that had taken steps after the training, 24.0% respondents made sure they treat their drinking water, 10.0% respondents took step to provide toilet facilities in their households and keeping the environment clean regularly, 12.0% of the respondents propagated the knowledge gained from the WASH training and criticise open field defaecation, 13.3% of the respondents ensured the enforcement of the practice of personal hygiene, water treatment, handwashing, and environmental sanitation while 4.0% advocating for the renovation of the public toilet in the community and 3.3% of the respondents prioritized the encouragement of community members on the construction of pit latrines among the households.

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Equally in Akufo community, 59.3% of the respondents in this community (Akufo) had taken steps after the training. Out of the 59.3% respondents that had taken steps after the training, 26.0% respondents made sure they treat their drinking water, 6.7% respondents took step to provide toilet facilities in their households and keeping the environment clean regularly, 19.3% of the respondents propagated the knowledge gained from the WASH training and criticise open field defaecation, 4.7% of the respondents ensured the enforcement of the practice of personal hygiene, water treatment, handwashing, and environmental sanitation while 2.7% advocating for the renovation of the public toilet in the community.

Also from the table, 3.3% of the respondents in Ijaiye community could not take any step after the training because they lived in a rented apartment, 2.7% of them could not take any step after the training because of low financial capability, and 1.3% of them relied on government. Likewise this in Akufo community, 6.0% of the respondents could not take any step after the training because they lived in a rented apartment, 4.0% of them could not take any step after the training because of low financial capability, and 3.3% of them relied on government.

The table also reveals 53.4% of the respondents from Ijaiye community gained the knowledge of water treatment, provision of toilet, and sanitation of the surrounding and 13.3% gained the knowledge on good human, relations, water treatment, and use of single water drawer. While in Akufo community, 51.3% of the respondents from the community gained the knowledge of water treatment, provision of toilet, and sanitation of the surrounding and 8.0% gained the knowledge on good human, relations, water treatment, and use of single water drawer.

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Table 4.15 - Effects of Educational Intervention on the Practice of WASH in Ijaiye and Akufo Communities

Outcome of WASH Intervention	Ijaiye Community		Akufo Community	
	Freq.	Percentage (%)	Freq.	Percentage (%)
Benefit of the WASH training				
Training was beneficial	116	77.3%	105	70.0%
Knowledge of water treatment, provision of toilet accommodation, and effective handwashing	96	63.9%	94	62.6%
Provision of toilet accommodation	10	6.7%	11	7.4%
Steps taken after WASH training				
Step was taken	101	67.3%	89	59.3%
Treatment of water before drinking	36	24.0%	39	26.0%
Provision of toilet and sanitation of surroundings	15	10.0%	10	6.7%
Propagation of WASH and criticism of open defaecation	18	12.0%	29	19.3%
Enforce the practice of personal hygiene, water treatment, handwashing, and environmental sanitation	20	13.3%	7	4.7%
Advocating for the renovation of the available public toilet	6	4.0%	4	2.7%
Encouraging the construction of temporary pit latrine among households in the community	5	3.3%	-	
	10	6.7%	20	13.3%
Step was not taken				
I live in rented apartment	5	3.3%	9	6.0%
Low financial capability	3	2.7%	6	4.0%
Rely on government for power supply and toilets	2	1.3%	5	3.3%
Gains from the WASH training				
Water treatment, Provision of toilet, and Sanitation of the surrounding	80	53.4%	77	51.3%
Good human, relations, Water treatment, and use of single water drawer	20	13.3%	12	8.0%

Source: Researcher's fieldwork, 202

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4.5. Comparison of the Baseline Studies and Post-Intervention Studies in the two Communities (Ijaiye and Akufo)

4.5.1. Treatment of Drinking Water and Water Hygiene

In Akufo community, treatment of drinking water increased amongst the respondents as there was increase from 45.9% during baseline studies to 89.7% post-intervention assessment (Figurer 4.1a). This signifies a 33.8% increase in the number of respondents that treat their drinking water.

In the same vein, in Ijaiye community, treatment of drinking water increased among the respondents as there was increase from 59.4% during baseline studies to 87.6% post-intervention assessment (Figure 4.1b). This signifies a 28.2% increase in the number of respondents that treat their drinking water.

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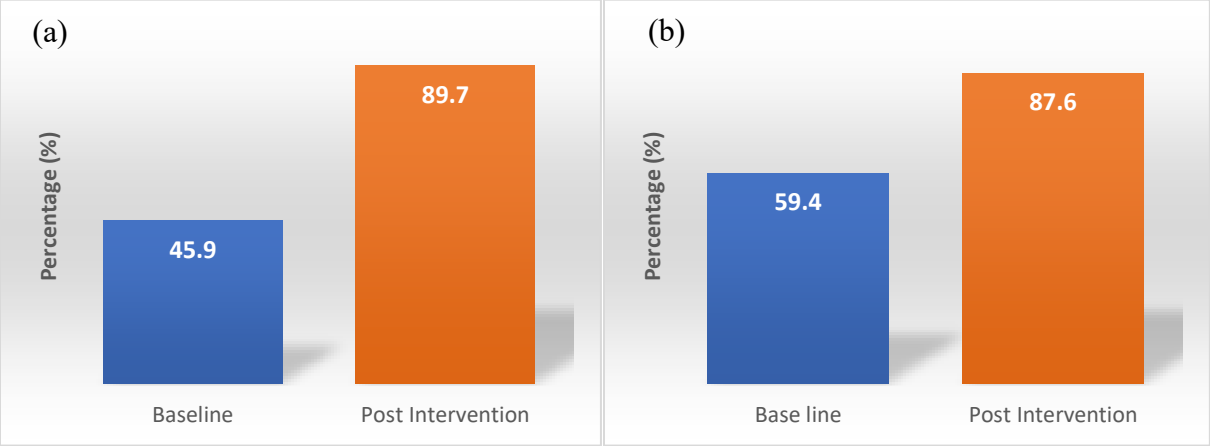


Figure 4.1: Change in the treatment of drinking water amongst (a) Akufo, and (b) Ijaiye

Source: Researcher's fieldwork, 2022

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In Akufo community, 33.8% increase in the number of respondents that treat their drinking water is accounted for by the increase in the number of respondents that are now applying some water treatment methods discussed during the intervention program. From Figure 4.2a, there was a marginal increase (0.3% increment) in percentage of respondents that boil their drinking water, there was 8.2% increase in respondents that chlorinate their drinking water, there was 18.5% increase in respondents that use alum to treat their drinking water, while there was 9.6% increase in respondent that sieve their drinking water.

In Ijaiye community, there was 28.2% increment accounted for by the increase in the number of respondents applying some water treatment methods. From the Figure 4.2b, there was a marginal decrease (3.1%) in percentage of respondents that boil their drinking water, there was a 3.9% decrease in respondents that chlorinate their drinking water, there was 6.3% increase in respondents that use alum to treat their drinking water, while 1.0% decrease in the respondents that use salt to treat their drinking water.

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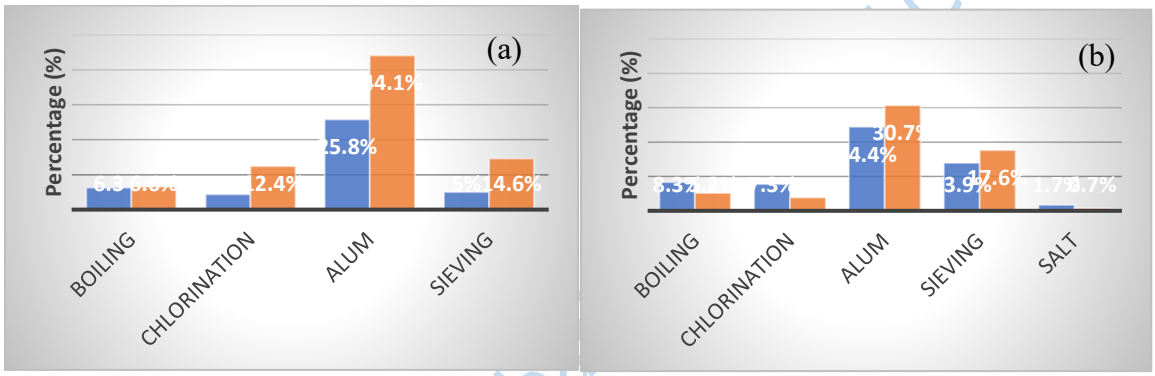


Figure 4.2: Changes in drinking water treatment methods amongst (a) Akufo, and (b) Ijaiye

(Blue represents baseline and orange stands for intervention)

Source: Researcher's fieldwork, 2022

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4.5.2. **Household Excreta Facility**

In Akufo community, there was a 9.8% increment in the use of proper excreta facility from 47.2% of the respondents during baseline assessment and 57.0% during post intervention assessment (Figure 4.3a). It was noticed that the respondents were tilted towards the use of water closet in the post intervention assessment (Figure 4.4a). This was also marked by marginal percentage decrease in the use of other excreta facility, including pit latrine, pour flush latrine, etc. The post intervention assessment also showed increase in the care of excreta facility within the respondents that participated in the study (Figure 4.5a).

In Ijaiye community, there was a 1.1% increment in the use of proper excreta facility from 43.3% of the respondents during baseline assessment to 44.4% during post intervention assessment (Figure 4.3b). It was noticed that the respondents were tilted towards the use of water closet and pit latrines in the post intervention assessment. This was also marked by marginal percentage decrease in the use of pour flush and open field defaecation (Figure 4.4b). The post intervention assessment also showed increase in the care of excreta facility within the respondents that participated in the research (Figure 4.5b).

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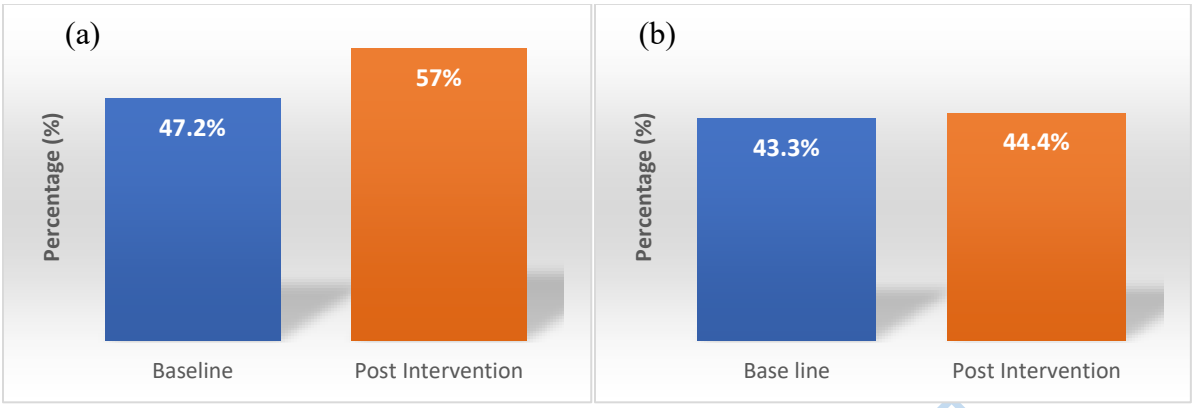


Figure 4.3: Use of excreta facility from the baseline and post-intervention assessments amongst the (a) Akufo, and (b) Ijaiye

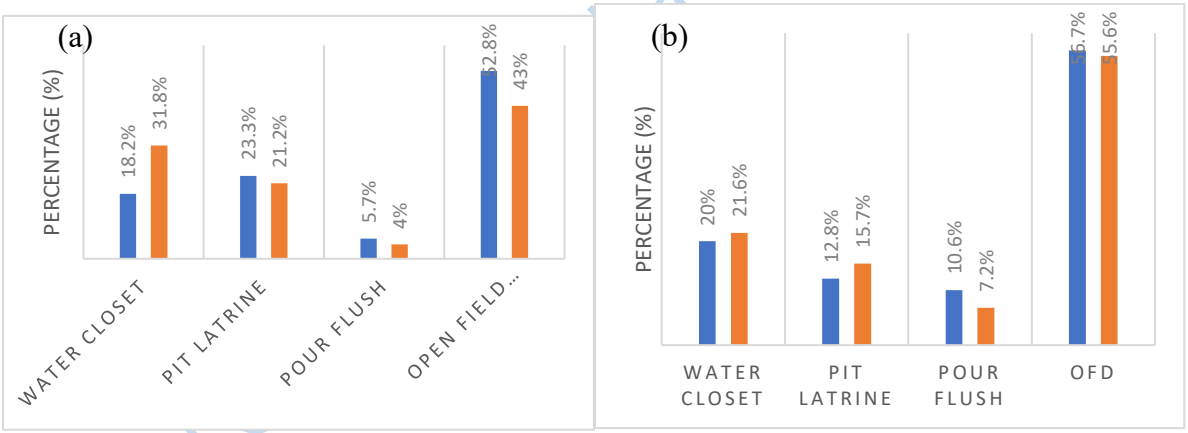


Figure 4.4: Comparison of the different excreta methods from the baseline and post intervention assessments of (a) Akufo, and (b) Ijaiye

Source: Researcher's fieldwork, 2022

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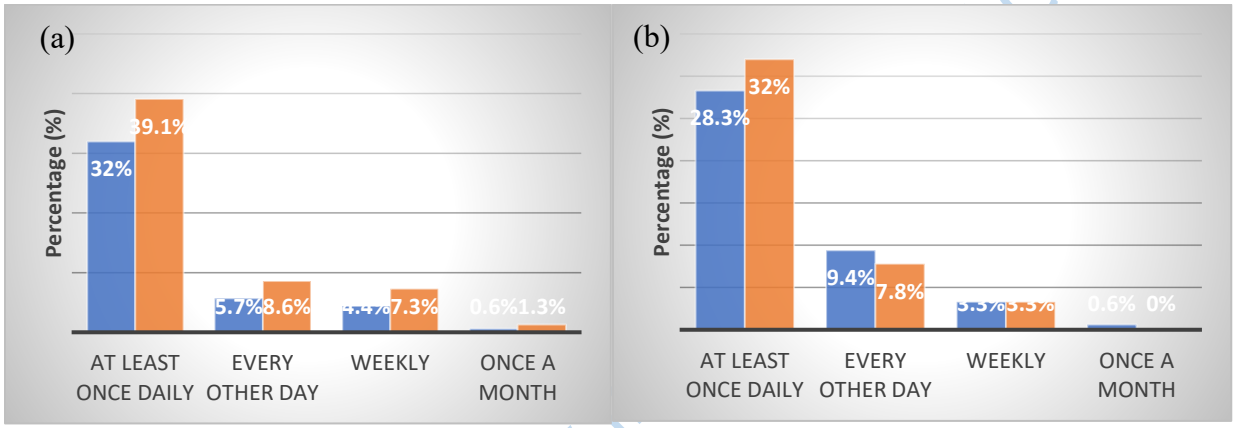


Figure 4.5: Comparison in the rate at which excreta methods were cleaned from the baseline and post intervention assessments of (a) Akufo, and (b) Ijaiye

Source: Researcher's fieldwork, 2022

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4.5.3. Practice of Personal and Environmental Hygiene

From the comparison of the baseline and post intervention assessments in Akufo, there was a 15.9% increase in the number of respondents that understood the meaning of personal hygiene (Figure 4.6a). The practice of personal hygiene was said to have increased as there was a 13.8% increase in the number of respondents that practice handwashing with water and soap (Figure 4.7a).

From the comparison of the baseline and post intervention assessments in Ijaiye, there was a 4.3% increase in the number of respondents that understood the meaning of personal hygiene (Figure 4.6b). The practice of personal hygiene was said to have increased as there was a 13.8% increase in the number of respondents that practice handwashing with water and soap (Figure 4.7b).

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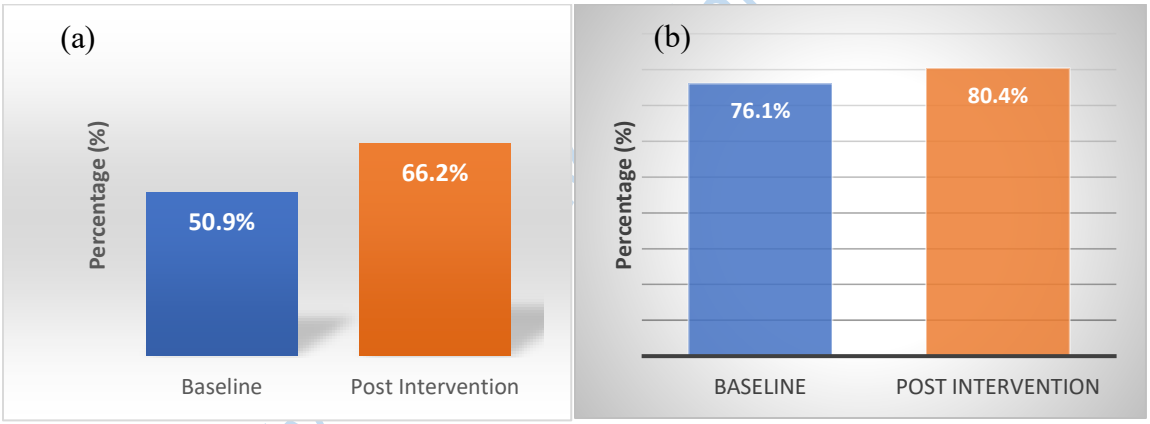


Figure 4.6: Changes in the understanding of Personal Hygiene in the (a) Akufo, and (b) Ijaiye

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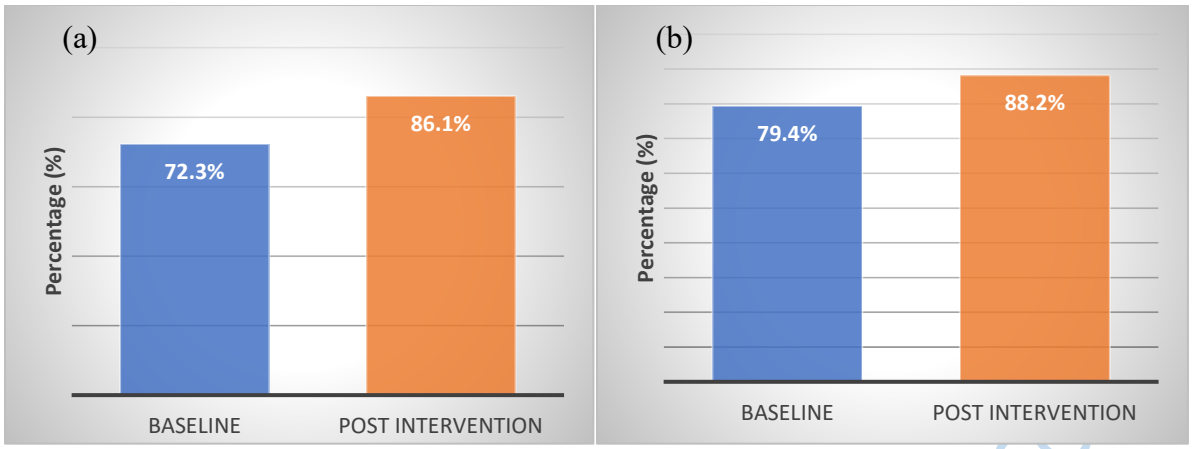


Figure 4.7: Changes in the understanding of Handwashing in the (a) Akufo, and (b) Ijaiye

Source: Researcher's fieldwork, 2022

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As relates to the households of Akufo community, post intervention assessment of the respondents revealed a 16.9% increase in the understanding of household hygiene when compared to the baseline assessment of the area (Figure 4.8a).

As relates to the households of Ijaiye community, post intervention assessment of the respondents revealed a 9.9% increment in the understanding of household hygiene when compared to the baseline assessment of the area (Figure 4.8b).

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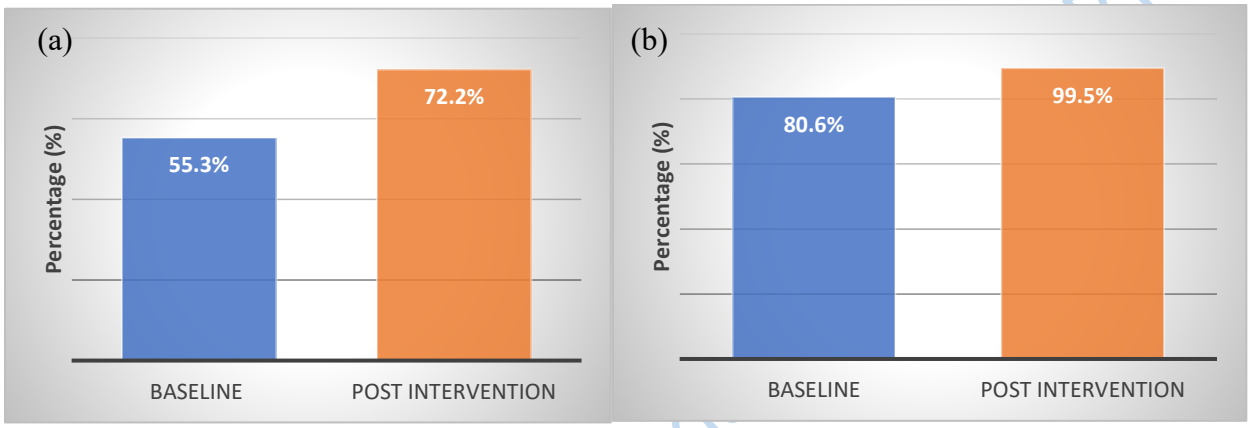


Figure 4.8: Practice of Household Hygiene (a) Akufo, and (b) Ijaiye

Source: Researcher's fieldwork, 2022

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4.5.4. Influence of Sociodemographic Characteristics on WASH Practices

This section presents results on how sociodemographic factors (age, gender, religion, marital status, education, family type, household size) influence WASH practices (water, sanitation, hygiene, and overall WASH scores) in baseline and post-intervention studies.

For dichotomous sociodemographic variables (Gender and family type), independent-sample t-test was employed to measure their influence on WASH practices. However, for the remaining sociodemographic variables ANOVA was employed to measure their influence on WASH practices at baseline and post-intervention levels. A combined look of the result is presented in table 4.17.

At baseline, there was a statistically significant relationship between the highest level of education and sanitation ($p = 0.033$) exposed by ANOVA. The Tukey post hoc analysis (Table 4.18) further revealed that those educated at the tertiary level had a mean sanitation score 27.10 ± 9.92 ($p=0.034$) lower than the uneducated and a mean sanitation score 23.68 ± 8.47 ($p=0.028$) lower than those with secondary highest level of education. This suggests that those with tertiary level of education have significantly better sanitation practices compared to the uneducated or those with secondary level of education.

Post-intervention, there was a statistically significant relationship between gender and water component of WASH evidenced by a mean difference of 11.4 ± 4.7 ($p = 0.016$) with males having a higher score compared to females (Figure 4.9). Though this means males had relatively worse water handling practices after intervention, when compared to baseline, males improved with a reduction of 18.30 in their mean water score. However, females had a 36.79 reduction in their mean water score which is twice the reduction in males. Therefore, the intervention was more effective in the female gender than male.

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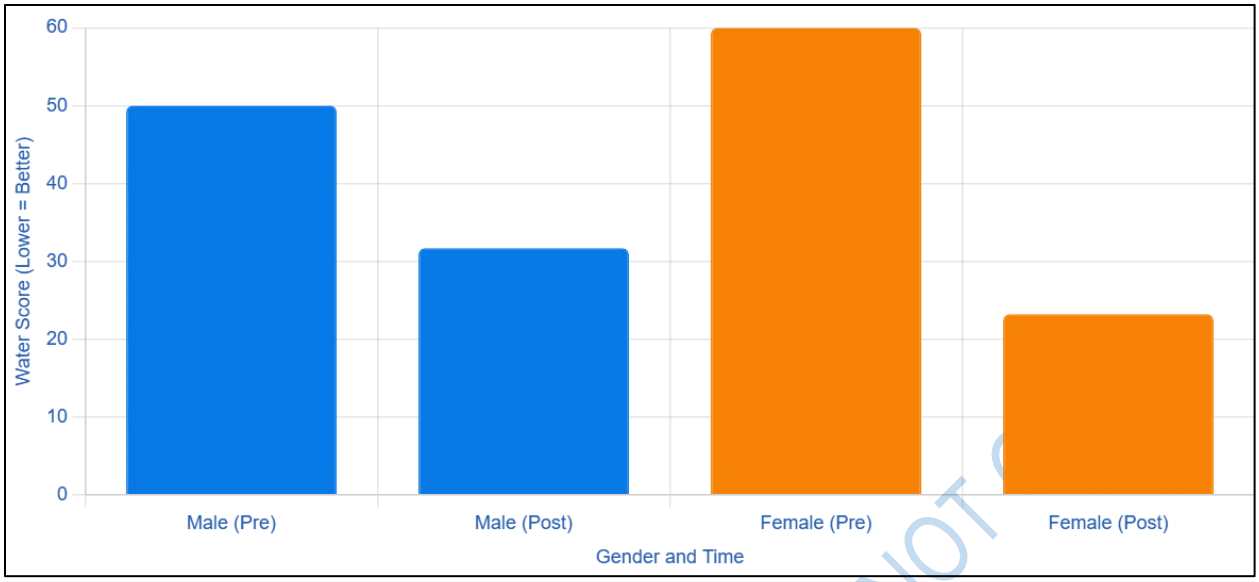


Figure 4.9: Water Score and Gender at Baseline (Pre) and Post-intervention (Post) levels

Source: Researcher's fieldwork, 2022

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Table 4.17: Socio-demographics Against Water, Sanitation, Hygiene and WASH score

Variable	Pre/Post	Water	Sanitation	Hygiene	WASH
Age groups. ANOVA: (F-score)	Pre	0.17 (p=0.953)	1.21 (p=0.306)	0.68 (p=0.604)	0.48 (p=0.751)
	Post	1.55 (p=0.189)	0.96 (p=0.428)	1.35 (p=0.251)	1.79 (p=0.131)
Gender. t-test: mean diff.	Pre	-7.1±6.0 (p=0.237)	3.6±4.8 (p=0.459)	10.6±6.4 (p=0.100)	7.1±11.9 (p=0.555)
	Post	11.4±4.7 (p=0.016) *	3.2±5.0 (p=0.521)	-2.0±6.1 (p=0.743)	13.2±12.1 (p=0.279)
Religion. ANOVA: (F-score)	Pre	0.19 (p=0.828)	0.08 (p=0.921)	1.05 (p=0.353)	0.69 (p=0.504)
	Post	0.44 (p=0.642)	0.14 (p=0.866)	0.59 (p=0.555)	0.40 (p=0.671)
Marital Status. ANOVA (F-score)	Pre	0.84 (p=0.471)	1.13 (p=0.337)	0.26 (p=0.852)	0.36 (p=0.781)
	Post	0.30 (p=828)	0.31 (p=0.818)	1.22 (p=0.301)	0.52 (p=0.669)
Highest level of education. ANOVA: (F-score)	Pre	0.29 (p=0.831)	2.95 (p=0.033) *	1.08 (p=0.360)	1.99 (p=0.116)
	Post	0.08 (p=0.971)	1.12 (p=0.342)	1.71 (p=0.165)	1.21 (p=0.307)
Type of Family. t-test: mean diff.	Pre	-9.2±6.4 (p=0.149)	1.4±5.2 (p=0.782)	5.4±7.0 (p=0.428)	-2.4±12.7 (p=0.853)
	Post	1.8±5.1 (p=0.722)	4.9±5.5 (p=0.378)	0.6±6.6 (p=0.932)	7.7±13.4 (p=0.564)
Number of household dwellers. ANOVA: (F)	Pre	1.24 (p=0.293)	2.58 (p=0.054)	0.61 (p=0.608)	1.68 (p=0.171)
	Post	1.46 (p=0.226)	0.39 (p=0.761)	0.23 (p=0.875)	0.69 (p=0.558)

Source: Researcher's fieldwork, 2022

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Table 4.18: Tukey Post-ANOVA Multiple Comparison Analysis on the Relationship between Sanitation and Highest Level of Education.

Highest Level of Education (I)	Highest Level of Education (J)	Mean difference (I–J)	Standard Error	p-value
Tertiary	None	-27.098*	9.916	.034
	Primary	-22.665	9.569	.086
	Secondary	-23.684*	8.469	.028

Source: Researcher's fieldwork, 2022

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4.5.5. **Relationship Between Health Education Awareness and WASH Practices**

Table 4.19: Effects of Health Education Against Water, Sanitation, Hygiene and WASH score

Variable	Pre/ Post	Water	Sanitation	Hygiene	WASH
Effect of health education on WASH. Correlation	Pre	-0.143 (p=0.015) *	-0.104 (p=0.08)	-0.132 (p=0.025) *	-0.134 (p=0.023) *
	Post	-0.072 (p=0.219)	-0.053 (p=0.37)	-0.065 (p=0.272)	-0.085 (p=0.148)

Source: Researcher's fieldwork, 2022

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Section E of the questionnaire measured the effect of educational intervention on WASH via 8 questions. Each question was interpreted as a Likert item. The mean of the Likert items was calculated and used as a numerical measure of the effect of educational intervention on the WASH practices of the respondents. This value was used in correlation and linear regression analyses.

At baseline (as seen in table 4.19), there were very weak but statistically negative correlations between the effect of health education awareness and water, hygiene and overall WASH represented as ($r = -0.143$, $p = 0.015$) for water; ($r = -0.132$, $p = 0.025$) for hygiene; ($r = -0.104$, $p = 0.08$) for sanitation; and ($r = -0.134$, $p = 0.023$) for overall WASH score. However, post intervention, they were no longer significant as represent in water ($r = -0.072$, $p = 0.219$), sanitation ($r = -0.053$, $p = 0.37$), hygiene ($r = -0.065$, $p = 0.272$), or overall WASH ($r = -0.085$, $p = 0.148$). Other variables in the preceding table had no statistically significant relationship with WASH and its components.

In the baseline (Table 4.19), the correlation analysis showed that **health education awareness had a very weak negative relationship** with water, hygiene, sanitation, and the overall WASH score. The correlation coefficients were small and negative—water ($r = –0.143$, $p = 0.015$), hygiene ($r = –0.132$, $p = 0.025$), sanitation ($r = –0.104$, $p = 0.08$), and overall WASH ($r = –0.134$, $p = 0.023$). Although some of these were statistically significant ($p < 0.05$), the strength of the relationships was still **weak**, and the direction indicated that **higher awareness was associated with slightly lower WASH practice scores at baseline**.

This suggests that at the beginning of the study, even though some participants were aware of WASH-related information, this awareness **did not translate into improved behaviour or practice**. In rural communities, awareness alone may not be enough to change behaviour,

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especially when environmental or structural barriers exist (e.g., lack of access to water, soap, sanitation facilities).

However, after the educational intervention, the results changed. The correlation coefficients for water ($r = –0.072$, $p = 0.219$), hygiene ($r = –0.065$, $p = 0.272$), sanitation ($r = –0.053$, $p = 0.37$), and overall WASH ($r = –0.085$, $p = 0.148$) **were no longer statistically significant**. This indicates that after participants received the intervention, the weak negative pattern previously observed between awareness and WASH practice disappeared. In practical terms, this shows that:

(i) The educational intervention **reduced the disconnect** between awareness and actual behaviour.

(ii) Participants no longer had awareness that was "just knowledge." Instead, awareness became more aligned with actual practice.

(iii) The intervention may have addressed barriers such as low self-efficacy, lack of skills, or poor perception of personal risk.

The statement that "other variables in the preceding table had no statistically significant relationship with WASH and its components" means that variables such as age, gender, marital status, and occupation **did not influence WASH practices**. This implies that the intervention was **equally effective across socio-demographic categories**, supporting the idea that WASH education can be broadly applied to different population subgroups. These findings reinforce that:

(i) Awareness alone does not change behaviour (baseline).

(ii) Education coupled with practical engagement and empowerment improves behaviour (post intervention).

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4.5.6. **Predictors of Overall WASH Practices**

This section presents the linear regression model evaluating the combined effect of sociodemographic variables, health education awareness, and intervention status on the overall WASH score.

4.20: Multiple Linear Regression Model

Parameters	Coefficient	p-value
Age	1.76	0.779
Gender	-15.38	0.079
Religion: Christianity	26.54	0.372
Religion: Islam	9.55	0.748
Marital Status: Single	-10.23	0.810
Marital Status: Married	-12.52	0.762
Marital Status: Widowed	1.32	0.976
Highest Level of Education	-13.19	0.018
Type of Family	-4.72	0.621
Number of people in Household	5.51	0.341
Section E: effects of health educational awareness on WASH	-29.32	0.012
Baseline or intervention	-54.35	<0.0005

Source: Researcher's fieldwork, 2022

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Table 4.21: Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.337[a]	.114	.095	99.870	1.674

b. Dependent Variable: WASH

Source: Researcher's fieldwork, 2022

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Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	721609.990	12	60134.166	6.029	.000[b]
	Residual	5615351.550	563	9973.981		
	Total	6336961.540	575			

a. Dependent Variable: WASH

Source: Researcher's fieldwork, 2022

A linear regression model was built to explain the relationship of the variables in table 4.22 above to WASH score, the target variable. Only 11.4% of the variance in the data is explained by this model as indicated by a R-square of 0.114. This suggests there are several other variables contributing to WASH not captured by this model. However, statistically significant ANOVA of the regression variables shows goodness of fit of the model. Highest level of education was again found to be statistically significant in predicting WASH (p=0.018) with a factor of -13. Health education predicts WASH significantly by a factor of -29 (p=0.012). Higher levels of education and more health education reduce WASH score and promote better water, sanitation and hygiene practices. The model also reveals that receiving intervention is statistically significant ($p < 0.0005$) in reducing adverse WASH practices by a factor of 54.35.

A linear regression model was developed to determine how the independent variables in Table 4.22 predict the overall WASH score. The model produced an **R-square value of 0.114**, meaning that the variables included in the model explain **11.4% of the variation in WASH practices** among participants. Although this explains only a modest proportion of the variability, it indicates that **other unmeasured factors** (such as cultural norms, household infrastructure, and environmental constraints) may also influence WASH practices. Nonetheless, the overall model was statistically significant, as indicated by the ANOVA result, demonstrating a **goodness of fit** and confirming that the predictors collectively have explanatory power. In examining individual predictors:

(i) Highest level of education was statistically significant ($p = 0.018$) with a coefficient of –13. This indicates that participants with higher levels of formal education tend to have **better WASH practices**, reflected by a reduction in WASH score (since a lower WASH score in this context represents improved practices). Education likely enhances awareness, skills, and the ability to adopt recommended behaviours.

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(ii) Health education was also a significant predictor ($p = 0.012$), with a coefficient of –29. This suggests that exposure to health education contributes to improved WASH behaviour. The negative coefficient implies that as health education increases, adverse WASH practices decrease.

(iii) Receiving the intervention showed the strongest effect ($p < 0.0005$), with a coefficient of –54.35. This provides strong evidence that participation in the WASH educational intervention **substantially improved WASH practices**. The large negative coefficient means that individuals who received the intervention demonstrated markedly better behaviour compared to those who did not.

Taken together, these findings demonstrate that:

(i) Educational attainment,

(ii) Health education exposure, and

(iii)The intervention itself

are significant predictors of improved WASH behaviour among rural dwellers. The direction of the coefficients (negative values) confirms that the intervention and education **reduce poor WASH practices**, thereby promoting safer water, sanitation, and hygiene behaviour.

These results indicate that educational interventions are effective in improving WASH practices, and that education—both formal schooling and targeted health education—plays a crucial role in enabling behaviour change. Although only 11.4% of the variation in WASH practices was explained by the model, key predictors were significant, highlighting the importance of education-based interventions in rural settings.

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4.5.7. Effectiveness of the Health Education Intervention on WASH Practices

This section evaluates the impact of a health education intervention on Water, Sanitation, and Hygiene (WASH) practices among rural dwellers in Ibadan, Oyo State, Nigeria, using a pre/post-intervention design. Data were analysed through independent samples t-tests, analysis of variance (ANOVA), correlation analysis, and multiple linear regression to assess changes in WASH component scores (water, sanitation, hygiene, and overall WASH) and the intervention's effect. Lower scores indicate improved WASH practices, consistent with the scoring system inferred from negative regression coefficients and correlations.

Pre- and post-intervention comparisons revealed notable improvements in WASH practices, particularly in water handling. Independent samples t-tests indicated a significant gender-based difference in water scores post-intervention (mean difference = 11.4, SE = 4.7, t = not reported, p = 0.016). Females exhibited a greater reduction in water scores (36.79 units) compared to males (18.30 units), suggesting that the intervention was more effective in improving water handling practices among females, despite males having higher (poorer) scores post-intervention. No significant post-intervention differences were observed for sanitation (mean difference = -2.0, SE = 6.1, p = 0.743), hygiene (mean difference = 3.2, SE = 5.0, p = 0.521), or overall WASH scores (mean difference = 13.2, SE = 12.1, p = 0.279) by gender.

ANOVA results further contextualize the intervention's impact. At baseline, education level significantly influenced sanitation scores (F = 2.95, df = not reported, p = 0.033), with Tukey post hoc tests indicating that tertiary-educated respondents had sanitation scores 27.10 (SE = 9.92, p = 0.034) lower than uneducated respondents and 23.68 (SE = 8.47, p = 0.028) lower than those with secondary education. However, this effect was not significant post-intervention (F = 1.12, p = 0.342), suggesting that the intervention may have reduced disparities in sanitation practices across education levels.

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Correlation analyses provided insights into the role of health education awareness (derived from Section E of the questionnaire). At baseline, significant negative correlations were observed between awareness and water ($r = -0.143$, $p = 0.015$), hygiene ($r = -0.132$, $p = 0.025$), and overall WASH scores ($r = -0.134$, $p = 0.023$), indicating that higher awareness was associated with better practices. Post-intervention, these correlations were no longer significant (e.g., water: $r = -0.072$, $p = 0.219$), suggesting that the intervention may have standardized awareness levels, reducing variability in its impact on WASH practices.

Multiple linear regression analysis confirmed the intervention's substantial effect on overall WASH scores (coefficient = -54.35, $p < 0.0005$), indicating a significant reduction in adverse WASH practices post-intervention. The model, which included sociodemographic variables and health education awareness, explained 11.4% of the variance in WASH scores ($R^2 = 0.114$, adjusted $R^2 = 0.095$, $F(12, 563) = 6.029$, $p < 0.001$). The intervention's effect was the strongest predictor, underscoring its efficacy in improving WASH practices.

These findings align with the WHO/UNICEF Joint Monitoring Programme (JMP) framework, as Section B of the questionnaire incorporated JMP-aligned questions (e.g., water source, sanitation facilities), enabling classification of practices into service ladders (e.g., safely managed, basic). The intervention's success in enhancing water handling, particularly among females, and reducing educational disparities in sanitation practices highlights its potential to advance WASH outcomes in rural settings. However, the low R^2 suggests that additional factors (e.g., infrastructure access) warrant further investigation.

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4.6. Report of Training Programme On Water, Sanitation and Hygiene Among People of Akufo and Ijaiye in Oyo State

The training on Water, Sanitation and Hygiene (WASH) started on 3rd October, 2023 in Akufo and Ijaiye communities in both Ido and Akinyele Local Governments and extended to 10th February, 2024. The training was carried out by a set of research team comprises of different health professionals. The procedure for the training sessions are as follows: The leaders in the two communities selected the venue for the training.

4.6.1. Introduction

The research team convened to carry out an intervention development training programme in Ido and Akinyele Local Government Areas. The intervention development team was set up to specify explicit learning objectives, consider evidence on what and how to teach, discuss, how to apply this in practice and reach consensus on training intervention components. The team consists of health-care professionals, academics, educationalists and expertise in water and sanitation.

4.6.2. Objectives

The objective for intervention development was to produce a well-described intervention with learning outcomes based on empirical research. The training was designed to update the knowledge of the participants on the importance of Water, Sanitation and Hygiene (WASH) and prevent the spread of diseases.

4.6.3. Method

Trainees for the programme were invited by the project team from various locations and households to converge in open space in front of the chief palace in Akufo and open space of community Primary School in Ijaiye communities. Both male and female adults attended the programme where female outnumbered the male participants.

Trainees were made aware that they would be required to give feedback as a group at the end of the training and they all obliged. These discussions were facilitated and noted by the research

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team; completed research measures and post-training evaluation were carried out. The core research team that delivered the training, including the lead simulator, also contributed their feedback on the intervention and the evaluation processes. The training took place on site at the selected venue where the trainees were based. Each of the training session was delivered by the research leader and moderated by two members of the core research team, with a third observing and participating as a trainee. The lead simulator acted in a supporting and observational role. Two simulators supported the evaluation scenarios and two supported the training scenarios.

4.6.4. **Materials**

Note books, pens, flipcharts, marker, plastic bowls, sieve, water, alum, water guard, burners, recorders, liquid soap, etc.

4.6.5. **Findings**

The trainees assembled at chief palace a location selected by the participants in the community (Akufo, Ido Local Government) and open space in front of the community primary school in Ijaiye. One of the research team members introduced all the members in each of the training session. The project team lead delivered a comprehensive lecture on water, sanitation and hygiene to all the participants at each of the sessions. The lecture which was divided into three segments namely; Water, its sources, uses, diseases associated with water and its purification, Sanitation with its component and Hygiene practices was delivered within fifty (50) minutes. After which practical was carried out.

Many of the participants were called out to demonstrate what they have learnt, and comprehension was established, the participants developed skills on purification of water, choice of water for household use and effective hand washing after defaecation, etc. different questions were asked, and answers were provided by the researcher at the end of each of the training (Figure 4.10).

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After the training, it was discovered among the participants that new things were learnt among which are:

i. Water from doubtful sources need to be treated to prevent infections
ii. Clean container with tight fittings cover is essential for storage of water
iii. A permanent drawer or cup is important to prevent contamination
iv. Each person at household level should use different container for drinking water to prevent the spread of faeco-oral diseases
v. Open defaecation or bush defaecation can cause the spread of faeco-oral diseases
vi. It can bring hazards from dangerous reptile to the users
vii. It can bring attacks of different forms to people especially the females, these include rape, killing, kidnapping, etc.
viii. Poor sanitation and hygiene can cause the spread of diseases
ix. All if not checked can lead to diseases and death.

Summarily, overall people in the two communities were provided with knowledge on water treatment, effective sanitation and hygiene practices. Comprehension was established and water treatment skill was also demonstrated by many of the participants in the two communities. This will help immensely at various households in preventing diseases among the people.

The training (WASH) will help to provide lifesaving, good access to clean safe water, basic sanitation facilities and promote good hygiene practices among the members of the community.

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Figure 4.10: Intervention Training

Source: Researcher's fieldwork, 2022

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4.7. Discussion of Findings

4.7.1. Socio-demographic Characteristics of the Respondents

The study focused on people in rural areas of Ibadan and their attitude towards Water, Sanitation and Hygiene (WASH) at both household and community levels. This is very important as recognized by United Nation General Assembly that claimed that every human has right to water and sanitation. Majority of them were female and Christians. This corroborated [1,2] by assertion that says, in many countries women are responsible for providing water for the households. It was noted that there was a gender disparity in fetching water, as females (93%) were largely responsible for fetching water in many areas[1,2,3].

Young persons participated greatly in the study as most of them were aged between 21 and 40 years. Yoruba was the dominant ethnic group, reflecting the geographical location of the study area, though the presence of other tribes highlighted its multi-ethnicity. Professions varied by ethnicity, with Igede/Egede people primarily farming in rural areas. Most respondents had secondary education, many of them were traders, and had households of 5 to 9 members.

4.7.2. Level of awareness of people in Ibadan rural areas on Water, Sanitation and Hygiene (WASH)

The main source of drinking water for most residents in the two local government areas where the study was carried out (Akinyele and Ido Local governments) is well water, which is also the closest water source to many households. This is in contrary to WHO's affirmation that says 159 million people depend on water from surface source like rivers and 423 million take water from unprotected springs linked to transmission of water-related diseases[4].

Water from aquifers (wells and boreholes) is predominantly used for domestic purposes beyond drinking. Many of them dry off during the dry season which is in agreement an affirmation that says[5] rural boreholes and water pumps have no water, rural water scheme/projects are deserted[5]. For most respondents, accessing water takes less than 15 minutes. However, water

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availability fluctuates seasonally, and many respondents do not treat their drinking water. Those who do treat it typically with the use of chlorine and addition of alum.

Most respondents lack private excreta disposal facilities, leading to the prevalent practice of open field defaecation. This is in line with WHO affirmation that says million women and girls globally lack adequate sanitation facilities especially for monthly hygiene. This is primarily due to the inability to build better facilities as such result to practicing open defaecation. This is supported by the World Bank Group[6] which estimated that around 90% of rural Nigerians defaecate in the open and the Leadership who affirmed that there was an increase in the number of open defaecations from 46 million in 2019 to 48 million in 2021. Among those with excreta facilities, the majority share them with other households, and these facilities are typically not accessible to the public. Despite the prevalence of open field defaecation, many respondents are willing to adopt safer disposal methods.

Those with toilets in their homes tend to clean them daily. Majority of respondents that practice WASH is primarily through personal hygiene, but more than half faced challenges in doing so. The leading issues are insufficient water availability and seasonal water fluctuations, along with unclean water, over-exploitation, unproductive wells, and faulty supply facilities. This is in accordance an assertion that says[7], Nigeria is the worst country in Africa for sanitation access due to unavailability of water for drinking and for other purposes in many homes. Non-water-related factors, such as lack of toilet facilities, ignorance, nonchalance, financial constraints, and inadequate government support, also contribute to WASH-related problems.

4.7.3. Problems that the rural dwellers in Ibadan area face in the practice of WASH

Water scarcity is the primary challenge to WASH implementation in the study area. Williams and Taiwo (2020) corroborated this through his affirmation that says a large percentage of rural communities in Nigeria live without access to safe WASH facilities[8]. This is because many of

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them lack facilities to practice WASH. Respondents believe that providing improved water sources through government and community leader interventions could address these issues. Constraints are common across households, with most respondents supporting government intervention to resolve them. While many respondents are willing to overcome WASH-related challenges, some perceive community members as unwilling due to their irresponsibility and stubbornness[9],[10]. Responsibility of fetching water is solely on women girls and this make it difficult for girls to attend school during school hours[10].

Most respondents believed that WASH knowledge improves health and prevents diseases. Adequate knowledge of WASH is important and it is in line with Freeman et. al., (2017)[11] which says that lack of knowledge on WASH is one of the most imperative causes for transmission of infectious diseases. Poor knowledge of WASH was described as unhygienic practices and poor attitudes which pollute water and spread illnesses. The respondents emphasized the need for training households on WASH practices, including water treatment, drinking safe water, and disease prevention. Respondents also supported educating communities on providing sanitary toilet facilities and promoting good hygiene practices, especially among rural dwellers[12].

Water scarcity and the absence of toilet facilities are common issues in Ijaiye community. Most respondents believed that these constraints could be resolved through government intervention, particularly from state and local governments, to provide improved water sources and excreta facilities. The majority felt that these difficulties were shared by all households and believed that government or community intervention is the best way to improve WASH in the area. Those who acknowledged the community-wide constraints also believed they could be resolved.

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4.7.4. Opinions of rural dwellers on how to resolve the difficulties/constraints in the implementation of WASH in rural area

Most respondents believed that WASH knowledge improves health and prevents diseases. They felt that households and community members should be trained on the importance of WASH, including water treatment, drinking safe water, and disease prevention. All respondents agreed that households need training on these topics, as well as on providing toilet facilities to curb disease spread. The majority also believed that knowledge of hygiene is crucial in WASH and that rural dwellers should be educated on good hygiene practices. World Health Organization affirmed a concrete intervention is required to alleviate the problems[13]. They describe the interventions to include implementation of: water safety planning; guidelines for drinking-water quality; guidelines for safe recreational water environments; guidelines for drinking-water quality; guidelines for safe use of wastewater, excreta and greywater; and sanitation safety planning to prevent exposure to excreta along the sanitation chain.

Most respondents understood personal hygiene to include bathing, haircutting or plaiting, nail cutting, washing clothes, and brushing teeth. Household hygiene was understood as regular sweeping, cleaning toilets and kitchens, and disposing of solid waste and wastewater. The majority clean their compounds once a day and dispose their refuse at communal dumpsites.

Most respondents practiced WASH by maintaining personal and household hygiene. However, many faced challenges, particularly the seasonal drying of water sources. The majority believed that seasonal water fluctuations were responsible for the difficulties they encountered while practicing WASH.

4.7.5. Influence of Sociodemographic Characteristics on WASH Practices

The study demonstrated that certain sociodemographic characteristics—specifically **gender and educational level**—significantly influenced WASH practices at different stages of the intervention.

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4.7.5.1. Gender Influence on WASH Outcomes

Post-intervention independent samples t-tests revealed a **significant gender difference in water practice scores** (mean difference = 11.4, SE = 4.7, p = 0.016). Females showed greater improvement in water handling practices than males, reflected in a larger reduction in scores among females (36.79-unit decrease) compared to males (18.30-unit decrease). Because lower scores indicate better practices in this study, this means women benefitted more from the intervention.

This result reflects the **gendered division of WASH responsibilities in rural Nigerian households**, where women and girls are primarily responsible for water collection, storage, sanitation, and hygiene activities. Women accounted for 62.7% of the participants, and their higher exposure to WASH responsibilities may have increased their receptiveness to intervention messages and provided more opportunities to apply new knowledge.

The finding supports previous studies reporting that women are more likely than men to engage with WASH interventions because they are directly involved in daily water-related tasks and therefore have a greater immediate need for improved WASH practices.

4.7.5.2. Educational Influence on WASH Outcomes

At baseline, a one-way ANOVA showed a **significant influence of education on sanitation practices** (F = 2.95, p = 0.033). Respondents with tertiary education demonstrated significantly better sanitation practices than those with no formal education (difference of 27.10 ± 9.92 points; p = 0.034). Higher educational attainment likely enhances comprehension of health information and appreciation of preventive hygiene measures.

This aligns with existing evidence that education improves sanitation adoption in low-income settings, as individuals with more schooling are better able to interpret health messages and recognize the benefits of safe sanitation behaviours.

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However, after the intervention, the effect of education **became non-significant** ($p = 0.342$). This suggests that the intervention succeeded in **reducing educational disparities** in WASH behaviour. Regardless of educational level, participants demonstrated similar sanitation practices post-intervention. In effect, the intervention served as an equalizer, enabling even respondents with low or no formal education to achieve improved sanitation outcomes.

4.7.5.3. Other Sociodemographic Factors

Other characteristics—including age, religion, marital status, household size, and family type—showed **no significant influence** on WASH outcomes. This is consistent with the assertion by Omole and Ndambuki that individual demographics often play a limited role when larger structural constraints exist. In many rural communities, lack of access to clean water sources, sanitation infrastructure, or hygiene facilities may limit behaviour change regardless of personal characteristics.

4.7.5.4. Implications

1. **Women should be prioritized as change agents** in community WASH programmes due to their central household roles.
2. **WASH interventions can bridge educational gaps**, making health knowledge accessible even to low-literacy populations.
3. **Structural/infrastructural improvements remain critical**, as demographic advantages (education, gender) cannot compensate for lack of access to safe water or sanitation facilities.

Conclusively, gender and education initially influenced WASH behaviour; however, the intervention effectively minimized these disparities, demonstrating that well-designed community-based WASH education can promote equitable behavioural change across diverse populations.

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4.7.6. Relationship Between Health Education Awareness and WASH Practices

Correlation analyses at baseline revealed **significant negative relationships** between health education awareness and WASH components—water ($r = –0.143$, $p = 0.015$), hygiene ($r = –0.132$, $p = 0.025$), and overall WASH score ($r = –0.134$, $p = 0.023$). The negative correlations indicate that **higher health education awareness was associated with better WASH practices**. In this study, lower WASH scores represented poorer practices; therefore, the negative direction implies that individuals with greater awareness were more likely to adopt safer water handling, improved hygiene behaviour, and overall improved WASH practices at baseline.

These findings are consistent with behaviour change theories such as the **Health Belief Model (HBM)**, which asserts that awareness of health risks and perceived benefits of preventive actions motivates individuals to adopt healthier practices. Respondents who understood the consequences of unsafe water and poor sanitation were more likely to engage in protective behaviours such as water treatment and handwashing.

However, following the intervention, these correlations **became statistically non-significant** (e.g., water: $r = –0.072$, $p = 0.219$). The disappearance of significant associations suggests that awareness levels improved across the entire sample due to the intervention, resulting in **reduced variability** between participants. In other words, before the intervention, awareness differentiated those who practiced good WASH behaviours from those who did not. After the intervention, awareness became widespread, meaning participants demonstrated similar levels of knowledge and practices regardless of initial awareness differences.

This shift shows that:

(i) The intervention succeeded in standardizing awareness across participants, leading to more uniform behaviour.

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(ii) Awareness was no longer the main determinant of WASH behaviour—participants had moved from knowledge acquisition to behaviour execution.

This aligns with participatory WASH education principles such as **PHAST and WHO hygiene promotion recommendations**, which emphasize that community involvement and repeated exposure to hygiene messages can lead to shared understanding and collective action. Supporting qualitative findings from the Focus Group Discussions (FGDs) highlight improved understanding of water treatment and handwashing as disease prevention strategies. Participants explicitly linked the adoption of better hygiene practices to the information received during the intervention, reinforcing the quantitative findings.

4.7.6.1. Summary

(i) At Baseline - there was significant negative correlation. Awareness influenced behaviour for those who are more aware practiced WASH better.

(ii) At Post-intervention - Correlations became non-significant. Awareness became uniform across respondents; behaviour change was widespread.

Conclusively, the loss of significant correlations post-intervention is an indication of behavioural equity achieved through education. The intervention effectively shifted WASH behaviour from being knowledge-driven (baseline) to habit-driven (post-intervention), demonstrating successful implementation of community health education strategies[13].

4.7.7. Predictors of Overall WASH Practices

The multiple linear regression model explained 11.4% of the variance in overall WASH scores among respondents ($R^2 = 0.114$, adjusted $R^2 = 0.095$, $F(12, 563) = 6.029$, $p < 0.001$). Although statistically significant, the low R^2 indicates that the predictors included in the model accounted for only a small proportion of the variability in WASH behaviour. This suggests that other important determinants of WASH practices were not captured in the model. In rural communities, WASH behaviour is not solely dependent on knowledge or demographic

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characteristics; structural and environmental factors—such as availability of water sources, access to sanitation facilities, and affordability—play decisive roles. This aligns with **UNICEF (2019)**, which reports that infrastructural limitations significantly hinder improved WASH outcomes in rural Nigeria.

Despite the low R^2, three variables emerged as **significant predictors of WASH practices**:

(i) Highest level of education (β = -13.19, p = 0.018)
Education significantly influenced WASH behaviour. Respondents with higher education levels demonstrated better WASH outcomes. This finding supports Ejemot-Nwadiaro et al. who revealed that education enhances the uptake of hygiene and sanitation practices in sub-Saharan African communities. Education increases an individual's ability to understand health messages and make informed decisions about water treatment, sanitation, and personal hygiene.

(ii) Health education awareness (β = -29.32, p = 0.012)
Awareness of health education messages was also a significant predictor of WASH behaviour. This suggests that exposure to information—through community sensitization, posters, or health personnel—has a positive impact on behavioural change. Awareness increases risk perception and encourages adoption of preventive behaviours, reflecting the core assumption of behavioural change models such as the **Health Belief Model**, which highlights perceived benefits and risk awareness as drivers of action.

(iii) Intervention status (β = -54.35, p < 0.0005)
Intervention status was the strongest predictor. Respondents who participated in the WASH intervention recorded significantly higher WASH scores than those who did not. This demonstrates that behaviour change interventions can produce measurable improvements in hygiene, sanitation, and water handling practices. The finding supports the **Participatory**

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Hygiene and Sanitation Transformation (PHAST) model (WHO, 2011), which emphasizes community involvement and participatory learning as effective strategies for improving WASH behaviour.

Interestingly, demographic factors such as **age, gender, and religion were not significant predictors** of WASH scores. Their lack of influence suggests that the educational intervention was effective across different socio-demographic groups. This agrees with regional evidence from cholera and diarrheal studies showing that WASH interventions are broadly applicable regardless of demographic characteristics, provided that enabling resources and capacity-building activities are present.

4.7.8. **Implications**

(i) The results show that **behaviour change interventions and education matter**, but they are not sufficient on their own.

(ii) **Infrastructure access remains a critical barrier**—knowledge cannot translate into behaviour where toilets, safe water sources, or handwashing stations do not exist.

(iii) Policymakers should therefore integrate **capacity-building with infrastructural investment** for sustainable WASH outcomes.

It can be concluded that, the regression analysis provides evidence that while education, awareness, and intervention significantly influence WASH behaviour, much of the variance is driven by factors beyond personal attributes—especially access to WASH infrastructure. Strengthening rural WASH systems will require a combination **of behaviour change programs and structural improvements,** consistent with global WASH strategic priorities[15].

4.5.8 Effectiveness of the Health Education Intervention on WASH Practices

The intervention led to a **significant improvement in WASH practices** among rural dwellers. Quantitative results from the regression analysis demonstrated that intervention status was a

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strong predictor of improved WASH outcomes ($\beta = -54.35$, $p < 0.0005$), confirming that participation in the WASH training produced meaningful behaviour change. Gender-specific improvements were also observed, with post-intervention t-tests showing females experienced significantly greater improvement in water handling practices compared to males ($p = 0.016$). This aligns with existing evidence that women are often the primary managers of household hygiene and water collection in rural contexts, making them more responsive to WASH interventions.

In addition, descriptive results from the survey indicated that respondents perceived the intervention to be beneficial. Specifically, 63.6% of Akufo participants found the training useful**,** and 58.7% reported adopting new WASH practices**,** including water treatment and handwashing with soap. These quantitative findings are further supported by Focus Group Discussion (FGD) narratives, where participants emphasized that improved hygiene practices help prevent diseases such as cholera. This observation aligns with **WHO data**, which confirms that handwashing with soap and improved sanitation tremendously reduce diarrheal disease burden.

Strong community acceptance of improved sanitation practices was also demonstrated, as 98.2% of respondents expressed willingness to stop open defecation**.** This level of buy-in is consistent with a finding that says community-driven WASH programs foster sustained behaviour change and ownership of sanitation improvement activities.

Importantly, the intervention was implemented in line with WHO/UNICEF Joint Monitoring Programme (JMP) indicators on safely managed drinking water, sanitation, and hygiene. Aligning with JMP benchmarks strengthens the external validity of the intervention and enhances its potential for scalability and replication across similar rural settings.

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However, despite knowledge and behaviour improvements, structural challenges persisted**,** particularly water scarcity**,** reported by 60.7% of respondents as a barrier to sustained WASH practices. This limitation echoes United Nations Sustainable Development Goal (SDG) 6**,** which stresses that health education alone is insufficient without parallel investment in water infrastructure. Thus, while behaviour and awareness improved, infrastructural constraints limited full realization of optimal WASH practices.

The findings underscore the effectiveness of health education interventions—particularly those based on the Participatory Hygiene and Sanitation Transformation (PHAST) approach—in improving WASH practices in rural Nigerian communities. By engaging community members through participatory learning and problem-solving, the PHAST model fosters ownership of hygiene and sanitation behaviours, resulting in measurable behaviour change. The results further highlight the need for gender-responsive strategies, as women play a central role in household water collection, sanitation upkeep, and hygiene practices. Targeting women, therefore, enhances both intervention uptake and household-level impact, reflecting **UNICEF's guidance on integrating gender considerations into WASH programming**[3].

Policy implications emerging from these results suggest that government and stakeholders should institutionalize WASH education through routine rural health outreach, school-based programs, and community mobilization. However, education alone is insufficient without the complementary provision of enabling infrastructure. As recommended by the Centers for Disease Control and Prevention (CDC), behavioural interventions should be paired with improvements in water supply, sanitation facilities, and handwashing stations to sustain behavioural gains over time. Such integrated interventions directly support Nigeria's progress toward Sustainable Development Goal (SDG) 6, which seeks to achieve universal access to safely managed water and sanitation by 2030.

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Conclusively, the findings demonstrate that education-based, community-centered WASH interventions are capable of improving knowledge, attitudes, and practices**,** achieving behaviour change even in low-resource communities. However, sustaining these gains requires continuous infrastructural support**,** reinforcing the need for integrated health education and infrastructure investment to achieve SDG 6.

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Chapter Five

Conclusion

This chapter focuses on the summary, conclusions and recommendations. The study addressed effectiveness of educational intervention on Water, Sanitation and Hygiene (WASH) among rural dwellers in two Local Government Areas in Ibadan area of Oyo State. These Local Government Areas include Akinyele and Ido Local Governments.

5.1 Summary of Findings

This study evaluated the effectiveness of a health education intervention on Water, Sanitation, and Hygiene (WASH) practices among rural dwellers in Akinyele and Ido Local Government Areas of Ibadan, Oyo State, Nigeria, using a pre/post-intervention survey and Focus Group Discussions (FGDs). The intervention targeted a diverse community, with a majority of female and married participants, many relying on well water and lacking private sanitation facilities. The findings revealed notable improvements in WASH practices, particularly in water handling and overall hygiene behaviours, with key insights organized around the study's research objectives.

The intervention significantly enhanced water handling practices, with women showing greater adoption of improved behaviours compared to men, reflecting their primary role in household water management. Education influenced sanitation practices at baseline, with higher-educated individuals demonstrating better habits, though the intervention reduced these disparities, suggesting its broad applicability across educational levels. Other factors, such as age, religion, marital status, household size, and family type, showed minimal influence, indicating that structural barriers like water scarcity and lack of sanitation facilities were more significant challenges.

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Health education awareness was strongly linked to better WASH practices before the intervention, but its influence diminished post-intervention, suggesting the training successfully standardized awareness across participants. The intervention itself was a key driver of improved WASH practices, with a majority of participants finding the training beneficial and adopting new behaviours, such as water treatment and handwashing. FGDs highlighted the community's recognition of these practices as critical for preventing diseases like cholera. Additionally, most respondents practicing open defaecation expressed willingness to adopt safer sanitation methods, indicating strong community buy-in.

Barriers to WASH implementation, including water scarcity and inadequate sanitation facilities, were identified through surveys and FGDs. Community members proposed solutions like improved water sources and better sanitation infrastructure, emphasizing the need for combined behavioural and structural interventions. The study's use of JMP-aligned questions ensured that findings are comparable to global WASH standards, reinforcing their relevance.

5.2 Conclusion

This study demonstrates the effectiveness of a health education intervention, likely grounded in a participatory approach, in improving WASH practices among rural dwellers in Ibadan. The intervention's success in enhancing water handling, particularly among women, and fostering community willingness to abandon open defaecation highlights its potential to address critical public health challenges. By reducing disparities in sanitation practices across educational levels, the intervention shows promise for broad applicability in rural settings.

The findings underscore the value of community-based, gender-sensitive WASH education in promoting sustainable behaviour change. However, persistent barriers like water scarcity and lack of sanitation facilities indicate that educational efforts must be paired with infrastructure improvements to maximize impact. Policymakers should integrate such interventions into rural

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health programs, prioritizing women's roles and community-driven solutions. Future research should explore long-term sustainability, incorporate different groups for stronger causal evidence, and integrate qualitative and quantitative data more robustly. These efforts will support Nigeria's progress toward equitable WASH access, reducing the burden of waterborne diseases and advancing global health goals.

5.3 Recommendations

The following recommendations are made based on the findings of this study. The recommendations are made into two phases: The community and Government:

5.3.1 The community

1. The educational intervention programme that was carried out among the community members in both communities (Ijaiye and Akufo) should be strictly followed by the participants to increase the level of their behavioural changes on Water, Sanitation and Hygiene (WASH).
2. The knowledge acquired from the training intervention on the use of permanent bucket in fetching water and water treatment at household level should be continually in use by the participants for prevention of cross and spread of infections among the family members.
3. There should be an end to open defaecation after the awareness created by the training and the households should come together to make provision for sanitary latrine accommodations with the use of locally available resources in the community.
4. Individuals should continue with handwashing practice after visiting the toilet, before and after meal to prevent the spread of faeco-oral diseases among the family members in the two communities

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5.3.2 The Government

1. There should be a public enlightenment programme for all heads of households relating to provision of adequate sources of water supply and sanitation facilities within the household level in the other communities where the intervention did not cover. This should involve the use of the electronic and print media.
2. Advocacy programmes should be planned and carried out by members of the community targeted at policy makers on the need to provide good quality water supply in the two local government areas. The Public Health effects of fetching water from unprotected sources should constitute the advocacy issues.
3. Training intervention on purification of water should also be organised and conducted for community members in the area where the training intervention did not cover most especially for girls and women in these communities. This will improve their knowledge on the treatment of water before use and ultimately give improvement on their health which will prevent diseases and prolong health and efficiency.
4. Continued public enlightenment programme on the effects of drinking polluted and contaminated water should be conducted by the government of various levels; this will create awareness on its effects and need to treat their water sources before use to prevent the spread of water- borne diseases.
5. Open defaecation should be curbed by the government through the provision of public latrine accommodation in public places like motor parks, marketplaces, etc. Locally available materials should be used in its construction.
6. There should be adequate community involvement in any programme to improve water sanitation and hygiene activities for acceptance and utilization by the community members.

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5.4 Contributions to knowledge

The contribution of this project work, effectiveness of educational intervention on water, sanitation, and hygiene (WASH) among rural dwellers in Ibadan to the body of knowledge are significant, particularly in global health, development studies, and behaviour change communication. The work provides insight into the social dynamics of hygiene adoption, adequate sanitation and effective water treatment. The Educational interventions have demonstrated that:

1. Education and awareness alone can improve practices, such as handwashing at critical times, safe water storage, and latrine use.
2. Rural communities, even with low literacy, can adopt healthier behaviours when education is tailored to their level and situations.

5.5 Suggestion for Further Studies

This work was limited to adult rural dwellers in Ibadan Oyo State, Southwest Nigeria. It is very important to extend its scope to cover many other places such Northern and Eastern parts of this nation. It therefore becomes imperative to future researchers who will be interested in WASH practice to look in the following areas.

- Examine the role of local beliefs, taboos, and social norms that can affect the adoption of Water Sanitation and Hygiene (WASH) practices.
- Investigate the long-term sustainability of behavioral changes following WASH education programs.
- Examine whether improvements in hygiene practices and sanitation behavior are maintained beyond one year after the intervention.

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- Examine the interaction between economic empowerment programs and WASH education in improving hygiene outcomes.
- Investigate the influence of socioeconomic status, literacy level, and cultural beliefs on the adoption of WASH practices.

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3.6 APPENDICES

3.6.1 Appendix I: Baseline Questionnaire

QUESTIONNAIRE **IDENTIFICATION NO _____**

EFFECTIVENESS OF HEALTH EDUCATION INTERVENTION ON WATER SANITATION AND HYGIENE (WASH) AMONG THE RURAL DWELLERS IN THE IBADAN AREA OF OYO STATE NIGERIA

Dear respondent,

My name is …….. I am a postgraduate student of the Department of Health Promotion and Education, Faculty of Public Health, Lead City University, Ibadan. This questionnaire is designed to help us learn about the effectiveness of health education intervention on Water Sanitation and Hygiene (WASH) among the rural dwellers in the Ibadan area of Oyo state Nigeria.

The information collected will be kept confidential and used for RESEARCH purposes. The questions will not take much of your time. Please, kindly share your experience with us by answering appropriately. Also be informed that there are no right or wrong answers, your kind, and sincere response will be appreciated.

Thank you for participating in this important study.

Section A: Demographic characteristics

Instruction: Please answer the following questions

1. Age in years (last birthday) _____
2. Gender A. Male ☐ B. Female ☐
3. Tribe A. Yoruba ☐ B. Hausa ☐ C. Igbo ☐ D. Others _____
4. What religion do you practice? A. Christianity ☐ B. Islam ☐ C. Traditional religion ☐ D. Other (Specify)_____
5. Marital status A. Single ☐ B. Married ☐ C. Widow ☐ D. Divorced ☐

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6. Highest Level of education A. None ☐ B. Primary ☐ C. Secondary ☐ D. Tertiary ☐ E. Arabic ☐
7. Occupation A. Farming ☐ B. Civil Servant ☐ C. Trading ☐ D. Artisan ☐ E. Food seller ☐ F. House wife ☐ G. Apprentice ☐
8. Type of Family A. Nuclear family ☐ B. Extended family ☐
9. Number of people in the household _____

Section B: Level of awareness of people in the Ibadan Area on Water, Sanitation, and Hygiene (WASH)

Instruction: (Kindly tick ☑ as applicable to you)

10. What is the main source of drinking water for members of your household? A. Well ☐ B. Pipe ☐ C. Borehole ☐ D. Stream ☐ E. Rain ☐
11. Which of these sources of water is closer to your house _____
12. What is the main source of water used by members of your household for other purposes, such as cooking and hand washing? A. Spring ☐ B. Aquifer ☐ C. Pond ☐
    D. Others (Specify)_____
13. How long does it take to go there, get water, and come back? A. <15 minutes ☐ B. >20 minutes ☐ C. Do Not Know ☐ D. No Response ☐
14. Do your source of water fluctuate seasonally? A. Yes ☐ B. No ☐ C. Do Not Know ☐ D. No Response ☐
15. How do you treat your drinking water? A. Boiling ☐ B. Chlorination ☐ C. Addition of Alum ☐ D. Sieving ☐ E. I don't treat my drinking water ☐
16. What type of excreta facility do you have in your household? A. Water closet ☐ B. Pit toilet ☐ C. Pour flush ☐ D. Others (specify)_____
17. Why is this toilet facility in use in this household? A. Cheap ☐ B. Easy to maintain ☐ C. Cannot afford to build a better one ☐
    D. Others (Specify_____
18. Do you share this facility with other households? A. Yes ☐ B. No ☐ C. Do Not Know ☐ D. No Response ☐
19. If yes, how many households do you share the toilet facility with? A. Yes ☐ B. No ☐ C. Do Not Know ☐ D. No Response ☐
20. Can any member of the public use this toilet? A. Yes ☐ B. No ☐ C. Do Not Know ☐ D. No Response ☐
21. If you are using an open field defecation method, are you willing to change and use safe means of excreta disposal? A. Yes, willing to change ☐ B. No, unwilling to change ☐ C. Do not know ☐ D. No response ☐

22. At what time do you think it becomes important to wash hands? A. Before meal ☐
    B. After defaecation ☐ C. After cleaning the children ☐ D. Faeces ☐ E. Do not know ☐ F. All of the above G. Others (specify _____
23. What do you do immediately after defecation? A. Go my way ☐ B.Wash hands ☐ C. Other things other than hand washing ☐ D. nothing ☐
24. If wash your hands after defecating, what do you use to clean your hands?

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A. Water only ☐ B. Water with soap ☐ C. Water with ashes ☐ D. Paper/cloth ☐ E. Leaves maize cobs ☐ F. Others (specify)_____

25. If you have a toilet in your house, how often is it washed (maintained)? A. On a daily basis ☐ B. Every other day ☐ C. Weekly ☐ D. Once a month ☐ E. No Response ☐
26. What do you understand by personal hygiene? A. Bathing ☐ B. Cutting of hairs ☐ C. Cutting of nails ☐ D. Washing clothes ☐ E. Brushing of teeth ☐ F. All of the above G. Others (specify) _____
27. What do you understand by household hygiene? A. Sweeping the house regularly ☐ B. Cleaning the kitchen ☐ C. Proper disposal of wastewater ☐ D. Cleaning of toilet regularly ☐ E. Proper disposal of solid waste ☐ F. All of the above ☐ G. others (specify) _____
28. How often do you keep your compound/environment clean? A. Once daily ☐ B. Every other day ☐ C. Weekly ☐ D. Twice a day ☐ E. others (specify) _____
29. How do you dispose off household refuse? A. Dump site ☐ B. Gutter ☐ C. Garbage pit ☐ D. Burning ☐ E. Others (specify) _____

<u>Section C:</u> Problems that the rural dwellers in Ibadan area face in the practice of WASH

Instruction: (Kindly tick ☑ as applicable to you)

30. Do you observe WASH? A. Yes ☐ B. No ☐ C. Do Not Know ☐ D. No Response ☐
31. If yes, how? _____
32. Do you encountered any problem in practicing WASH? A. Yes ☐ B. No ☐ C. Do Not Know ☐ D. No Response ☐
33. What kind of problem are you facing? _____
34. How does this/these problem/s occur? _____

<u>Section D:</u> Opinions of rural dwellers on how to resolve the difficulties/constraints in the implementation of WASH in the Ibadan area

Instruction: (Kindly tick ☑ as applicable to you)

35. What are the difficulties/constraints to the implementation of WASH? _____
36. In your opinion, how can these constraints be resolved?_____
37. Are these difficulties/constraints common to all the households in the community? A. Yes ☐ B. No ☐ C. Do Not Know ☐ D. No Response ☐

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38. How can these be improved among the community members? _____

39. Do you think the community members will want to resolve or remove these difficulties?
A. Yes ☐ B. No ☐ C. Do Not Know ☐ D. No Response ☐

40. If no, why? _____

Section E: Effects of Health Educational intervention on the practice of Water Sanitation and Hygiene (WASH) in the Ibadan area

S/NO	OBSERVATION	A	SA	DA	SDA	U
41.	Knowledge on WASH help to improve health of people					
42.	Practice of WASH prevent diseases					
43.	Households should be trained on importance of WASH					
44.	Community members need training on WASH					
45.	Household need to be trained on water treatment, drinking wholesome water and preventing diseases					
46.	People should be trained on provision of toilet facility to curb the spread of diseases under WASH					
47.	Knowledge of hygiene is important in WASH					
48.	Rural dwellers should be knowledgeable on good hygiene practice					

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Thank you.
Name of interviewer _____
Signature _____
Date _____

3.6.2 Appendix II: Post Intervention Questionnaire

QUESTIONNAIRE **IDENTIFICATION NO _____**

EFFECTIVENESS OF HEALTH EDUCATION INTERVENTION ON WATER SANITATION AND HYGIENE (WASH) AMONG THE RURAL DWELLERS IN THE IBADAN AREA OF OYO STATE NIGERIA

Dear respondent,

My name is …….. I am a postgraduate student of the Department of Health Promotion and Education, Faculty of Public Health, Lead City University, Ibadan. This questionnaire is designed to help us learn about the effectiveness of health education intervention on Water Sanitation and Hygiene (WASH) among the rural dwellers in the Ibadan area of Oyo state Nigeria.

The information collected will be kept confidential and used for RESEARCH purposes. The questions will not take much of your time. Please, kindly share your experience with us by answering appropriately. Also be informed that there are no right or wrong answers, your kind, and sincere response will be appreciated.

Thank you for participating in this important study.

Section A: Demographic characteristics

Instruction: Please answer the following questions

1. Age in years (last birthday) _____

7. Gender A. Male ☐ B. Female ☐
8. Tribe A. Yoruba ☐ B. Hausa ☐ C. Igbo ☐ D. Others _____
9. What religion do you practice? A. Christianity ☐ B. Islam ☐ C. Traditional religion ☐ D. Other (Specify)_____

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10. Marital status A. Single ☐ B. Married ☐ C. Widow ☐ D. Divorced ☐
11. Highest Level of education A. None ☐ B. Primary ☐ C. Secondary ☐ D. Tertiary ☐ E. Arabic ☐
12. Occupation A. Farming ☐ B. Civil Servant ☐ C. Trading ☐ D. Artisan ☐ E. Food seller ☐ F. House wife ☐ G. Apprentice ☐
13. Type of Family A. Nuclear family ☐ B. Extended family ☐
14. Number of people in the household _____

<u>Section B:</u> Level of awareness of people in the Ibadan Area on Water, Sanitation, and Hygiene (WASH)

Instruction: (Kindly tick ☑ as applicable to you)

15. What is the main source of drinking water for members of your household?
A. Well ☐ B. Pipe ☐ C. Borehole ☐ D. Stream ☐ E. Rain ☐
16. Which of these sources of water is closer to your house _____
17. What is the main source of water used by members of your household for other purposes, such as cooking and hand washing? A. Spring ☐ B. Aquifer ☐ C. Pond ☐
D. Others (Specify)_____
18. How long does it take to go there, get water, and come back? A. <15 minutes ☐
B. >20 minutes ☐ C. Do Not Know ☐ D. No Response ☐
19. Do your source of water fluctuate seasonally? A. Yes ☐ B. No ☐
C. Do Not Know ☐ D. No Response ☐
20. How do you treat your drinking water? A. Boiling ☐ B. Chlorination ☐
C. Addition of Alum ☐ D. Sieving ☐ E. I don't treat my drinking water ☐
21. What type of excreta facility do you have in your household? A. Water closet ☐
B. Pit toilet ☐ C. Pour flush ☐ D. Others (specify)_____
22. Why is this toilet facility in use in this household? A. Cheap ☐ B.Easy to maintain ☐
C. Cannot afford to build a better one ☐ D. Others (Specify_____
23. Do you share this facility with other households? A. Yes ☐ B. No ☐
C. Do Not Know ☐ D. No Response ☐
24. If yes, how many households do you share the toilet facility with? A. Yes ☐ B. No ☐
C. Do Not Know ☐ D. No Response ☐
25. Can any member of the public use this toilet? A. Yes ☐ B. No ☐
C. Do Not Know ☐ D. No Response ☐
26. If you are using an open field defecation method, are you willing to change and use safe means of excreta disposal? A. Yes, willing to change ☐ B. No, unwilling to change ☐
C. Do not know ☐ D. No response ☐
27. At what time do you think it becomes important to wash hands? A. Before meal ☐
B. After defaecation ☐ C. After cleaning the children ☐ D. Faeces ☐ E. Do not know ☐ F. All of the above G. Others (specify _____
28. What do you do immediately after defecation? A. Go my way ☐ B.Wash hands ☐
C. Other things other than hand washing ☐ D. nothing ☐
29. If wash your hands after defecating, what do you use to clean your hands? A. Water only ☐ B. Water with soap ☐ C. Water with ashes ☐ D. Paper/cloth ☐

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E. Leaves maize cobs ☐ F. Others (specify)_____

30. If you have a toilet in your house, how often is it washed (maintained)? A. On a daily basis ☐ B. Every other day ☐ C. Weekly ☐ D. Once a month ☐ E. No Response ☐
31. What do you understand by personal hygiene? A. Bathing ☐ B. Cutting of hairs ☐ C. Cutting of nails ☐ D. Washing clothes ☐ E. Brushing of teeth ☐ F. All of the above G. Others (specify) _____
32. What do you understand by household hygiene? A. Sweeping the house regularly ☐ B. Cleaning the kitchen ☐ C. Proper disposal of wastewater ☐ D. Cleaning of toilet regularly ☐ E. Proper disposal of solid waste ☐ F. All of the above ☐ G. others (specify) _____
33. How often do you keep your compound/environment clean? A. Once daily ☐ B. Every other day ☐ C. Weekly ☐ D. Twice a day ☐ E. others (specify) _____
34. How do you dispose off household refuse? A. Dump site ☐ B. Gutter ☐ C. Garbage pit ☐ D. Burning ☐ E. Others (specify) _____

Section C: Problems that the rural dwellers in Ibadan area face in the practice of WASH

Instruction: (Kindly tick ☑ as applicable to you)

35. Do you observe WASH? A. Yes ☐ B. No ☐ C. Do Not Know ☐ D. No Response ☐
36. If yes, how? _____
37. Do you encounter any problem in practicing WASH? A. Yes ☐ B. No ☐ C. Do Not Know ☐ D. No Response ☐
38. What kind of problem are you facing? _____
39. How does this/these problem/s occur? _____

Section D: Opinions of rural dwellers on how to resolve the difficulties/constraints in the implementation of WASH in the Ibadan area

Instruction: (Kindly tick ☑ as applicable to you)

40. What are the difficulties/constraints to the implementation of WASH? _____
41. In your opinion, how can these constraints be resolved? _____
42. Are these difficulties/constraints common to all the households in the community? A. Yes ☐ B. No ☐ C. Do Not Know ☐ D. No Response ☐
43. How can these be improved among the community members? _____
44. Do you think the community members will want to resolve or remove these difficulties? A. Yes ☐ B. No ☐ C. Do Not Know ☐ D. No Response ☐
45. If no, why? _____

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Section E: Effects of Health Educational intervention on the practice of Water Sanitation and Hygiene (WASH) in the Ibadan area

S/NO	OBSERVATION	A	SA	DA	SDA	U
46.	Knowledge on WASH help to improve health of people					
47.	Practice of WASH prevent diseases					
48.	Households should be trained on importance of WASH					
49.	Community members need training on WASH					
50.	Household need to be trained on water treatment, drinking wholesome water and preventing diseases					
51.	People should be trained on provision of toilet facility to curb the spread of diseases under WASH					
52.	Knowledge of hygiene is important in WASH					
53.	Rural dwellers should be knowledgeable on good hygiene practice					

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Section F: Outcomes of educational intervention on the practice of Water Sanitation and Hygiene (WASH) in the 2 selected communities

54. Have you heard of WASH? A. Yes ☐ B. No ☐ C. Do Not Know ☐
D. No Response ☐
55. If yes, where? ----------
56. Are you part of a training just concluded in this area? A. Yes ☐ B. No ☐

C. Do Not Know ☐ D. No Response ☐

57. If yes, who brought the training? ----------

58. Where did the training took place? ----------

59. Is the training beneficial? A. Yes ☐ B. No ☐ C. Do Not Know ☐
D. No Response ☐

60. If yes, how? ----------

61. Have you taken any step after the training? A. Yes ☐ B. No ☐
C. Do Not Know ☐ D. No Response ☐

62. If yes, what step ----------

63. If no, why?

Thank you.

Name of interviewer _____

Signature _____

Date _____

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3.6.3 Appendix III: FGD Guide

FGD GUIDE ON WATER SANITATION AND HYGIENE (WASH)

1. How do you get your water for the household use?
2. How far is /are this/these water source(s) to your premises?
3. What is the colour/taste of the water?
4. Why do you prefer fetching water from this/these source(s)?
5. What is your experience after each fetching?
6. Can you encourage other community members to be fetching from the same source(s)?
7. If no, why?
8. Have ever you encountered diseases after drinking water?
9. If yes, what type?
10. Do you have toilet in your house?
11. If yes, what type of toilet do you have?
12. If no, where do you defaecate when you are pressed?
13. Do you normally wash your hand?
14. If yes, when?
15. What do you wash your hand with?
16. How often do you clean your surrounding?
17. Who clean the environment in your house?
18. Do you agree that one can contact diseases from dirty environment?
19. If yes, what kind?

CHECKLIST ON WATER SANITATION AND HYGIENE (WASH)

1. Questions on the well water use as a source of water in the community

(i) Is the well sited very close to dumping site a. Yes b. No

(ii) Does the well has parapet wall a. Yes b. No

(iii) Is there apron provided around the well a. Yes b. No

(iv) Do the users of the well use a common bucket for drawing water out of the well a. Yes b. No

(v) Is the well located 100meters away from latrine accommodation a. Yes b. No

2. Questions on stream use as a source of water in the community

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(i) Is the stream section into three for the use of people and animals

a. Yes b. No

(ii) Is the upper part of the stream use for drinking of people

a. Yes b. No

(iii) Do the people use the middle part for animal

a. Yes b. No

(iv) Do the people wash their things in the lower part of the stream

a. Yes b. No

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3.6.4 Appendix IV: Letter of Introduction

Lead City University

Faculty of Public Health

Motto: Redefining Health

Ref: LCU/FPH/EXT/302 **Wednesday, August 17, 2022**

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

LETTER OF INTRODUCTION

I wish to inform you that the bearer is currently a Postgraduate student in the Faculty of Public Health, Lead City University, Ibadan.

The bearer is obliged to conduct research as one of the requirements for the award of a degree of Master in Public Health. In this regard, kindly accord any relevant information and assistance.

Thank you, and I look forward to your favorable support.

Best regards,

Dr. F. T. Akinsolu,
Head, Department of Public Health,
Lead City University, Ibadan.
Email: akinsolu.folahanmi@lcu.edu.ng
Contact Number: +2347033171050

Appendix V: Ethical Approval for this research

TELEGRAMS..... TELEPHONE.....

MINISTRY OF HEALTH

DEPARTMENT OF PLANNING, RESEARCH & STATISTICS DIVISION

PRIVATE MAIL BAG NO. 5027, OYO STATE OF NIGERIA

Your Ref. No. .....
All communications should be addressed to the Honorable Commissioner quoting
Our Ref. No. AD 13/479/193 Date 08 May 2025

NAME OF PRINCIPAL INVESTIGATOR: MUSTAPHA MUJIDAT
TITLE OF STUDY: EFFECTIVENESS OF EDUCATIONAL INTERVENTION ON WATER SANITATION AND HYGIENE AMONG RURAL DWELLERS IN IBADAN AREA OF OYO STATE, NIGERIA.
RESEARCH INSTITUTION: LEAD CITY UNIVERSITY, IBADAN.
NREC ASSIGNED NUMBER: NHREC/OYOSHRIEC/10/11/22

DATE OF RECEIPT OF VALID APPLICATION: 22/04/2025

NOTIFICATION OF EXECUTIVE APPROVAL OF PROTOCOL

This is to notify you that the Oyo State Ministry of Health Research Ethics Committee (HREC) has concluded to give executive approval to your research proposal after necessary reviews and corrections under the regulations guiding experiment in human subjects.

2. This approval is for a period of (1) one year from 06th May, 2025 to 07th April, 2026. If there is hindrance in starting this research, please inform the Oyo State HREC so that dates of approval can be adjusted accordingly. Note that no activity related to this research may be conducted outside these dates. No changes are permitted in the research without prior approval by Oyo State HREC.

3. All forms and questionnaires used in this study must carry the HREC assigned number and the duration of HREC approval. You are to note further that the National Code of Health Research Ethics requires you to comply with all Institutional guidelines, rules and regulation of the codes. Please ensure that any adverse effect from your study is quickly reported to the HREC Oyo State Ministry of Health, Ibadan.

4. You are expected to submit a **report** to this committee every three (3) months from the date of this approval. The Oyo State HREC reserves the right to conduct compliance visit on your research sites without previous notification.

5. I thank you.

Dr. Adekunle Aremu
Director, Planning, Research & Statistics
Secretary, Oyo State Research Ethics Review Committee

Bio-data

A. Personal data:

Full Name:	Bukola Mujidat Mustapha
Email Address:	kennybukolamustaper@yahoo.com
Mobile:	+2348033728651
Address:	No 12, Lane 3, Road A, Pacesette Estate, Soba Villa, off Kute way, Ibadan, Nigeria
Date and Place of Birth:	2ist March, 1968, Igbeti, Oyo State, Nigeria
Nationality:	Nigerian
Next of Kin:	Mr. Basheer A. Mustapha, +2348030431420

B. Educational Background:

School Attended	Date	Qualification
NUD Primary School, Igbeti, Oyo State	1976-1981	PSLC
UMCA Secondary Gram School, Igbeti	1982 -1987	WASCE
Oyo State College of Health Science and Technology, Ibadan, Oyo State	1990-1993	HND Environmental Health
University of Ibadan, Ibadan, Nigeria	1997-1998	Diploma, Tutor of Health Sciences
University of Ibadan, Ibadan, Nigeria	2001-2005	BSc Health Education

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University of Ibadan, Ibadan, Nigeria	2008-2015	MPH (HPE)
Ladoke Akintola University of	2011-2013	MEHM (Public Health)

C. Work Experience

Director (Environmental Health Tutor, UCH, Ibadan)	2007 till date
Assistant Director Environmental Health Officer	March 2006 – August 2007
Akinyele Local Government, Ibadan	
Chief Environmental Health Officer	2004 – 2006
Oluyole Local Government IBadan	
Assistant Chief Environmental Health Officer	2001 – 2004
Ibadan South-west Local Government, Town planning	
Principal Environmental Health Officer	1996 – 2001
Ogbomoso South Local Government	
Environmental Health Officer	1993 - 1996

D. Awards (if any):

- Best Graduating Student, Environmental Health Officer Tutors Course, UCH, Ibadan

E. Professional Membership:

- Member, West African Post Graduate College of Environmental Health

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- Member, Environmental Health Officers Association of Nigeria (EHOAN)
- Member, Environmental Health Officers Association of Nigeria (EHOAN) Southwest Chapter
- Member, Environmental Health Officers Association of Nigeria (EHOAN) Oyo State Chapter
- Member, Environmental Health Scientist Association of Nigeria (EHSAN)
- Member, Environmental Health Council of Nigeria (EHCON)
- Member, Medical and Health Workers Association of Nigeria (MAHWAN)
- Member, Environmental Health Tutors Welfare Association of Nigeria (ETHWAN)
- Member Health Education and Promotion Association of Nigeria

F. Publications (if any):

- Mustapha Bukola Mujidat, Arulogun O, Akinsolu F, Aduroja P, Mustapha H.A,

Assessing Awareness and Challenges of Water, Sanitation, and Hygiene (WASH) Practices Among Rural Dwellers in Ibadan, Nigeria. An abstract accepted for publication in the International Journal of Health and Medical Information Volume 8 No 2 of 2025 Edition

- Mustapha Bukola Mujidat, Arulogun O, Fadekemi, Mustapha A.H,

Assessment of Water Sanitation and Hygiene (WASH) Practices in Rural Ibadan, Oyo State, Nigeria. A paper accepted for presentation at the 2nd Lead City University Postgraduate Conference, 2025

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G. Major Conferences Attended with Dates:

(i) 8th South West Conference/Scientific Workshop in collaboration with Environmental Health Council of Nigeria (EHCON) by Environmental Health Officers Association of Nigeria (EHOAN) 21 – 24 July, 2025

(ii) 7th South West Conference and Scientific Workshop of Environmental Health Officer Association of Nigeria. 2023

(iii) 5th Annual Scientific Virtual Conference and Congress organized by WAPCEH in collaboration with WAHO 27 November, 2020

(iv) 4th Scientific Symposium "GHANA 2019" organized by WAPCEH in collaboration with WAHO 18 – 22 November, 2019

(v) 2019 Triennial National Conference by Environmental Health Teachers Welfare Association of Nigeria (EHTWAN) 29 – 30 October, 2019

(vi) 2nd Annual Scientific Conference of Health Promotion and Education Alumni Association, Ibadan College of Medicine. September, 24 – 26, 2024

(vii) Scientific Workshop on Workforce and Budgeting, Kano Nigeria. 1st September – 5th, 2025

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H. References:

- Prof. Oyedunni S. Arulogun

Vice Chancellor

Chrisland University, Ogun State, Nigeria

Mobile: +2348035794630

Email: oyedunniarulogun@gmail.com

- Prof. S. A. Ojewale

West Africa Postgraduate College of Environmental Health

Oyo State Zonal Office

Mobile: 08035696616

Email: saojewal@yahoo.com

- Mrs. Adedeji I. Adetola

Director, Nurse Tutors Programme

University College Hospital, Ibadan

E-mail: toppy4me2003@yahoo.co.uk

Mobile: +2348023360014

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The University Compliance Certificate

This is to certify that the thesis by Bukola Mujidat MUSTAPHA with the matriculation number LCU/PG001918 in the Department of Public Health, Faculty of Medical and Applied Sciences, Lead City University, Ibadan is in full compliance with the University format and style of Thesis.

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_____ _____

Signature Date

Lead City University Ibadan DO NOT COPY

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