

**ASSESSMENT OF WATER, SANITATION, AND HYGIENE (WASH)
PRACTICES AMONG NURSING MOTHERS ATTENDING
IMMUNIZATION CLINIC IN UNIVERSITY OF BENIN TEACHING
HOSPITAL (UBTH)**

BY

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PUBLIC HEALTH AND COMMUNITY MEDICINE

SCHOOL OF MEDICINE

COLLEGE OF MEDICAL SCIENCES

UNIVERSITY OF BENIN

BENIN CITY, NIGERIA

MAY, 2026

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SUPERVISED BY: PROF. ANDREW OBI

**A RESEARCH PROPOSAL SUBMITTED TO THE DEPARTMENT OF
PUBLIC HEALTH AND COMMUNITY MEDICINE,
SCHOOL OF MEDICINE,
COLLEGE OF MEDICAL SCIENCES,
UNIVERSITY OF BENIN,
BENIN CITY, NIGERIA.**

**IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE
AWARD OF BACHELOR OF MEDICINE, AND BACHELOR OF
SURGERY (MBBS) DEGREE**

MAY, 2026

DECLARATION

I declare that this research project titled “**Assessment of Water, Sanitation, and Hygiene (WASH) Practices Among Nursing Mothers Attending Immunization Clinics in the University of Benin Teaching Hospital (UBTH)**”, submitted to the Department of Community Medicine, is a record of original work conducted by me under the guidance of Prof. A. I. Obi. I further declare that the information and data presented in this report were authentic, and that this project report will not be submitted, either in part or in full, to any other university or institution for the award of any degree, diploma, or fellowship, nor will it be published at any time before submission.

Orobosa Evelyn Igbiosa

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Date

CERTIFICATION

This is to certify that this research project titled “**Assessment of Water, Sanitation, and Hygiene (WASH) Practices Among Nursing Mothers Attending Immunization Clinics in the University of Benin Teaching Hospital (UBTH)**” was carried out by **Orobosa Evelyn Igbiosa**, matriculation number **MED1807415**, under the supervision of Prof. A. I. Obi, in the Department of Public Health and Community Medicine, College of Medical Sciences, University of Benin, Benin City, Nigeria, in partial fulfillment of the requirements for the award of the Bachelor of Medicine, Bachelor of Surgery (MBBS) degree.

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DEDICATION

This work is dedicated first and foremost to God Almighty, whose grace, mercy, wisdom, and strength made this journey possible.

It is also lovingly dedicated to my beloved son, Seal Ehidiamen Oriaifo, whose presence has been a source of joy, strength, inspiration, and motivation throughout this journey.

I also dedicate this work to the loving memory of my late sister, Precious Igbinosa, whose memory remains forever cherished in my heart. I believe she would have been proud of how far I have come and all that I have achieved.

May this achievement stand as a testament to hard work, perseverance, and the faithfulness of God.

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IGBINOSA OROBOSA EVELYN

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LIST OF ABBREVIATIONS

ARI	Acute Respiratory Infection
DALYs	Disability-Adjusted Life Years
FSM	Fecal Sludge Management
HBM	Health Belief Model
HIV	Human Immunodeficiency Virus
LMICs	Low- and Middle-Income Countries.
NGO	Non-Governmental Organization
SDGs	Sustainable Development Goals
SPSS	Statistical Package for the Social Sciences
TPB	Theory of Planned Behaviour
UBTH	University of Benin Teaching Hospital
UNICEF	United Nations Children’s Fund
WASH	Water, Sanitation, and Hygiene
WHO	World Health Organization
WinS	WASH in Schools

OPERATIONAL DEFINITIONS OF TERMS

Water, Sanitation, and Hygiene (WASH): A combination of interventions and practices involving safe water supply, proper sanitation, and good hygiene behaviours aimed at improving health and preventing diseases.

Nursing Mothers: Women who are breastfeeding and caring for infants or young children, particularly those aged 0–24 months.

Immunization Clinic: a healthcare facility or unit where vaccines are administered to infants and children to protect them against vaccine-preventable diseases.

Handwashing: The act of cleaning the hands using soap and water to remove dirt, germs, and microorganisms that may cause infections.

Sanitation: Facilities and practices used for the safe disposal of human waste and maintenance of hygienic environmental conditions.

Hygiene: Personal and environmental practices carried out to maintain health and prevent the spread of diseases.

Diarrheal Disease: A condition characterized by the frequent passage of loose or watery stools, commonly caused by infections associated with poor hygiene and contaminated food or water.

Acute Respiratory Infection (ARI): Infections affecting the respiratory tract, including illnesses such as pneumonia and bronchitis, which may be worsened by poor hygiene practices.

Safe Drinking Water: Water that is free from harmful microorganisms, chemicals, and contaminants and is suitable for human consumption.

Open Defecation: The practice of passing feces in open spaces such as fields, bushes, or water bodies instead of using toilets or latrines.

Household WASH Practices: Behaviours carried out within the home relating to water handling, sanitation, waste disposal, hand hygiene, and environmental cleanliness.

Health Education: Activities designed to improve knowledge and influence behaviours that promote health and prevent diseases.

Under-Five Children: Children between birth and five years of age who are particularly vulnerable to infectious diseases and poor environmental conditions.

Fecal–Oral Transmission: The spread of infectious organisms from feces to the mouth through contaminated hands, food, water, or objects.

Environmental Hygiene: Measures aimed at maintaining a clean and healthy environment through proper waste disposal, sanitation, and cleanliness practices.

ABSTRACT

Background: Poor water, sanitation, and hygiene (WASH) practices remain a major public health concern in Nigeria and contribute significantly to morbidity and mortality among children under five years of age. Nursing mothers play a critical role in preventing infections such as diarrhea and acute respiratory infections through appropriate hygiene behaviours. Despite the importance of immunization clinics as contact points for maternal and child health education, limited data exist on the WASH practices of nursing mothers attending these facilities. This study aims to assess the knowledge, attitudes, and practices regarding WASH among nursing mothers attending immunization clinics at the University of Benin Teaching Hospital (UBTH), Benin City.

Methods: An analytical cross-sectional design was employed. The study population were nursing mothers with children aged 0–24 months attending the immunization clinic during the study period. A sample size of 229 participants was determined using Cochran's formula, with adjustment for non-response. Systematic random sampling was used to select respondents. Data was collected using a structured, interviewer-administered questionnaire adapted from validated WASH assessment tools. The instrument assessed sociodemographic characteristics, knowledge of WASH, attitudes toward hygiene practices, household WASH behaviours, influencing factors, infant feeding practices, and history of diarrhea. Data was analyzed using SPSS version 27.0. Descriptive statistics and chi-square tests was used to examine associations between variables, with significance set at $p < 0.05$. The findings provided evidence on existing WASH practices and associated factors among nursing mothers, and informed targeted interventions aimed at reducing hygiene-related infections and improving child health outcomes in the study setting.

Results: Mean age of respondents was 27.70 ± 2.72 years. Overall, 48 (20.9%) had good knowledge, while 182 (79.1%) had poor knowledge of WASH. Attitude was positive in 160 (69.6%) and negative in 70 (30.4%). 162 (70.4%) had good WASH practice, while 68 (29.6%) had poor WASH practice. Satisfactory water-related practice was observed in more than three-fifths of respondents, satisfactory sanitation practice in about three-quarters, and satisfactory hygiene practice in three-fifths. Major

factors influencing WASH practice included household support, affordability of hygiene products, cultural practices, and health education from health workers. Logistic regression showed affordability of hygiene products as the only independent predictor of good WASH practice (OR = 0.429; 95% CI = 0.219–0.841; $p = 0.014$).

Conclusion: Good WASH practice was high among nursing mothers attending immunization clinic in UBTH, despite poor knowledge among most respondents. Affordability of hygiene products significantly influenced practice, highlighting the need for continuous health education and economically sensitive WASH interventions.

Keywords: *Water, Sanitation and Hygiene (WASH); Nursing Mothers; Immunization Clinic; Diarrhea; Child Health*

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Hand washing with soap and water is one of the most effective ways to prevent infectious diseases. It reduces the risk of diarrhea by 50% and respiratory infections by about 25%.¹ Hand washing at critical moments, such as after visiting the toilet, after wiping a child following defecation, before cooking, and before and after meals, is very important in disease prevention.² These activities are primarily carried out by nursing mothers, who care for children daily, dispose of garbage, and prepare meals. Their hands may harbor germs which may, in turn, cause diarrhea, respiratory infections, and other diseases among children during interaction.³

Globally, diarrhea and acute respiratory infections are among the leading causes of death in children under five years of age. The World Health Organization (WHO) estimates that about 3.8 million children die annually from these preventable diseases.⁴ Many of these deaths could be prevented through WASH interventions, such as improving access to clean water, sanitation, and hygiene practices. Proper hand washing with soap alone can avert an estimated 170,000 child deaths from diarrhea and pneumonia each year.⁵ However, in many communities, hand washing with soap remains low. Studies show that globally, hand washing with soap occurs in only 0–34% of situations where it is required.^{4,6} In developing countries, including Nigeria, these figures are often lower, especially in rural areas where access to clean water and hygiene facilities is limited.⁷

Poor WASH practices remain a major burden in Nigeria. Recent reports indicate that only 33% of households have access to improved sanitation facilities, and only 20% of the population practice hand washing with soap at critical moments.⁸ These poor hygienic conditions contribute significantly to deaths among children under five due to diarrhea and

respiratory diseases. Nursing mothers, who are responsible for childcare and maintaining household hygiene, play a crucial role in improving child health through better WASH practices.⁹

The WASH services play an important role in preventing and controlling infections at the health facilities. Immunization centres, where mothers with young infants spend considerable time, provide an important setting to promote proper hand washing and hygiene practices. Poor hygiene in these facilities may expose both children and mothers to healthcare-associated infections.¹⁰ Nevertheless, studies in Nigeria and other low- and middle-income countries show that hand washing facilities in many healthcare settings are inadequate, and that many mothers do not practice proper hygiene even when water and soap are available.^{10,11}

Previous initiatives in Africa have demonstrated that community health programs can improve hygiene practices. For example, the Ethiopian Health Service Extension Package trained households to adopt model hygiene behaviours, including latrine use and safe water handling practices.¹² These interventions resulted in improved latrine coverage, reduced diarrhea among children, and more frequent use of maternal and child health services.¹³ A similar strategy may be used in Nigeria, particularly in urban hospitals, to promote hand washing behaviour among nursing mothers attending immunization services.

Hand washing is especially important for nursing mothers, as they directly influence their children's risk of infection. Handling baby food, cleaning the infants and feeding children are some of the activities that offer chances of the fecal-oral disease transmission in case hygiene is compromised.¹⁴ Although many mothers understand the importance of hand washing, compliance is not always consistent, particularly during challenges such as water scarcity, lack of soap, limited education, and cultural practices.^{4,15}

1.2 Statement of the Problem

Poor water, sanitation, and hygiene (WASH) practices remain a major contributor to preventable morbidity and mortality globally, particularly among children under five years of age. According to the World Health Organization (WHO), unsafe water, inadequate sanitation, and poor hygiene are responsible for approximately 1.4 million deaths annually and over 74 million disability-adjusted life years (DALYs) worldwide.^{16,17} Diarrhoeal diseases alone account for over one million deaths yearly, with a substantial proportion occurring among children in low- and middle-income countries.¹⁸ In 2017, about 2.3 billion people globally lacked basic sanitation services, while approximately 844 million people did not have access to safe drinking water.¹⁹ Despite global improvements in healthcare, WASH-related illnesses such as diarrhoea, acute respiratory infections, intestinal helminthiasis, cholera, and typhoid fever continue to affect millions of children, especially in sub-Saharan Africa and South Asia.^{17,20}

Sub-Saharan Africa bears a disproportionate burden of WASH-related diseases due to poverty, rapid urbanization, inadequate infrastructure, and limited access to safely managed sanitation and hygiene services. WHO reports indicate that between 66% and 76% of diarrhoeal diseases in Africa are attributable to unsafe WASH conditions.²⁰ In many African countries, open defecation, unsafe disposal of child faeces, poor handwashing practices, and inadequate household water treatment remain common.²¹ Furthermore, healthcare facilities in the region frequently lack functional handwashing stations, safe water supply, and adequate sanitation systems, increasing the risk of healthcare-associated infections among mothers and children.^{21,22} Studies conducted in Ethiopia, Kenya, have shown that although many mothers possess some knowledge regarding hygiene practices, consistent implementation remains poor because of economic hardship, water scarcity, poor sanitation infrastructure, and sociocultural barriers.^{12,13,23,24}

Nigeria continues to experience substantial WASH-related public health challenges. National reports indicate that only about 33% of households have access to improved sanitation facilities, while only about 20% of Nigerians practice handwashing with soap at critical times.⁸ In addition, millions of Nigerians still rely on unimproved water sources, unsafe water storage practices, and inadequate sanitation systems. Open defecation remains widespread in many communities despite ongoing national campaigns aimed at eliminating the practice. Poor WASH conditions contribute significantly to the persistence of diarrhoeal diseases, typhoid fever, intestinal worm infestations, malnutrition, and respiratory tract infections among Nigerian children. Studies have shown that diarrhoeal disease remains one of the leading causes of morbidity and mortality among under-five children in Nigeria, with repeated episodes negatively affecting growth, nutritional status, cognitive development, and school performance.^{17,19,25-27}

Nursing mothers play a critical role in the prevention or transmission of WASH-related infections because they are primarily responsible for breastfeeding, preparation of infant food, water handling, cleaning of children, household sanitation, and maintenance of environmental hygiene.^{3,9,14} Improper handwashing before breastfeeding or food preparation, unsafe disposal of child faeces, poor water handling practices, and inadequate environmental cleanliness increase the risk of faecal–oral transmission of infectious organisms to infants and young children.^{1,2} Children under five years are particularly vulnerable because of their immature immune systems, dependence on caregivers, and frequent exposure to contaminated environments through crawling, feeding, and hand-to-mouth activities.^{17,19}

Although immunization clinics provide regular opportunities for health education and interaction between healthcare workers and mothers, there is evidence that many nursing mothers still demonstrate poor hygiene behaviours despite attending health facilities.^{10,11} Previous studies in Nigeria and other low- and middle-income countries have reported inconsistent handwashing practices, poor household sanitation, unsafe water storage, and

inadequate food hygiene among mothers caring for young children.^{28,29} However, many of these studies focused mainly on isolated hygiene behaviours such as handwashing alone and did not comprehensively assess broader WASH practices and the factors influencing them.

Furthermore, there is limited local evidence assessing the knowledge, attitudes, practices, and influencing factors relating to WASH among nursing mothers attending immunization clinics in tertiary healthcare settings such as the University of Benin Teaching Hospital (UBTH). Most available Nigerian studies have been community-based or conducted in rural settings, with relatively few studies focusing specifically on mothers attending urban tertiary healthcare institutions where repeated maternal-child health interactions occur. In addition, there is inadequate local data examining how socioeconomic conditions, affordability of hygiene materials, environmental constraints, cultural beliefs, and healthcare-related factors influence WASH practices among nursing mothers within this environment.

Without adequate local evidence, it becomes difficult for healthcare administrators, policymakers, and public health professionals to design targeted interventions aimed at improving maternal hygiene practices and reducing the burden of WASH-related childhood illnesses. Therefore, this study seeks to assess the knowledge, attitudes, and practices relating to water, sanitation, and hygiene among nursing mothers attending immunization clinics in the University of Benin Teaching Hospital, Benin City. The study will also identify factors influencing these practices and generate evidence that may guide the development of effective WASH promotion strategies, maternal health education programmes, and preventive interventions aimed at improving child health outcomes and reducing hygiene-related diseases among children under five years.

1.3 Justification of the Study

Water, sanitation, and hygiene (WASH) practices are essential components of disease prevention and child survival. Poor WASH practices remain major contributors to morbidity

and mortality among children under five years, particularly in low- and middle-income countries such as Nigeria. Diseases such as diarrhea, cholera, typhoid fever, intestinal worm infestations, and acute respiratory infections continue to pose serious public health challenges despite being largely preventable through proper hygiene practices, access to clean water, and adequate sanitation. Nursing mothers play a vital role in maintaining household hygiene and protecting children from these preventable diseases because they are directly involved in feeding, bathing, cleaning, and caring for infants and young children. Therefore, assessing WASH practices among nursing mothers is important in understanding factors that influence child health and disease prevention.

Although several public health interventions and awareness campaigns have been implemented to improve hygiene practices in Nigeria, evidence suggests that compliance with recommended WASH practices remains inadequate in many households. Studies have shown that while some mothers possess good knowledge of hygiene practices, this knowledge does not always translate into proper practice. Factors such as poverty, poor access to clean water, inadequate sanitation facilities, overcrowding, cultural beliefs, irregular water supply, and limited environmental support may hinder the adoption of safe hygiene behaviours. Consequently, many children remain exposed to preventable infections associated with poor environmental and personal hygiene.

Immunization clinics provide an important opportunity for healthcare workers to interact regularly with nursing mothers. During immunization visits, mothers receive health talks and counseling on childcare, breastfeeding, nutrition, and disease prevention. These clinics therefore serve as strategic points for promoting proper WASH practices and reinforcing healthy behaviours among mothers. However, despite the importance of immunization clinics in maternal and child healthcare, there is limited information regarding the actual WASH practices of nursing mothers attending these facilities, especially within tertiary healthcare institutions such as the University of Benin Teaching Hospital (UBTH). Most available

studies have focused mainly on rural communities or general household hygiene practices, with fewer studies specifically assessing mothers attending immunization clinics in urban healthcare settings.

This study is therefore important because it will provide relevant local data on the knowledge, attitudes, and practices of nursing mothers regarding water, sanitation, and hygiene. The findings will help identify gaps in hygiene knowledge and areas where unsafe practices still exist among mothers attending immunization clinics in UBTH. It will also provide insight into the socio-cultural, environmental, and economic factors influencing WASH practices among nursing mothers. Understanding these factors is necessary for developing realistic and culturally appropriate interventions aimed at improving hygiene behaviours and reducing preventable childhood illnesses.

In addition, the study will contribute to efforts aimed at reducing the burden of diarrheal diseases and respiratory infections among children under five years. Since nursing mothers are primary caregivers, improving their hygiene practices can significantly reduce exposure of children to infectious agents transmitted through contaminated hands, unsafe water, poor sanitation, and unhygienic feeding practices. Better WASH practices among mothers may therefore improve child health outcomes, reduce hospital visits, decrease healthcare costs, and lower child morbidity and mortality rates.

The findings of this study will also be useful to healthcare workers, policymakers, public health professionals, and hospital administrators. The results may guide the planning and implementation of targeted health education programs, behavioural change interventions, and WASH promotion strategies within immunization clinics and other maternal and child health services. Furthermore, the study may provide baseline information for future research on maternal hygiene practices and child health outcomes within the study area and similar settings.

Finally, this study aligns with global and national public health priorities, including the Sustainable Development Goals (SDGs), particularly Goal 3, which focuses on good health and well-being, and Goal 6, which aims to ensure access to clean water and sanitation for all. By generating evidence on WASH practices among nursing mothers attending immunization clinics in UBTH, this study will contribute to ongoing efforts to improve maternal and child health, strengthen preventive healthcare, and promote safer hygiene practices within households and healthcare settings.

1.4 Research Questions

The following questions guided this study;

1. What is the level of knowledge of WASH among nursing mothers attending immunization clinics in UBTH?
2. What are the attitudes of nursing mothers towards WASH practices?
3. What WASH practices are commonly adopted by nursing mothers in their households?
4. What socio-cultural, economic, and environmental factors affect WASH practices among nursing mothers?
5. How do breastfeeding practices relate to the incidence of diarrheal diseases and hygiene behaviours among nursing mothers and their children?

1.5 Objectives of the Study

General Objectives: To assess the knowledge, attitudes, practices, and influencing factors regarding water, sanitation, and hygiene (WASH) among nursing mothers attending immunization clinics in UBTH, so as to provide information that will help improve hygiene practices and prevent infections and diarrhoeal diseases among under five children.

Specific Objectives

1. To determine the level of knowledge of WASH among nursing mothers attending immunization clinics in UBTH.
2. To assess the attitudes of nursing mothers towards WASH practices.
3. To evaluate the WASH practices adopted by nursing mothers in their households.
4. To identify socio-cultural, economic, and environmental factors influencing WASH practices among nursing mothers.

CHAPTER TWO

LITERATURE REVIEW

2.0 BACKGROUND

This chapter provides an extensive literature review on the current state of water, sanitation and hygiene (WASH) practices, especially in relation to nursing mothers and child health. The review is organised to have a detailed insight into the most important concepts, empirical findings and background information that will be useful in the present study of WASH Knowledge, Attitude and Practices of Nursing mothers attending the Immunisation clinics of the University of Benin Teaching Hospital (UBTH).

Worldwide, poor WASH conditions are a major cause of child morbidity and mortality, and are estimated to cause 3.8 million child deaths each year from preventable diseases like acute respiratory infections and diarrhoea.⁴ Hand washing with soap alone has been shown to reduce the risk of diarrhoea by up to 50%, and respiratory infections by about 25% and compliance has been shown to be remarkably low ranging from 0-34% in situations where it is required.^{1,4,6} This knowledge-transfer-practice disconnect is evident in developing countries where access to clean water, sanitation and hygiene facilities and infrastructure is low.⁷

The WASH situation is challenging in Nigeria. At the national level, 33% of households have improved sanitation facilities and only 20% of people wash their hands with soap at critical times.⁸ These inadequate hygienic practices have a significant impact on the incidence of childhood diarrheal diseases, respiratory infections and malnutrition. In this context, nursing mothers play a pivotal role, as they are regarded as the custodian of infant feeding, food preparation, water management, maintaining clean environment and personal hygiene in the household.^{3,9,14} Pathogenic organisms can be found in their hands, and can be spread to

children when feeding, cleaning and handling on a daily basis, thus raising the risk of transmission of fecal-oral disease.³

Immunization clinics are strategic points of interface between nursing mother and health care providers. Routine immunization visits are also important opportunities to educate mothers on childcare, nutrition, breastfeeding, and disease prevention, which are important components of health education, and also serve as a good platform to talk about the importance of appropriate WASH practices.^{10,11} But, in many health care facilities, facilities for hand washing are inadequate and many mothers do not know to wash their hands properly even if they have water and soap.¹⁰ The Ethiopian Health Service Extension Package illustrated that community health programmes can effectively improve community hygiene behaviours leading to increased access to sanitation and improved childhood diarrhoea and maternal and child health care services use.^{12,13}

Although there is a lot of literature on WASH, there are still many gaps in the local evidence base. Past research has mainly targeted aspects of hygiene (hand washing, food hygiene etc.) among nursing mothers without looking at the whole WASH package and factors that affect the uptake of WASH practices. Moreover, there is a dearth of studies which has specifically focused on the knowledge, attitudes and practices of nursing mothers attending immunization clinics in tertiary healthcare centres such as UBTH in urban centres. This study is also anchored on global and national WASH policy frameworks, including the Sustainable Development Goals (SDGs), WHO/UNICEF WASH guidelines, which emphasize improved access to safe water, sanitation, hygiene education, and behavioural-change interventions as essential strategies for reducing preventable maternal and childhood illnesses.

This chapter thus discusses the conceptual bases of WASH, its elements, potential health effects of poor WASH services, the special vulnerabilities of women and nursing mothers,

and the effectiveness of WASH interventions in promoting maternal and child health outcomes. The review examines the evidence both from global, regional and national context to set a theoretical and empirical basis for the current study.

2.1 POLICY FRAMEWORK

The policy framework for this study is anchored on the global, national, health-system, and household-level policy directions that guide water, sanitation and hygiene (WASH) programming. In the context of nursing mothers attending immunization clinics, WASH policy is not limited to the provision of water and toilets; it also includes hygiene education, maternal behaviour change, infection prevention, equity, affordability, and sustained monitoring. This is important because nursing mothers are central to infant feeding, water handling, food preparation, child cleaning, waste disposal, and household environmental hygiene. Therefore, any policy framework for WASH in this population must connect infrastructure provision with maternal knowledge, attitudes, daily practice, and child health outcomes.^{3,9,14}

At the global level, the Sustainable Development Goals provide the broadest policy foundation for WASH. SDG 6 emphasizes universal and equitable access to safe drinking water, sanitation, and hygiene, while SDG 3 focuses on reducing preventable morbidity and mortality and improving health and well-being.^{16,19} These goals are directly relevant to maternal and child health because poor WASH conditions contribute to diarrhoeal diseases, respiratory infections, malnutrition, worm infestations, and other preventable illnesses among children.^{17,18,20,30} For nursing mothers, SDG-oriented WASH policy therefore supports not only environmental improvement but also child survival, growth, and development.

The WHO/UNICEF Joint Monitoring Programme further strengthens this framework by classifying WASH services into measurable levels, including safely managed drinking water, improved sanitation, and availability of handwashing facilities with soap and water.³¹ This

monitoring approach is important because it shifts WASH assessment from vague descriptions of “good hygiene” to specific measurable indicators such as source of drinking water, sanitation facility type, safe disposal of faeces, and availability of handwashing materials. These indicators are consistent with the present study, which assesses knowledge, attitudes, household WASH practices, and factors influencing practice among nursing mothers attending immunization clinics in UBTH.

At the national level, Nigeria’s WASH policy direction is shaped by government and partner-led programmes aimed at improving access to clean water, ending open defecation, strengthening sanitation systems, and promoting hygiene behaviour change. The Federal Ministry of Water Resources and Sanitation, development partners, and civil society organizations have supported policies and programmes directed at improving WASH service delivery, although implementation gaps remain, particularly among women, children, and low-income households.^{32,33} These policies are relevant to this study because Nigerian households still experience poor sanitation coverage, inadequate handwashing practice, water insecurity, and affordability barriers, all of which may affect the ability of nursing mothers to maintain proper hygiene consistently.^{8,32,33}

Within the healthcare system, WASH policy is closely linked with infection prevention and maternal-child health services. Healthcare facilities are expected to provide safe water, functional sanitation facilities, handwashing stations, waste management systems, and hygiene promotion services.²¹ However, many facilities in low- and middle-income countries still lack adequate WASH infrastructure, and this affects patients, caregivers, healthcare workers, mothers, and children.²² Immunization clinics are therefore important policy entry points because they provide repeated contact between healthcare workers and nursing mothers. During these visits, mothers can receive practical education on handwashing at critical times, safe water storage, hygienic feeding, proper disposal of child faeces, and environmental cleanliness.^{10,11}

The policy framework also recognizes that WASH interventions are more effective when infrastructure provision is combined with behaviour-change education. Evidence from LMICs shows that safe water access, improved sanitation, hygiene education, and community mobilisation can reduce diarrhoeal diseases and improve household hygiene behaviour.³² For nursing mothers, this combined approach is particularly important because knowledge alone may not lead to good practice when water, soap, sanitation facilities, time, and household support are lacking. Therefore, policies that focus only on health education without addressing enabling resources may have limited impact.

Equity and affordability are also central to the policy framework. WASH access is often shaped by poverty, gender, place of residence, household structure, and social position.¹⁹ Nursing mothers in low-resource households may understand the importance of hygiene but still struggle to buy soap, treat water, access safe toilets, or maintain a clean domestic environment. In this sense, affordability becomes a policy issue, not merely an individual problem. WASH policies must therefore include low-cost hygiene promotion, household-level support, community-based supply of essential hygiene materials, and targeted interventions for vulnerable mothers.

Finally, the framework emphasizes coordination, sustainability, and monitoring. Effective WASH improvement requires collaboration between government ministries, hospital management, healthcare workers, community leaders, NGOs, and households.³⁴ For UBTH, this means integrating WASH education into routine immunization services, ensuring functional clinic WASH facilities, training health workers to deliver consistent hygiene messages, and using clinic attendance as an opportunity to identify mothers who face household-level barriers to good practice. In this study, the policy framework therefore supports the assessment of maternal WASH knowledge, attitudes, practices, and influencing factors as evidence for strengthening WASH promotion within maternal and child health services.

2.2 THEORETICAL REVIEW

Water, sanitation, and hygiene (WASH) practices are critical determinants of maternal and child health, particularly in low- and middle-income countries where poor hygiene and unsafe water contribute significantly to preventable diseases such as diarrhea, cholera, and typhoid. Among nursing mothers, the adoption of proper WASH practices is influenced by knowledge, beliefs, socio-cultural factors, and environmental constraints. Understanding the theoretical basis of maternal behaviour regarding WASH helps explain why mothers may or may not adopt recommended hygiene practices, despite awareness of the associated health risks.³⁵

Behavioural theories have been widely applied in public health to understand, predict, and influence hygiene behaviours.³⁶ Two of the most relevant theories for maternal WASH practices are the Health Belief Model (HBM) and the Theory of Planned Behaviour (TPB). These models provide frameworks to examine the interplay of individual cognition, social influences, and perceived control over hygiene behaviours, which are central to the design of interventions aimed at improving child health outcomes.

2.2.1 Health Belief Model (HBM)

The Health Belief Model posits that individuals' engagement in health-promoting behaviours is determined by their perceptions of susceptibility to a health problem, the severity of the problem, the benefits of preventive actions, barriers to action, cues to action, and self-efficacy.³⁷ In the context of WASH, nursing mothers are more likely to adopt proper hygiene practices if they perceive their children to be at risk of diarrhea or other sanitation-related illnesses (high perceived susceptibility) and consider these diseases severe enough to warrant preventive action (high perceived severity).³⁸

Perceived benefits play a significant role in motivating behaviour. For example, mothers who understand that hand washing with soap, safe disposal of child feces, and treating drinking water can prevent infections are more likely to engage in these behaviours.³⁹ Conversely,

perceived barriers, such as limited access to clean water, lack of soap, or time constraints due to household responsibilities, can reduce adherence to recommended hygiene practices.⁴⁰ Cues to action, such as educational sessions at immunization clinics, reminders from healthcare workers, or witnessing a child fall ill due to poor hygiene, can trigger mothers to adopt proper WASH behaviours.⁴¹ Self-efficacy, defined as confidence in one's ability to perform a behaviour under varying circumstances, is also crucial. Mothers who feel capable of maintaining hygiene even under resource constraints are more likely to wash hands consistently, safely handle drinking water, and ensure proper disposal of feces.⁴²

The HBM explains why knowledge alone does not always translate into practice. Even when mothers are aware of WASH principles, barriers such as inadequate facilities or competing household responsibilities may limit their ability to implement proper hygiene behaviours.⁴³ Through perceived susceptibility, severity, benefits, barriers, cues to action, and self-efficacy, the researchers will be in a position to comprehend the differences in WASH practice among nursing mothers better.

2.2.2 Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour asserts that behaviour is primarily determined by behavioural intention, which is influenced by attitudes toward the behaviour, subjective norms, and perceived behavioural control.⁴⁴ Attitude refers to an individual's positive or negative evaluation of performing a behaviour. In WASH, mothers who view hand washing, water treatment, and safe sanitation as beneficial are more likely to adopt these practices. Subjective norms relate to perceived social pressures, including expectations from family members, peers, and healthcare providers, which can either encourage or discourage adherence to recommended hygiene practices.⁴⁵

Perceived behavioural control reflects the individual's perception of the ease or difficulty of performing the behaviour. High perceived behavioural control is associated with increased

confidence in practicing hygiene consistently, even when resources are limited or challenges arise. Conversely, mothers with low perceived control due to inadequate water access, lack of soap, or unsupportive social environments may fail to maintain proper WASH practices.^{36,46} TPB thus highlights the role of social and environmental influences alongside personal attitudes in shaping maternal hygiene behaviours.

Research applying TPB in maternal and child health shows that subjective norms significantly influence WASH behaviours. For example, mothers are more likely to adopt safe hygiene practices if family members, community leaders, or health workers value and reinforce these behaviours.²² Similarly, perceived behavioural control affects compliance; mothers who believe they can effectively use available water and hygiene resources are more consistent in practicing hand washing, proper storage of drinking water, and safe feces disposal.³⁸

2.2.3 Integration of HBM and TPB in WASH Studies

Both HBM and TPB emphasize that behaviour change is multi-dimensional and cannot be attributed solely to knowledge. Knowledge provides the foundation, but beliefs, perceived risks and benefits, social expectations, and perceived control ultimately determine whether a behaviour is performed.²⁴ Mothers may understand the importance of hand washing or water treatment yet fail to practice them due to household constraints, limited access to hygiene products, or cultural norms that discourage certain practices.⁴⁰

These theories justify the inclusion of multiple constructs in the study's questionnaire. Section B (knowledge) measures awareness of WASH principles, safe water handling, and disease prevention. Section C (attitudes) evaluates mothers' beliefs about hygiene importance, boiling water, and toilet use. Sections D and E (practices and influencing factors) assess actual hygiene behaviours and environmental, socio-cultural, or economic barriers. Section F

(breastfeeding and diarrhea) links maternal hygiene practices to child health outcomes, reflecting the theoretical assumption that health behaviours directly affect disease risk.⁴¹

Using both HBM and TPB, this research will be able to examine the association between maternal knowledge, social influences, perceived control, and WASH practices. For instance, a mother can be highly knowledgeable and positive about hand washing and still not practice it regularly because of lack of soap or because of societal disapproval. On the contrary, the mothers who have good social support and high self-efficacy can be better obedient even with limited formal knowledge.⁴²

Furthermore, integrating infant feeding practices and child health outcomes into the study aligns with theoretical assumptions. Mothers who recognize that proper hygiene protects their children are more likely to wash hands before food preparation, sterilize feeding bottles, and ensure safe water use, thereby reducing diarrheal disease risk. This illustrates how theoretical models can guide both the design of research instruments and the interpretation of observed behaviours.^{35,36}

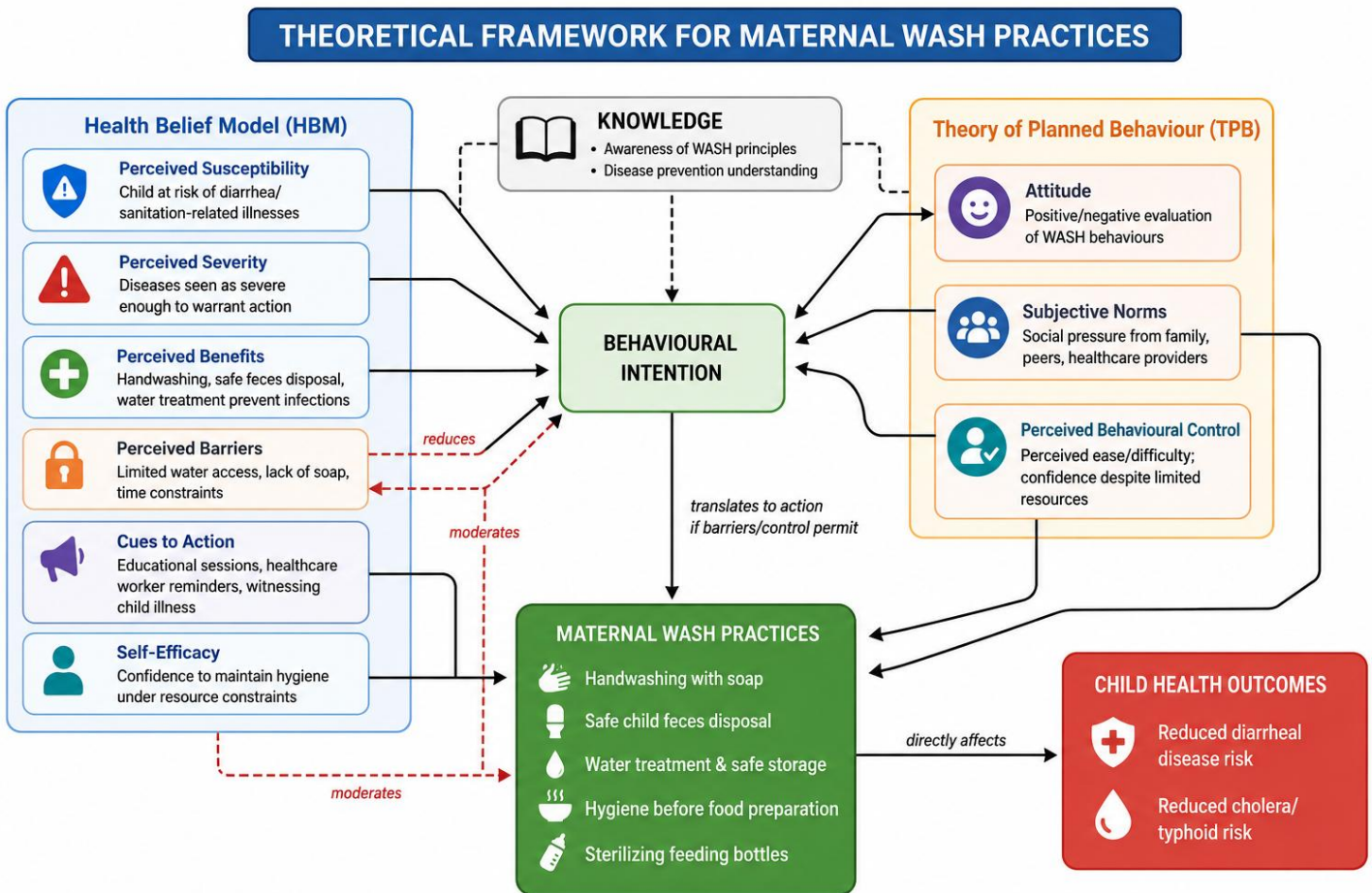


Figure 2.1 Theoretical Framework of the Study

2.3 CONCEPTUAL FRAMEWORK

The conceptual frameworks are developed to guide the study Water, Sanitation and Hygiene (WASH) practice by nursing mothers attending immunization clinic in the University of Benin Teaching Hospital (UBTH). This framework is based on the fact that nursing mothers are the main caregivers for children, and their WASH practices are important for children's health and sanitation in the household.^{3,9,14} It portrays the interconnections between maternal knowledge and attitudes, WASH practice, influencing factors, and health outcomes of children under the age of five. The framework acknowledges that, even with knowledge,

socioeconomic and environmental barriers may hinder proper WASH practice.^{15,4} and that immunization clinics are a good platform for reinforcing appropriate WASH practices among mothers.^{10,11}

The framework is based on six interrelated domains that move from the left to the right and illustrate the path from maternal characteristics and influencing factors to the final health outcomes of children.

1. Background Characteristics of Nursing Mothers.

This domain is the sociodemographic characteristics of the study population which could affect their knowledge, attitude and practices on WASH.

- Age of the mother
- Educational status.^{4,15}
- Place of residence (rural or urban)
- Parity and number of children under five
- Individuals' needs and concerns are directly related to their religion and cultural background.
- Type of Family and household size

2. Influencing Factors: Enabling and Challenging Determinants

This domain recognises that WASH practices of nursing mothers are influenced by a number of factors that can both enable and constrain good hygiene practices.^{1,4}

- Socio-cultural Factors: Cultural beliefs and practices, gender roles as hygiene falls to the female and traditional childcare practices.^{3-4,9,15}

- Economic Factors: Poverty, irregular income, inability to afford soap and clean water and limited access to improved sanitation facilities.^{4,7,8}
- Environmental Factors: safe drinking water, handwashing facilities (with soap and water), sanitation facilities, inadequate water supply, overcrowding, and waste disposal systems.^{4,7,10}
- Healthcare Facility Factors: WASH infrastructure in immunization clinics, health education at immunization visits and attitudes of health care workers.^{10,11,13}

3. Independent Variables: Knowledge and Attitudes towards WASH

This domain involves the cognitive and affective aspects that lead to and affect WASH practices. These are the key independent variables measured in this study (as defined in the research questions and objectives).

- **Knowledge of WASH:** Hand washing with soap and water is important; critical moments for hand washing; poor hygiene is linked to childhood diseases such as diarrhoea and acute respiratory infections; safe water storage and handling practices; proper sanitation and waste disposal practices.⁸
- **Attitudes towards WASH:** perceived susceptibility of children to WASH-related diseases, perceived benefits of proper hygiene, perceived barriers to practicing good hygiene, motivation to maintain household cleanliness and beliefs about the role of hygiene in child health and development.^{9,14}

4. Dependent Variables: WASH Practices among Nursing Mothers

This domain reflects the real-life hygiene practices of nursing mothers in their homes, and is the main outcome of interest for this study. These practices directly affect the risk of children being infected with diseases.^{3,14}

- Hand Hygiene Practices: Hand washing with soap at critical moments, after using the toilet, after cleaning a child after defecation, before food preparation, before feeding children, and before and after meals.^{2,3}
- Water Management Practices: sources of drinking water, how to store water, how to treat water, how to treat drinking water so that it does not get contaminated.⁸
- Sanitation Practices: Toilet facility type, safe child defecation, waste disposal and general environment cleanliness.^{7,8}
- Food Hygiene Practices: Hygienic breastfeeding practices, cleaning of feeding utensils and safe preparation of infant food.¹⁴
- Attending clinic and being exposed to hygiene education during clinic visit, utilizing health messages received.^{10,11,13}

5. Intermediate Outcomes: Child Health Indicators

This domain is an attempt to capture the immediate health outcomes associated with the WASH behaviours of nursing mothers. These results can be used to assess the effectiveness of maternal hygiene behaviours in safeguarding child health.^{1,4,5}

- The rate at which diarrheal diseases occur in children under 5 years of age.^{1,4,5}
- The incidence of acute respiratory infections in children.^{1,4}
- Frequency of Febrile illnesses and Intestinal worms.⁸
- Nutritional status and growth indicators of children.⁹
- Incidence of health-related absences from clinic

6. Ultimate Impact: Improved Child Health and Well-being

This is the last domain and is indicative of long-term objectives related to encouraging good WASH practice among nursing mothers. It is consistent with the study justifications and child survival goals around the world.^{4,5}

- Decrease in morbidity and mortality due to WASH related diseases in children under 5.
- Better children's growth, nutrition and cognitive development.⁹
- Less strain on health facilities due to avoidable child infections
- Improved quality of life of mothers and children
- Support for the work of SDG 6 targets on water, sanitation and hygiene.^{4,8}

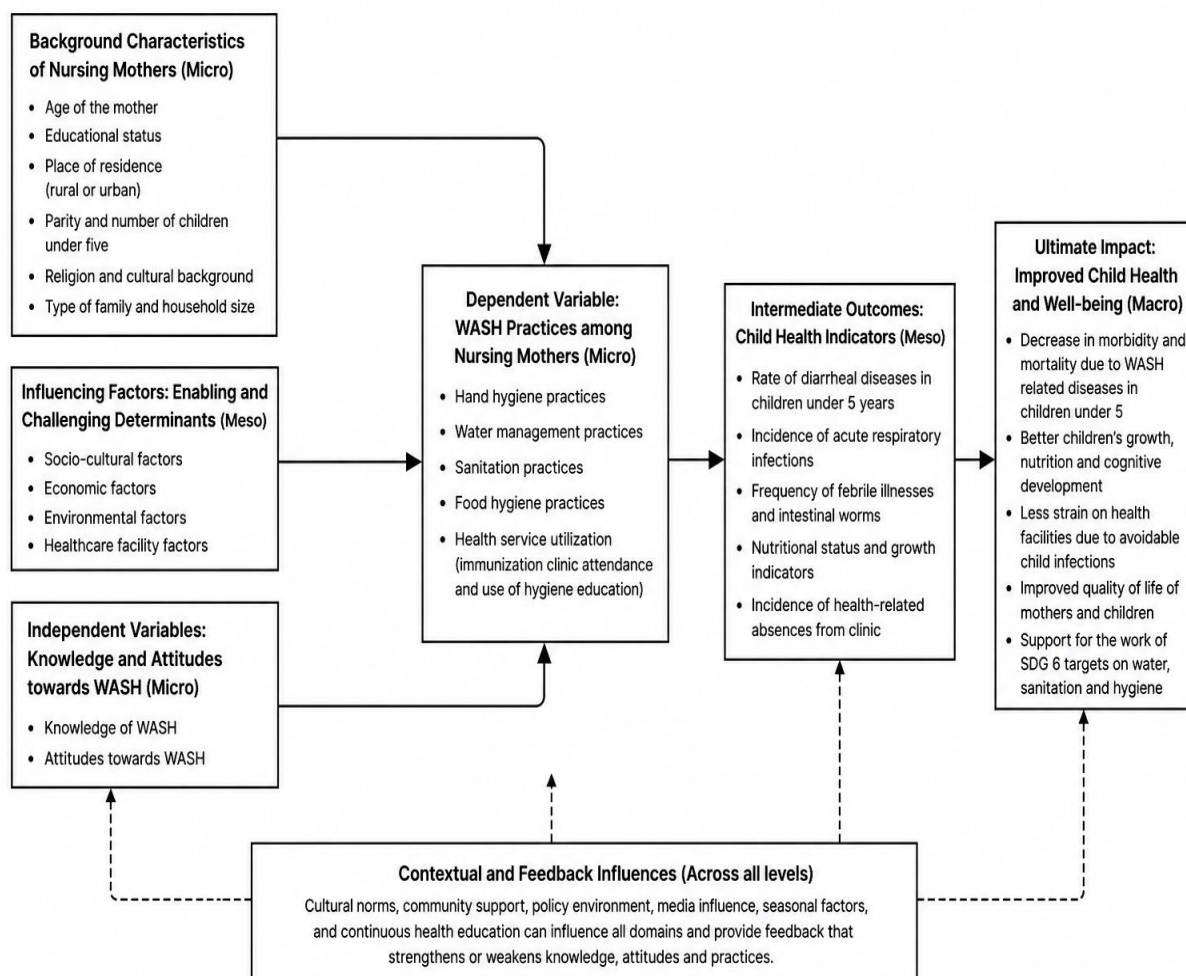


Figure 2.2 Conceptual framework of the study

2.4 CONCEPTUAL REVIEW

2.4.1 Concept of WASH

WASH stands for water, sanitation, and hygiene. It is often called WaSH or WatSan, derived from the first letters of these three words. WASH represents a sector within development cooperation or local governments that focuses on providing communities with access to clean water, proper sanitation, and hygiene services.^{19,47} For example, in Sindh, Pakistan, women pump water from handpumps in villages; in Boquete, Panama, elementary schools have proper toilets; and in Omaruru, Namibia, simple handwashing stations are set up where running water is not available.¹⁹

The goal of WASH services is to improve public health, promote human rights related to water and sanitation, reduce the burden of water collection on women, and enhance educational and health outcomes in schools and healthcare facilities.⁴⁸ WASH is an essential part of water security, ensuring that communities have reliable access to safe water. Universal, affordable, and sustainable WASH access is a major focus in international development.¹⁶ It is central to Sustainable Development Goal 6 (SDG 6), which emphasizes clean water and sanitation for all. Specifically, targets 6.1 and 6.2 aim to provide equitable and accessible water and sanitation services to everyone. In 2017, approximately 2.3 billion people lacked basic sanitation facilities, while 844 million people did not have safe drinking water.^{16,19,49,50} The term WASH is widely used by non-governmental organizations and aid agencies in developing regions.

The health risks associated with insufficient WASH services are significant. Common diseases and conditions caused by poor WASH include diarrhea, malnutrition, stunting, and neglected tropical diseases.⁴⁸ Women face extra health risks during pregnancy, childbirth, and in managing menstrual hygiene.¹⁷ Chronic diarrhea in children can lead to long-term problems in both physical growth and cognitive development.¹⁸ Measuring the direct health benefits of improved WASH is challenging due to various factors. Researchers recommend long-term studies on technological effectiveness, more detailed analysis of sanitation interventions, and evaluations of combined interventions to better understand WASH outcomes.³⁰

Access to WASH is necessary not only at home but also in schools, healthcare centers, workplaces, prisons, temporary shelters, and for displaced populations.²⁰ In schools, group handwashing facilities can improve hygiene and reduce disease transmission. A lack of such facilities often causes girls to miss school, affecting their education.²¹

Providing reliable WASH services in urban slums is especially difficult. Infrastructure may fail soon after installation, water sources may be polluted, and climate change can affect water availability. Strategies to improve WASH access include national planning, monitoring, empowering women, and enhancing the climate resilience of water systems.⁴² Strong water management systems can help communities adapt to climate-related challenges and maintain safe water supplies.¹⁹

2.4.2 Components of WASH

The WASH concept groups water supply, sanitation, and hygiene together because deficiencies in any of these areas often affect the others.

Drinking water services

A safe drinking water service is defined as water that is accessible, available when needed, and free from contamination.³¹ WHO and UNICEF classify water sources as “improved” or “unimproved” to monitor water quality. An improved source includes piped water into households, public taps, tube wells, protected dug wells, springs, and rainwater collection.⁵¹

Access to drinking water is part of SDG 6, Target 6.1, which aims to ensure universal and equitable access to safe and affordable drinking water by 2030. The related indicator tracks the proportion of people using safely managed drinking water.⁵² In 2017, 844 million people lacked even basic drinking water, and by 2019, 435 million relied on unimproved sources while 144 million still used surface water.⁵⁰

Drinking water comes from surface water, groundwater, rainwater, and desalinated seawater after collection, treatment, and distribution. Without safe domestic water, communities face seasonal shortages and lower water security.^{25,53} Water quality can degrade from collection to use, making household hygiene, storage, and treatment practices crucial.^{26,27}

Groundwater: Groundwater is essential in dry areas where surface water is limited. Globally, over one-third of water comes from underground sources. In arid and semi-arid regions, groundwater supports drinking water, food production, and ecosystems.⁵⁴ Population growth and climate change increase demand and stress on these resources. Human activities such as pumping, irrigation, and land use changes also impact groundwater.⁵⁴

In sub-Saharan Africa, groundwater is vital for both water supply and livelihoods. Many communities use groundwater as a new source of water, especially in low-income areas where treatment infrastructure is lacking.^{55,56} While groundwater is often considered microbiologically safe, chemical contamination (like fluoride, arsenic, nitrate, or salinity) can pose risks if not monitored.⁵⁶

Sanitation services

Sanitation services are organized on a “ladder” from lowest to highest: open defecation, unimproved, limited, basic, and safely managed.⁵⁷ Limited services are shared between households, while basic services are not. Improved sanitation facilities hygienically separate human waste from contact. Toilets considered improved include flush toilets, piped sewer connections, septic systems, pour-flush latrines, pit latrines with slabs, ventilated improved pit latrines, and composting toilets.⁵⁸

SDG 6 Target 6.2 aims to provide access to adequate sanitation and hygiene for all and end open defecation by 2030, with special attention to women, girls, and vulnerable groups. The indicator tracks both access to safely managed sanitation and handwashing facilities.⁵⁹ In 2017, 4.5 billion people lacked safe home toilets, 600 million shared facilities, and 892 million practiced open defecation.⁶⁰ Barriers to sanitation access include social, technical, institutional, and environmental challenges. Solutions require integrated approaches, including planning, economic opportunities, and behaviour change interventions.⁶¹⁻⁶³

Fecal sludge management and sanitation workers: Safe sanitation depends on fecal sludge management (FSM), which includes storing, collecting, transporting, treating, and safely disposing of sludge from onsite systems like pit latrines and septic tanks.⁶⁴ Sanitation workers perform essential tasks in operating and maintaining these systems.⁶⁵

Hygiene

Hygiene refers to practices that protect health and prevent disease.⁶⁶ Key behaviours include hand washing, menstrual hygiene, and food hygiene.⁵⁷ Handwashing with soap and water is a priority and is monitored globally as an indicator of hygiene access. Basic hygiene facilities provide soap and water on premises, and may include sinks, buckets with taps, tippy-taps, or portable basins.⁵⁷

Hygiene is included in SDG 6 Target 6.2, tracking the proportion of people using handwashing facilities.⁵¹ In 2017, only one in four people in low-income countries had handwashing facilities at home, and only 14% in sub-Saharan Africa did.⁵⁰ Globally, at least 500 million women and girls lacked safe and private facilities for menstrual hygiene, and about 40% of the world's population lived without basic handwashing facilities.^{67,68}

Purpose of WASH

The main purposes of WASH services are to improve public health, uphold human dignity, guarantee water and sanitation as human rights, reduce women's burden of water collection, decrease risks of gender-based violence, enhance education and healthcare outcomes, and reduce environmental pollution.¹⁹

A better WASH access improves health, life expectancy, student performance, gender equality, and contributes to poverty reduction and socioeconomic development.^{17,69}

2.4.3 Health aspects of lack of WASH services

Categories of health impacts

The health effects of insufficient WASH services can be grouped into three categories.

1. First, direct impacts include infections transmitted through fecal–oral routes, helminth infections, and vector-borne diseases. For example, contaminated drinking water due to poor sanitation can cause life-threatening diarrhea in infants.¹⁹
2. Second, sequelae refer to conditions that occur after an initial infection. These include stunted growth, obstructed labour, low birth weight, impaired cognitive development, pneumonia in undernourished children, and anemia caused by hookworm infections.⁴⁷
3. Third, broader well-being impacts affect mental, social, and economic health. This includes anxiety, sexual assault, negative birth outcomes, long-term school absence, poverty, reduced economic productivity, and antimicrobial resistance.⁵⁰

2.4.4 WASH-attributable burden of diseases and injuries

The World Health Organization has studied how much death and disease worldwide result from poor WASH. Their analysis focuses on diarrhea, acute respiratory infections, malnutrition, and soil-transmitted helminth infections.¹⁶ These outcomes are also tracked under Sustainable Development Goal 3 as part of global health targets.⁴⁸

In 2019, safe WASH could have prevented at least 1.4 million deaths and 74 million disability-adjusted life years (DALYs) from these conditions. This represents about 2.5% of all global deaths and 2.9% of all DALYs.¹⁷ Diarrheal diseases caused the highest burden, with over 1 million deaths and 55 million DALYs attributed to lack of WASH. Of these, 564,000 deaths were linked specifically to unsafe sanitation.¹⁸

Acute respiratory infections were the second largest contributor, followed by malnutrition and soil-transmitted helminth infections. Although helminth infections result in fewer deaths, they are entirely linked to unsafe WASH conditions.³⁰

Most WASH-related deaths occur in low-income countries due to poverty and limited access. Mortality rates per 100,000 were 42 in low-income, 30 in lower-middle-income, 4.4 in upper-middle-income, and 3.7 in high-income countries. Africa and South-East Asia are most affected, where 66–76% of diarrheal disease could be prevented with safe WASH.²⁰ Diseases caused by poor sanitation are closely tied to poverty. Open defecation, the extreme form of poor sanitation, is a major factor for diarrhea and intestinal worm infections.²¹

Earlier reports show, WASH-related diseases caused 3.3% of global deaths and 4.6% of global DALYs. Among children under five, these numbers represented 13% of deaths and 12% of DALYs. Worldwide, 1.9 million deaths and 123 million DALYs could have been prevented with adequate WASH.²² Estimates from 2002 suggested up to 5 million people died annually from preventable waterborne diseases.³¹ Progress in countries such as China, India, and Indonesia has improved sanitation access, reducing these numbers.⁵²

List of diseases

Inadequate WASH services increase the risk of at least twelve specific diseases, including:

- Diarrheal diseases
- Respiratory infections
- Soil-transmitted helminth infections
- Malaria
- Trachoma
- Schistosomiasis
- Lymphatic filariasis
- Onchocerciasis
- Dengue

- Japanese encephalitis
- Protein–energy malnutrition
- Drowning.⁵²

Other diseases are also linked to poor WASH but are harder to quantify. These include arsenicosis, fluorosis, legionellosis, leptospirosis, hepatitis A and E, cyanobacterial toxins, lead poisoning, scabies, spinal injuries, poliomyelitis, neonatal and maternal outcomes, and neglected tropical diseases.⁵³

Diarrhea, malnutrition, and stunting

Diarrhea is primarily spread through fecal–oral contamination. In 2011, it caused about 700,000 deaths in children under five and 250 million lost school days, roughly 2,000 child deaths per day.²⁵ Children with diarrhea are more likely to become underweight, stunted, and more vulnerable to other infections like malaria and respiratory diseases.⁴⁸ Chronic diarrhea also affects physical and cognitive development.²⁷

Studies show improving water, sanitation, and hygiene reduces diarrhea. Measures include using water filters, piped water, and sewer connections.⁵⁴ Improved sanitation, clean drinking water, and handwashing could save an estimated 525,000 children annually.⁵⁵

Unsafe WASH also contributes to malnutrition. About half of all stunting in children under five is linked to repeated diarrhea or intestinal worms caused by poor WASH practices.¹⁹ In 2008, unsafe WASH practices were estimated to cause 860,000 child deaths from malnutrition.⁴⁷

Neglected tropical diseases

WASH interventions prevent many neglected tropical diseases (NTDs), like soil-transmitted helminth infections. About two billion people worldwide are infected with these intestinal

worms, which spread through contaminated soil.^{16,50} Integrating WASH and NTD programs benefits both sectors and the communities they serve, especially in regions endemic with multiple NTDs.⁴⁸

Since 2015, WHO has promoted strategies to integrate WASH with public health programs to eliminate NTDs. Goals include eradicating dracunculiasis, yaws, and reducing trachoma and lymphatic filariasis. The strategy emphasizes awareness, monitoring, evidence-based interventions, and stakeholder involvement.^{17,18}

Additional health risks for women

Women are at higher risk due to limited WASH access. During late pregnancy, collecting water is physically challenging, and contaminated water contributes to 15% of pregnancy-related deaths globally.³⁰ Poor menstrual hygiene also poses health risks where clean water and toilets are unavailable. In Bangladesh and India, women often rely on old cloths and unclean water to manage periods.²⁰

Health risks for sanitation workers

Sanitation workers face exposure to diseases from human waste, injuries from lifting and transporting waste, and accidents in confined spaces or from sharp objects.⁴¹ Many work without protective equipment or formal training. Health effects include fatigue, respiratory infections, gastroenteritis, cholera, typhoid, hepatitis, polio, schistosomiasis, skin burns, musculoskeletal injuries, and cuts.^{22,31}

2.4.5 Effectiveness of WASH interventions on health outcomes

The effectiveness of WASH programs in improving health is debated. Many studies face ethical or practical challenges, and high-quality randomized trials are costly or difficult. This

can result in biased estimates of the health impact of WASH interventions.⁵³ Long-term studies, analysis of sanitation, and evaluation of combined interventions are recommended.⁵⁴

Handwashing promotion is particularly effective. Research shows handwashing reduces diarrhea risk by 40–47%, though compliance and self-reporting challenges limit certainty.^{26,28} Point-of-use water treatment and safe storage also reduce disease, especially in infants.²⁷

Water quality interventions protect health. In India, chlorine tablets reduced cholera incidence by 75%.⁵⁴ Historical data from the United States showed clean water technologies cut overall and infant mortality significantly.⁵⁵ However, poor adherence can reduce effectiveness, as seen in Nepal and Guinea-Bissau, where households stopped treating water.⁵⁴ Sanitation interventions alone are rarely studied but, when combined in WASH programs, they reduce under-five diarrhea and protect health.^{19,47}

2.4.6 Impact of WASH Insecurity on Women and Nursing Mothers

Women, especially nursing mothers, are more affected by poor access to water, sanitation, and hygiene services.¹⁹ In many cultures, women are primarily responsible for collecting and managing water for their households. This responsibility, combined with the lack of nearby toilets and the challenges of menstruation, limits their ability to participate in work, community activities, and health care.⁴⁷ Nursing mothers may face additional health risks when clean water and sanitation are unavailable, including exposure to water-related infections, stress, and complications for both mother and child.

Time required to collect water

Nursing mothers often spend hours each day collecting water, reducing the time available for childcare, rest, or income-generating work. In sub-Saharan Africa, women carry heavy water

containers over long distances, sometimes walking miles and waiting in line for water, spending billions of hours per year on this task.¹⁶ In low-income urban areas, like parts of Nairobi, women carry 20-kilogram containers, sometimes taking several hours for each trip.⁴⁸ This task, considered “women’s work,” remains largely unpaid and tied to household responsibilities such as cooking, cleaning, laundry, and caring for children.⁴⁸

Violence against women

Collecting water can be dangerous for nursing mothers and girls. They face risks of physical and sexual assault while traveling to distant water sources or using poorly maintained sanitation facilities.¹⁷ Studies in India and Uganda show that women experience fear and insecurity during these trips, particularly at night.¹⁷ Domestic tensions and conflicts over water shortages further increase their vulnerability.¹⁸

Gender norms for occupations

Cultural expectations also affect women’s access to water services. Water collection is viewed as a female task, so men performing it may face social stigma. Similarly, women are often discouraged from working in water utilities or sanitation management because of societal assumptions that these roles are unsuitable for them.³⁰ Nursing mothers may also be exposed to disease when performing household sanitation chores, such as cleaning toilets. Despite these challenges, efforts in some countries have increased the number of women in water and sanitation professions, providing new opportunities for empowerment.²⁰

2.4.7 Non-household settings for WASH

Non-household WASH settings include schools, healthcare facilities, workplaces (including prisons), temporary use sites, mass gatherings, and populations that have been displaced.¹⁹

In schools

Many primary schools in developing countries lack adequate water and sanitation facilities. Even when facilities exist, they are often in poor condition. Children participate more effectively in school when water and sanitation are available.⁴⁷

The absence of WASH facilities can prevent students, especially girls, from attending school. Cultural taboos around menstruation combined with limited menstrual hygiene management services often cause girls to stay home during their periods.⁵⁰ Reasons for missing or poorly maintained facilities include poor collaboration between government sectors, schools, and communities, as well as lack of leadership and accountability.¹⁶

Programs that improve WASH in schools, often called SWASH or WinS, reduce hygiene-related illnesses, increase attendance, and promote dignity and gender equality.⁴⁸ Schools with good WASH facilities create safer environments and help children become advocates for hygiene in their families and communities. In Zambia, data from over 10,000 schools showed that improved sanitation correlated with higher female enrollment and reduced repetition and dropout rates.³⁷

Policy measures include broadening the education sector's focus, establishing quality assurance systems, and ensuring effective use of funds. Practical steps involve mobilizing communities, strengthening intersectoral partnerships, monitoring WASH services, training educators, and partnering with school management.¹⁸ Support from development agencies at national, state, and district levels can create an enabling environment for WASH. Success also depends on local leadership and collective commitment from students, teachers, parents, and community stakeholders.³⁰

In healthcare facilities

Adequate WASH is critical in healthcare facilities to prevent infections and protect patients and staff. Many facilities in developing countries lack improved water sources, sanitation, or handwashing stations. In Africa, 42% of facilities lack safe water, while sanitation is poorest in the Americas with 43% of facilities insufficiently served.⁴¹

One in four facilities globally lacks basic water, and one in five has no sanitation, affecting billions of people. Facilities in low-income countries are at least three times more likely to lack water, contributing to higher maternal sepsis rates.²¹

Barriers to WASH in healthcare include incomplete standards, weak monitoring, limited budgets, poor infrastructure, and disempowered staff.³¹ Improvements require national policies, dedicated budgets, and solutions such as safe water supply for drinking and medical procedures, functional handwashing stations, proper waste management, hygiene promotion, and clean gender-segregated toilets.⁵² Better access to handwashing and sanitation reduces infections and mortality, especially for mothers and children.⁵³

In prisons

Prisons in developing countries are often overcrowded and in poor condition. Water and sanitation systems frequently cannot meet the needs of inmates, and overuse accelerates facility deterioration.¹⁹ State budgets are often too low to maintain adequate water, sanitation, and medical services.⁴⁷ However, careful planning and low-cost solutions can help renovate infrastructure and improve WASH services even with limited funds.⁵⁰

2.4.8 Challenges in WASH implementation

Equitable access to drinking water supply

Access to water, sanitation, and hygiene services is not equal for everyone. Inequalities often depend on income, gender, and social status.¹⁹ In 2019, data from 24 countries showed that the richest populations had at least double the coverage of basic water services compared to the poorest.³² For example, in Bangladesh, minority ethnic groups have lower access to WASH services due to systemic discrimination.⁵⁰ Even within a country, access can differ depending on socioeconomic status, political influence, and urbanization. Studies show that urban households are significantly more likely to have improved water and sanitation compared to rural households.¹⁶ Human rights laws prohibit discrimination in access to water and sanitation based on race, sex, language, religion, disability, or social status.⁴⁸

Urban low-income areas

In slum areas, three main barriers limit improvements to urban WASH services. First, there is often an insufficient supply of networked services. Second, demand constraints, such as low willingness or ability to pay, prevent people from using available services. Third, institutional barriers make it difficult for the poor to access services.¹⁷

Polluted water sources

Water pollution occurs when contaminants harm water bodies, including lakes, rivers, oceans, reservoirs, and groundwater.¹⁸ Pollution usually comes from human activities, such as sewage discharge, industrial waste, agricultural runoff, and urban stormwater.³⁰ Polluted water affects ecosystems and can spread waterborne diseases when people drink or use it for irrigation.²⁰

Groundwater pollution

Groundwater can also become contaminated by pollutants seeping from sanitation systems, landfills, wastewater treatment plants, leaking sewers, petrol stations, or excessive use of fertilizers.²¹ Naturally occurring contaminants like arsenic and fluoride can also cause problems. Drinking or using polluted groundwater can cause poisoning and the spread of disease.²²

Failures of WASH systems over time

Water supply and sanitation systems, including wells, boreholes, and toilets, often fail over time due to financial constraints, inadequate technical skills, poor use of facilities, and lack of community ownership.³¹ Poor populations may be unable to pay fees for operation and maintenance, meaning even existing systems fail to benefit them.⁵² Contamination during water distribution is another challenge that increases the risk of waterborne illnesses.⁵³

Working conditions of sanitation workers

Sanitation workers are responsible for cleaning, operating, and maintaining sanitation equipment in homes, schools, hospitals, and public spaces.⁵⁴ They are also involved in street cleaning, managing sewers, storm drains, and public toilets.²⁸ Some definitions include municipal solid waste collectors, while others focus only on liquid or excreta-related sanitation tasks.⁴⁸

These workers are essential for maintaining safe sanitation services and protecting public health, but their jobs expose them to many risks. They can be affected by biological and chemical hazards, heavy labour, poor posture, confined spaces, and psychosocial stress. These risks are often worsened by poverty, illness, poor nutrition, unsafe housing, child labour, migration, drug or alcohol abuse, discrimination, social stigma, and general neglect.²⁷ In many developing countries, sanitation workers are particularly vulnerable because

environmental and labour protections are weak or poorly enforced, and occupational health measures are often lacking.

2.4.9 WASH Interventions and Policies in Nigeria and LMICs

In Nigeria and many low- and middle- income countries, lack of clean water, safe sanitation, and good hygiene practices continues to affect health, education, and daily life, especially for women, children, and nursing mothers.^{70,71} Governments, development partners, and civil society groups have put in place a range of interventions and policies to address these problems, but challenges remain in delivering services equitably and sustainably.⁷¹

Government and NGO Programs on WASH

At the national level, the Federal Ministry of Water Resources and Sanitation has been working steadily to strengthen policy, coordination, and planning for water, sanitation, and hygiene services. The ministry hosts regular national forums and workshops where government officials, NGOs, donors, and sector experts come together to share data, identify gaps, and agree on strategies for improving WASH delivery.⁷⁰ These meetings aim to embed WASH more deeply into planning and budgeting across government ministries, and to build systems that can sustain services even in the face of emergencies like flooding and drought.

One example of this collaborative approach is the National Action Plan developed in partnership between the Government of Nigeria and organisations like WaterAid. This plan focuses on governance, sustainable service delivery, sanitation, financing, and monitoring and evaluation. It also includes a national campaign called “Clean Nigeria: Use the Toilets,” which seeks to eliminate open defecation and improve sanitation practices across communities.⁷¹ Partnerships such as these are important because they help align government policy with community-level action, increase accountability, and mobilise both technical and financial resources for implementation.

International NGOs have played a significant role in supporting these efforts. Organisations like WaterAid Nigeria work with government agencies and community groups to expand access to safe water, decent toilets, and good hygiene practices. Their strategies often include strengthening WASH systems to be climate-resilient and gender-responsive, meaning that services are designed to withstand the impacts of climate change and reduce inequalities between men and women in access and leadership roles.^{72,73} Often, these groups also contribute to policy development at state levels and help pilot new solutions such as solar-powered water systems in drought-prone areas.

The World Bank's SURWASH programme is another example of a large-scale intervention. With substantial funding, this programme works to improve urban and rural water supply and sanitation services across several Nigerian states. It supports infrastructure upgrades, helps communities achieve open defecation-free status, and expands drinking water services to schools and health facilities as part of the broader national WASH framework.⁶⁶ Such programmes aim not just to build facilities but to strengthen the systems that manage and maintain them over time.

Civil society organisations beyond large international NGOs also contribute to WASH improvements. Community-driven efforts by local groups often focus on behaviour change, hygiene promotion, and strengthening local governance. Some groups work specifically with women and youth to create inclusive spaces for training, leadership, and advocacy. Networks like FEMinWASH Nigeria bring together female water professionals to promote gender rights, civic education, and poverty reduction through improved WASH services.⁷⁵ These kinds of networks help raise awareness of gender disparities in access to water and sanitation, and encourage women to take on leadership roles in local WASH governance.⁷⁶

Health Education Programs in Immunization Clinics

Health facilities and immunisation clinics are important delivery points for WASH education, particularly for nursing mothers and caregivers of young children. When women bring their infants for routine vaccinations, health workers take the opportunity to reinforce key hygiene messages. These include teaching proper handwashing with soap, safe storage and treatment of drinking water, and safe disposal of waste.⁷⁷ This education is practical and tailored to local needs. For example, mothers are shown how to make simple handwashing stations at home, how to keep water clean in jerry-cans, and how to maintain household sanitation to reduce the spread of disease.⁷⁸

Linking WASH education with maternal and child health services has multiple benefits. It increases the likelihood that nursing mothers adopt safer practices that protect both their health and that of their babies.⁷⁷ Clean hands before feeding and handling infants reduce the transmission of diarrhoeal pathogens. Safe water helps prevent waterborne illnesses that can worsen malnutrition and slow child growth. Clinics that integrate WASH education also tend to collect and share better data on hygiene behaviours, which helps ministries track progress and target areas with poor coverage.^{77,79}

Some states in Nigeria have taken this integration a step further by training health educators and clinic staff on menstrual hygiene management, sanitation-related disease prevention, and nutrition. These workshops help build local capacity to reach communities and ensure consistent messaging.⁷⁹ In rural areas where access to health facilities may be limited, mobile health teams also carry hygiene promotional materials and engage families during outreach visits.

Evidence on Effectiveness of WASH Interventions Targeting Maternal Practices

There is growing evidence that WASH interventions aimed at improving maternal practices can make significant health differences in LMICs.⁷⁰ Studies show that when households have

access to safe water and improved sanitation, rates of diarrhoea and other infectious diseases among children decrease.^{73,75} Nursing mothers who are supported with clean water and hygiene education tend to adopt better handwashing practices and are more likely to keep living environments free of contaminated water and waste, which in turn reduces their infants' exposure to pathogens.^{71,72}

Programmes that combine infrastructure improvements with behaviour change education show the most promising results.⁷² For example, when water points are built closer to homes and accompanied by education on safe water handling, families are more likely to use them correctly and consistently. Latrine construction combined with community hygiene promotion has been linked with reductions in open defecation and improvements in household hygiene behaviours.⁷² This combination of access and education is especially important for nursing mothers, who need clean environments to ensure their infants' growth and development.⁷³

When interventions target women specifically, they also tend to have broader community benefits.⁷⁰ Women often play central roles in household water management, child care, and hygiene routines. Empowering them with knowledge, skills, and leadership opportunities improves not only their own outcomes but also the health outcomes of families and communities. Programmes that include women in planning and monitoring can help ensure that services reflect actual needs, leading to greater uptake and sustainability.^{80,81}

However, the effectiveness of these interventions depends on strong policy support, reliable funding, and continuous monitoring.⁷² Nigeria's efforts to build climate-resilient and inclusive WASH systems show that integrating national policy priorities with on-the-ground implementation can strengthen service delivery and improve health outcomes. Continued collaboration between governments, NGOs, communities, and health systems remains crucial

to ensure that WASH services support the health and dignity of all, particularly nursing mothers and young children.^{77,79,81}

2.5 EMPIRICAL REVIEW

2.5.1 Knowledge of WASH among nursing mothers attending immunization clinics

Nursing mothers attending immunization clinics demonstrated varying levels of knowledge about WASH. A 2023 study in Ghana investigated the experiences and perceptions of postnatal mothers regarding healthcare quality and WASH amenities during the COVID-19 outbreak. The study used an institutional cross-sectional design and included 424 postnatal mothers from six regions in northern, middle, and coastal Ghana. Respondents had attended antenatal care in twelve healthcare facilities, including primary and secondary level hospitals. The study found that privacy and confidentiality were rated highest among WASH and healthcare quality indicators, while dignity and respect for clients were rated lowest. Approximately half of the mothers reported paying out-of-pocket for essential antenatal medications. Mothers who accessed care in district or municipal hospitals, cohabited with partners, or lived in urban areas were more likely to report positive perceptions of healthcare quality, including WASH facilities. Similarly, mothers with private health insurance and those attending district hospitals ranked WASH amenities higher than their counterparts. The findings indicated that WASH amenities were generally acceptable but highlighted gaps in dignity, respect, and out-of-pocket payments for some services, suggesting the need for better investment in hygiene infrastructure in healthcare facilities to support maternal and child health.⁸²

A 2024 Nigerian study focused on breastfeeding mothers in tertiary health institutions in Abakaliki, Ebonyi State. The study aimed to determine the knowledge and practices of breast milk and hand hygiene among 215 breastfeeding mothers attending immunization clinics. The study found that 71.3% of the mothers had good knowledge of breast milk hygiene,

while 75.3% had good knowledge of hand hygiene. Only 2.3% and 1.4% of the mothers demonstrated poor knowledge of breast milk and hand hygiene, respectively. The findings suggested that continuous education and reinforcement of hygiene practices among nursing mothers were needed, especially regarding hand washing and safe handling of breast milk to protect infants' health.⁸³

Another 2024 study in Ekiti State, Nigeria, assessed the personal and environmental hygiene practices of mothers attending primary health centres. The study focused on hygiene practices at baby wellness clinics and used a descriptive cross-sectional design with questionnaires and checklists. The results showed that 60.3% of mothers consistently washed their hands with soap and water before feeding their children. However, 60.9% only occasionally washed their hands after using the toilet. Most breastfeeding mothers, 78.8%, reported washing their brassieres weekly. In terms of environmental hygiene, 71.52% cleaned their surroundings daily, although 24.51% still disposed of waste by the roadside. The study concluded that overall hygiene levels among mothers were low, and poor hand hygiene was common. These findings highlighted the need for targeted health education campaigns to improve personal and environmental hygiene practices among nursing mothers attending immunization clinics.⁸⁴

A 2023 study in Nigeria examined food hygiene knowledge, attitudes, and practices among 330 nursing mothers attending under-five clinics. The study found that 82% of respondents had good knowledge of food hygiene, 95.2% had positive attitudes, and 82.7% demonstrated good practice. Knowledge levels were significantly associated with age and educational status, with mothers who had tertiary education performing better. Educational status also predicted positive attitudes and proper practices. Occupation was another predictor of knowledge, with employed mothers showing better understanding of food hygiene. The findings suggested that nursing mothers attending immunization clinics had generally good

knowledge of food hygiene, but regular health promotion programs were necessary to reinforce both knowledge and practice.⁸⁵

A 2022 study in Igbo Imabana, Cross River State, assessed community knowledge and practices of WASH among nursing mothers. The study used a survey design and collected responses from 210 nursing mothers across seven wards. The study revealed that mothers had above-average knowledge of WASH and agreed with practices such as sorting waste to prevent littering and fly breeding. However, the actual practice was inconsistent, with some mothers dumping waste in compounds or gutters for convenience. Mothers understood that improper waste disposal could lead to diseases such as typhoid, hepatitis, cholera, and poliomyelitis, especially when rain carried waste into water streams. The study emphasized the importance of government-led education programs in clinics and hospitals, particularly in rural areas, to improve personal hygiene and WASH knowledge among nursing mothers. Collaboration between healthcare personnel and environmental officers was recommended to ensure consistent hygiene practices, reduce disease risk, and protect maternal and child health.⁸⁶

2.5.2 Attitudes of nursing mothers towards WASH practices

A 2025 global study in Noakhali, Bangladesh explored the knowledge, attitudes, and practices of mothers regarding water, sanitation, and hygiene (WASH) and food safety. The study used a cross-sectional design and included 325 mothers selected through purposive sampling. Researchers used a pretested questionnaire to assess mothers' attitudes towards WASH practices. The findings showed that although most mothers had good knowledge, only a smaller proportion displayed positive attitudes and consistent hygiene practices. Mothers with higher education and better economic conditions were more likely to show favourable attitudes towards WASH. Those with good knowledge of hygiene were nearly ten times more likely to practice safe hygiene behaviours. The study highlighted that positive

attitudes among mothers were closely linked to education and economic empowerment, suggesting that interventions targeting awareness, training, and access to hygiene resources could improve WASH practices in rural communities. Mothers with supportive environments and access to healthcare services were more willing to adopt proper sanitation and hygiene behaviours.⁸⁷

A 2024 study in Malawi examined handwashing behaviours of new mothers and their guardians in healthcare facilities and households. The study involved observations and interviews with 15 mother-guardian pairs in postnatal wards and 20 mothers in households, with 15 guardians also participating. The study found that handwashing facilities often lacked soap. In postnatal wards, only 20% of hand hygiene opportunities involved actual hand rinsing, mostly by guardians. In households, 38% of opportunities involved rinsing hands with water only. Although mothers knew the importance of handwashing, fatigue and competing responsibilities, such as attending to crying newborns, limited their practice. Guardians were often excluded from health promotion activities, reducing the support available for hygiene behaviours. Intermittent water supply and restricted access to handwashing facilities were additional barriers. Despite these challenges, mothers and guardians expressed willingness to improve hygiene if they had access to soap and proper facilities. The study showed that mothers' attitudes toward hygiene were positive but constrained by practical limitations and the need for context-specific support.⁸⁸

A 2022 Nigerian study assessed mothers' attitudes toward preventing and managing diarrheal diseases among children under five in Lagos State. The descriptive cross-sectional study included 360 mothers, and data were collected using structured questionnaires. The study revealed that 59.2% of mothers had positive attitudes toward preventing and managing diarrheal diseases. Age, occupation, and education were significantly associated with positive attitudes. Educated, employed, and married mothers were more likely to adopt recommended hygiene practices for their children. Although knowledge and practice were important, the

study highlighted that mothers' attitudes played a crucial role in translating knowledge into action. Mothers who valued hygiene and child care practices consistently showed better engagement in preventive behaviours, such as proper handwashing and sanitation.⁸⁹

A 2023 study in Lafia, Nasarawa State, Nigeria assessed hygiene and feeding practices among mothers with children aged 6–23 months. Two hundred mothers participated in a facility-based cross-sectional study using structured questionnaires. The study showed that most mothers had positive attitudes toward handwashing, water treatment, and safe feeding practices. Eighty percent practiced proper handwashing, while 60% boiled water before drinking. Many mothers used cups or spoons for feeding, and 42% always sterilized feeding bottles. Mothers' attitudes toward hygiene influenced their consistency in maintaining clean environments and safe feeding habits. Even when mothers faced challenges, such as lack of access to insecticide-treated nets or clean water, their willingness to maintain hygiene reflected positive attitudes. The study highlighted that attitude was a key factor in determining whether mothers implemented WASH practices in daily routines.⁹⁰

A 2022 study in Pakata, Ilorin, Kwara State, Nigeria examined knowledge and attitudes of nursing mothers toward hygiene practices. The study used a systematic descriptive survey and included 220 mothers selected through multistage sampling. Researchers found that mothers had high knowledge of hygiene practices, and their attitudes were slightly above average. Mothers generally understood the importance of handwashing, proper sanitation, and safe food handling. Positive attitudes were influenced by previous education and exposure to health messages. The study recommended interventions to further strengthen attitudes by promoting health education and improving access to WASH resources. Mothers who recognized the connection between hygiene and disease prevention were more likely to adopt consistent hygiene practices. The study also emphasized the role of both health personnel and households in supporting mothers to maintain positive attitudes toward hygiene behaviours.⁹¹

2.5.3 WASH practices adopted by nursing mothers in their households

A 2024 global study in Hosanna town examined the relationship between household water insecurity and mothers' handwashing practices in relation to childhood diarrhea. The study involved 424 mothers living in peri-urban and informal settlements. Data were collected using structured questionnaires, the HWISE scale, and observational checklists. Results showed that household water insecurity was common, affecting 68.6% of families, and 16% of children experienced diarrhea. Only 42.2% of mothers practiced good handwashing at critical times, such as after defecation, before preparing food, and before feeding their children. Good knowledge of handwashing, positive attitudes, household water security, and the presence of handwashing facilities were strongly associated with proper handwashing. The study found that uncovered or wide-mouthed water containers, unsafe stool disposal, and poor handwashing practices increased the risk of diarrhea among children. Mothers who maintained safe handwashing practices and used secure water storage were more likely to reduce illness in their households. The study highlighted that household water security and access to handwashing facilities were crucial for effective WASH practices among nursing mothers.²³

A 2023 African study in Bibugn district, North West Ethiopia, assessed handwashing practices among mothers in model and non-model households. The study used a community-based comparative cross-sectional design and a multi-stage sampling method. Data were collected through structured interviews and analysed with SPSS. Only 20.3% of mothers washed their hands with water and soap or ash at critical times, such as before feeding children and after cleaning infants. Model households performed significantly better than non-model households. Mothers who had knowledge about hygiene were 3.49 times more likely to wash their hands properly. Access to adequate water increased the likelihood of handwashing by 2.22 times, and mothers with handwashing facilities were 1.88 times more likely to practice handwashing. The study showed that education, access to water, and

availability of handwashing facilities were key determinants of WASH practices. Mothers in households with better resources demonstrated safer hygiene behaviours, while limited access and lack of knowledge reduced the consistency of handwashing in non-model households.²⁴

A 2017 Nigerian study in Port Harcourt explored handwashing practices among mothers of children under five. The study was cross-sectional and involved 154 mothers attending paediatric clinics. Results indicated that 41.6% of mothers washed their hands with soapy water in a container, 19.5% used soap with running water, and 38.9% used only water. After cleaning an infant's perineal area, 40.3% washed their hands with soap and running water, 25.3% used soapy water in a container, and 31.2% used plain water. Only 30.5% of mothers washed their hands with soap and running water before feeding their infants. The study found that handwashing at critical times was significantly associated with the mothers' education level. Mothers washed their hands more often after dealing with faeces than before food preparation. The study highlighted that handwashing practices at home were inadequate and that intensive public education was necessary to improve household WASH behaviours.⁹²

A 2023 Nigerian study assessed WASH practices among 361 mothers of under-five children living in urban slums of Lagos. The study used structured interviews to collect data on water sources, sanitation, and hygiene behaviours. Only 15.2% of mothers used improved water sources, and 44.3% stored drinking water safely. About 10.3% did not treat home drinking water. Open defecation was high at 61.8%, while only 22.4% of mothers washed their hands with water and soap at critical times. Mothers disposed of waste into rivers and canals (36.6%), open dumpsites (33.8%), or used waste to fill marshy areas (29.6%). Despite recognizing that children were vulnerable to unsafe water, mothers' positive perceptions of WASH benefits did not always translate into practice. Factors such as age, education, marital status, and occupation influenced household hygiene practices. Economic constraints and limited access to WASH facilities were common barriers, while support from community

leaders encouraged better hygiene. Mothers with awareness and access to resources demonstrated more consistent WASH practices in their homes.²⁸

A 2024 Nigerian study in Ekiti State evaluated personal and environmental hygiene among mothers attending baby wellness clinics. The descriptive cross-sectional study used questionnaires and checklists to collect information from nursing mothers. Results showed that 60.3% consistently washed their hands with soap and water before feeding their children, while 60.9% washed their hands only occasionally after using the toilet. Most breastfeeding mothers, 78.8%, reported washing their brassieres weekly. In terms of environmental hygiene, 71.52% cleaned their surroundings daily, but 24.51% still disposed of waste by the roadside. The overall hygiene level among mothers was low. The study revealed that while mothers knew the importance of personal and environmental hygiene, their practices were inconsistent. Limited resources, poor access to water, and inadequate waste management influenced household WASH behaviours.⁸⁴

2.5.4 Socio-cultural, economic, and environmental factors influencing WASH practices among nursing mothers

A 2026 global study in northwest Ecuador examined how socioecological factors shaped maternal WASH practices in households with children under two years. Researchers conducted in-depth interviews and freelistening exercises with 33 mothers participating in the ECoMiD study. Data were analysed using the socioecological framework, connecting individual, household, community, geographic, and climatic factors. Mothers' WASH choices were influenced by seasonal flooding, which reduced the usefulness of household cisterns and other investments. Household wealth allowed some families to maintain access to WASH services even during periods of climatic stress. Geographic proximity to piped water or rivers affected access, but quality, consistency, and labour requirements complicated these benefits. At the community level, local infrastructure and national policies determined

the options available for mothers. Within households, access to consistent, quality piped water for drinking and chores was a key preference, while mothers often weighed time and labour constraints when deciding on hygiene practices. Individual mothers valued time-saving technologies and convenient access. Overall, the study highlighted that socio-cultural norms, economic status, and environmental conditions intersected to influence maternal WASH practices, and that mothers in poorer households with limited infrastructure faced the greatest burden in maintaining proper hygiene.⁹³

A 2023 sub-Saharan African study in Addis Ababa, Ethiopia investigated handwashing behaviours of mothers of under-five children and factors influencing the practice. The facility-based cross-sectional study involved 312 mothers who completed a structured questionnaire. Results showed that 74.4% of mothers washed their hands at critical times, including after defecation, after handling children's feces, and before preparing food. However, illiterate mothers and those without tap water in the home or backyard had lower odds of practicing proper handwashing. Mothers from middle, richer, and richest economic groups were significantly more likely to wash hands at critical times than mothers from poorer households. The study revealed that literacy, household economy, and environmental factors such as access to water in the home directly influenced WASH behaviours. Cultural expectations around child care and domestic work also affected mothers' ability to maintain hygiene consistently. Mothers who faced competing household responsibilities or lacked nearby water sources often prioritized other tasks over hygiene, despite knowing its importance.⁹⁴

A 2025 Nigerian study analysed household and individual factors related to WASH deprivation among children across Nigeria. Using a secondary analysis of the 2021 Nigeria Multiple Indicator Cluster Survey, researchers examined 22,059 households to assess access to water, sanitation, and hygiene facilities. Results indicated that 32% of children lacked

improved water sources, 40% lacked hygiene facilities, and 67% lacked sanitation facilities. Socio-economic factors such as household wealth and head-of-household education significantly affected access. Children in rural areas were more likely to experience deprivation than those in urban settings. The study found that gender of the household head influenced access to hygiene facilities, while geographic region affected sanitation and water availability. Mothers' WASH practices were constrained by economic limitations, low literacy, and inadequate community infrastructure. Cultural norms around water use, waste disposal, and child care also shaped household hygiene behaviours, with some households continuing traditional practices that limited WASH adoption.⁹⁵

A 2025 Nigerian study on environmental sanitation in Owerri Municipal LGA examined socio-demographic determinants influencing monthly sanitation exercises. The cross-sectional study surveyed 384 residents using questionnaires and a multistage sampling method. Results revealed that 65% of residents participated in sanitation exercises, with women participating more than men. Older adults and more educated individuals were more likely to engage in sanitation activities, while lack of resources and low awareness limited participation. Economic constraints and household responsibilities influenced mothers' involvement in sanitation exercises. Environmental factors, including availability of communal sanitation tools and waste collection points, affected the feasibility of maintaining clean surroundings. The study highlighted that socio-cultural norm, such as gender roles and community expectations, shaped the adoption of environmental WASH practices among mothers.⁹⁶

Another 2025 Nigerian study investigated household factors influencing unimproved WASH conditions. Results showed that 88% of households had unimproved hygiene, 47% had poor sanitation, and 25% had limited access to safe water. Rural residence, low literacy, poverty, and large household size were strongly associated with poor WASH practices. Wealth status,

education, and gender of the household head influenced sanitation and hygiene conditions. Residency type had the greatest impact on water source choice, suggesting that environmental and infrastructural limitations played a larger role than individual wealth or education in determining WASH practices. Mothers in rural households faced significant challenges in accessing safe water and sanitation, and socio-cultural factors, such as local beliefs about water storage and waste disposal, further influenced hygiene behaviour.²⁹

2.6 GAP IN LITERATURE

Previous studies on WASH among nursing mothers have highlighted knowledge and hand hygiene practices, but gaps remain in understanding the full picture of maternal WASH behaviours. Many studies reported that mothers had good knowledge but did not consistently apply it in household practices. These studies often focused on handwashing or food hygiene alone, without integrating broader WASH practices. Socio-cultural, economic, and environmental factors were frequently mentioned, such as household wealth, maternal education, cultural norms, and access to water and sanitation infrastructure, but they were rarely examined together in a comprehensive framework. Furthermore, most research was conducted in rural or generalized populations, leaving urban healthcare settings, like immunization clinics, underexplored.

The relationship between breastfeeding, maternal hygiene practices, and diarrheal incidence among children is also poorly documented, with studies typically addressing either hygiene behaviour or child health outcomes separately. This study addresses these gaps by assessing knowledge, attitudes, household practices, and influencing socio-cultural, economic, and environmental factors, while also exploring the link between hygiene, breastfeeding, and diarrheal occurrence among children of nursing mothers attending immunization clinics in UBTH.

CHAPTER THREE

METHODOLOGY

3.1 Study Area

This study was conducted at the University of Benin Teaching Hospital, located in Benin City, Edo State, Nigeria. Edo State is one of the 36 states of the Federal Republic of Nigeria and is situated in the South–South geopolitical zone. The state was created on 27 August 1991 from the northern part of the former Bendel State, with Benin City as its capital. Edo State shares boundaries with Kogi State to the northeast, Anambra State to the east, Delta State to the south and southeast, and Ondo State to the west and northwest.⁹⁷

Benin City is a humid tropical urban settlement comprising three Local Government Areas: Egor, Ikpoba-Okha, and Oredo. Geographically, it has been described as a narrow, north–south strip of land in West Africa, covering an estimated land area of approximately 1,125 km². The terrain is relatively flat, with an average elevation of about 80 metres above sea level. It lies between latitude 6°21'N and 6°44'N and longitude 5°35'E and 5°44'E. The projected population of Edo State by 2025 is approximately 5.42 million, with an average annual growth rate of 3.2%, comprising about 2,550,240 males and 2,869,760 females. The state is ethnically diverse, with the Binis constituting approximately 57.5% of the population, followed by the Esan (14.1%), Etsako (12.2%), Owan (7.4%), and Akoko Edo (5.7%) ethnic groups, in addition to other minority groups.⁹⁸

The University of Benin Teaching Hospital is a federal tertiary health institution established on 12 May 1973 following the enactment of Edict No. 12 in April 1971. The hospital was created to support the University of Benin and to provide secondary and tertiary healthcare services to the then Midwestern Region, now comprising Edo and Delta States. On 1 April

1975, UBTH was taken over by the Federal Government, becoming the fifth teaching hospital in Nigeria at the time. Over the past four decades, UBTH has functioned as a major referral centre for complex medical and surgical conditions. Its catchment area includes Edo State, Delta State, parts of Kogi and Ondo States, and occasionally other parts of southern Nigeria. Originally commissioned as a 300-bed facility, UBTH has expanded substantially and currently operates with a bed capacity exceeding 900. The hospital is situated in Egor Local Government Area along the Benin–Ore Road and shares boundaries with the University of Benin and the Federal Government Girls’ College Road.⁹⁹

UBTH is a multi-specialist tertiary institution with a broad range of clinical departments involved in healthcare delivery, medical education, and research. These include Internal Medicine, Surgery, Chemical Pathology, Haematology, Histopathology, and Medical Microbiology, as well as subspecialties such as Orthopaedics, Dermatology, Radiology, Anaesthesiology, Family Medicine, Ear, Nose and Throat (ENT), and Ophthalmology. Other core departments include Child Health, Obstetrics and Gynaecology, Public Health, Mental Health, and Dentistry. In addition, UBTH houses the College of Nursing and departments of Physiotherapy, Occupational Therapy, and Pharmacy, all of which support the hospital’s mandate of providing high-quality patient care, training healthcare professionals, and advancing medical research in Nigeria.¹⁰⁰

This facility offers full maternal and child health services including immunization clinics. These clinics serve nursing mothers from diverse urban and peri-urban communities, and hence an ideal setting to assess household WASH practices.

3.2 Study Design

This study employed a descriptive cross-sectional design.

3.3 Study Duration

The study was conducted between December 2024 and May 2026.

3.4 Study Population

The study population consisted of nursing mothers who attended immunization clinics at UBTH. Participants included mothers of children aged 0–24 months who were the primary recipients of routine immunization and were vulnerable to adverse health outcomes associated with poor WASH practices.

3.5 Selection Criteria

Inclusion Criteria:

- Nursing mothers attending immunization clinics at UBTH during the study period.
- Mothers with children aged 0-24 months.
- Mothers who provide informed consent to participate in the study.

Exclusion Criteria:

- Mothers who are too ill to participate at the time of data collection.
- Mothers who withdraw consent during data collection.

3.6 Sample Size Determination

The sample size was determined using Cochran's formula for estimating a single population proportion in cross-sectional studies.¹⁰¹

$$n = \frac{Z^2 \times p(1 - p)}{d^2}$$

Where:

- **n** = minimum required sample size
- **Z** = standard normal deviate at 95% confidence level (1.96)
- **p** = estimated prevalence of access to basic hygiene services in Nigeria (16% or 0.16), as reported in the WASH-NORM survey conducted by the National Bureau of Statistics.¹⁰²
- **d** = margin of error (5% or 0.05)

Substitution into the formula

$$\begin{aligned}n &= \frac{(1.96)^2 \times 0.16 \times (1 - 0.16)}{(0.05)^2} \\n &= \frac{3.8416 \times 0.16 \times 0.84}{0.0025} \\n &= \frac{3.8416 \times 0.1344}{0.0025} \\n &= \frac{0.516}{0.0025} \\n &= 206.4\end{aligned}$$

The minimum calculated sample size is 206 participants.

Adjustment for Non-Response

To account for a 10% non-response rate:

$$\begin{aligned}n_{adj} &= \frac{n}{1 - 0.10} \\n_{adj} &= \frac{206}{0.90} \\n_{adj} &= 228.9\end{aligned}$$

The final sample size, rounded up to the nearest whole number, is 229 nursing mothers. However, a final sample size of 230 was used.

3.7 Sampling Technique

A systematic random sampling method was used. A random starting point between 1 and k was selected on each clinic day, after which every kth eligible mother was recruited until the daily quota was met. The sampling interval was determined by:

$k = \text{estimated daily eligible attendance} \div \text{required daily sample}$.

3.8 Data Management

Data were collected using a structured, interviewer-administered questionnaire, developed to align with the objectives of the study and adapted from validated WASH assessment tools used by WHO and UNICEF.¹⁰³

The questionnaire was structured in the following sections:

Section A: Sociodemographic Characteristics – Gathered data on age, marital status, religion, ethnicity, level of education, occupation, monthly income, number of children, and the age of the index child. This information assisted in identifying socio-demographic factors that had the potential to affect WASH knowledge and practices.

Section B: Knowledge of WASH – tested the awareness and knowledge of mothers on the major WASH practices, including WASH terminologies, sources of information, safe water handling, handwashing practices, and disposal of child faeces. This section assessed knowledge as a predictor of hygiene behaviour.

Section C: Attitude Towards WASH – examined the beliefs and perceptions of the mothers regarding hygiene, water treatment, use of toilets, handwashing, and adoption of new hygiene

behaviours. The attitudes and social influences were quantified by measuring the responses using a Likert scale.

Section D: WASH Practices – investigated real household behaviours, including water source, water storage, water treatment, handwashing, type of toilet, faecal disposal, and waste disposal. This section identified how mothers translated knowledge and attitudes into practical hygiene behaviours.

Section E: Factors Affecting WASH Practices – explored socio-cultural, economic, and environmental influences, including household support, access to and affordability of hygiene products, and cultural practices that influenced sanitation and water consumption. This section addressed obstacles and facilitators of appropriate hygiene behaviour.

A semi-structured questionnaire was used for data collection. The tool was selected on the basis of its validity and reliability in previous WASH studies, and it was suitable for measuring the level of knowledge, attitudes, and practices of nursing mothers in a clinical facility.

3.9 Pretesting

A pretest was conducted among 23 nursing mothers (10% of 229) at Edaiken Primary Health Care Centre, Uselu, Egor LGA in Benin City, which was not part of the main study. Pretesting was used to evaluate the questions in terms of clarity, relevance, and reliability. Based on the results of the pretest, the necessary changes were implemented.

3.10 Research Assistant

The questionnaires were administered with the assistance of two trained research assistants. They were trained on the study objectives, ethical conduct, and proper interviewing techniques to ensure consistency and minimise bias.

3.11 Data Management and Analysis

Data collected were entered, cleaned, and analysed using IBM Statistical Package for the Social Sciences (SPSS) version 27.0. Data analysis involved both descriptive and inferential statistics.

Descriptive Statistics

Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarise the socio-demographic characteristics, knowledge, attitudes, WASH practices, breastfeeding patterns, and diarrhoeal incidence among nursing mothers.

Inferential Statistics

Inferential statistics included chi-square tests and logistic regression analysis to examine associations between socio-demographic variables, knowledge levels, attitudes, WASH practices, breastfeeding status, and diarrhoeal incidence among children aged 0–24 months.

A p-value of less than 0.05 was considered statistically significant.

Scoring System

Knowledge of WASH

Knowledge of WASH was assessed using 16 questions in Section B (Knowledge of WASH).

Each correct response was scored as **1 point**, while each incorrect or “Don’t know” response was scored as **0 point**.

The total knowledge score was calculated and converted into a percentage of the maximum obtainable score using:

$$\text{Knowledge Score (\%)} = \frac{\text{Score Obtained}}{\text{Maximum Obtainable Score}} \times 100$$

Knowledge was interpreted as follows:

- **0%–69.9%:** Poor knowledge
- **70%–100%:** Good knowledge.¹⁰⁴

Attitude Towards WASH Practices

Attitudes toward WASH practices were assessed using Likert-scale statements in Section C.

Responses were measured on a **5-point Likert scale**: Strongly agree = 4, Agree = 3, Neutral = 2, Disagree = 1, and Strongly disagree = 0.

Negatively worded statements were reverse scored to ensure consistency in directionality. Each appropriate response was given a score of 1 and inappropriate response was given a score of 0.

The total attitude score was summed and converted into a percentage of the maximum obtainable score.

Attitude was interpreted as:

- **0%–69.9%:** Negative attitude
- **70%–100%:** Positive attitude.¹⁰⁴

WASH Practices

WASH practices were assessed using items in Section D and relevant practice-based questions in Section F relating to diarrhoea management and breastfeeding during illness.

Appropriate or recommended practices (e.g., treating drinking water, handwashing with soap at critical times, safe disposal of child faeces, use of improved sanitation facilities, and continuation of breastfeeding during diarrhoea) were scored as **1 point**, while inappropriate practices were scored as **0 point**.

The total practice score was calculated and converted into a percentage of the maximum obtainable score.

Practice was interpreted as:

- **0%–69.9%:** Poor practice
- **70%–100%:** Good practice.¹⁰⁴

Factors Influencing WASH Practices

Section E variables (socio-cultural, economic, and environmental factors) were not scored in isolation. Instead, these variables were analysed for their association with WASH practice level using chi-square tests and multivariable logistic regression analysis.

This approach enabled the identification of significant predictors of good WASH practice and determinants of diarrhoeal occurrence among children.

3.12 Ethical Considerations

Ethical approval was obtained from the UBTH Health Research Ethics Committee before the commencement of the study with the protocol number ADME22/A/VOL.VII/1486549127290. Informed consent was obtained from all participants. Confidentiality was maintained by assigning codes instead of names, and participants were assured that participation was voluntary, with the right to withdraw at any time. No personal identifiers were used in data analysis or reporting.

3.13 Study Limitations

This study was subject to several limitations. The cross-sectional design limited the ability to establish causal relationships between WASH practices and child health outcomes. Also, this study utilised a small sample size and findings may not be generalizable. This study was also limited by reporting bias and social desirability bias. Conducting the study in a single tertiary hospital may have restricted generalisability to other settings.

CHAPTER FOUR

RESULTS

A total of 230 respondents participated in the study with 100% response rate. The results are presented in the following sections in line with the specific objectives.

SECTION A: Socio-demographic characteristics of respondents.

SECTION B: Knowledge of WASH among nursing mothers

SECTION C: Attitude of nursing mothers towards WASH practices

SECTION D: WASH practices adopted by nursing mothers

SECTION E: Factors influencing WASH practices among nursing mothers.

SECTION A:

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Table 1: Socio-demographic characteristics of nursing mothers

Variables	Frequency (n = 230)	Percent
Age (years)		
18–27	142	61.7
28–37	59	25.7
38–47	29	12.6
Mean ± SD	27.70± 2.72	
Marital status		
Ever Married*	220	95.7
Never Married**	10	4.3
Religion		
Christian	175	76.1
Islam	42	18.3
African Traditional Religion	13	5.7
Ethnicity		
Benin	122	53.0
Esan	69	30.0
Hausa	17	7.4
Etsako	9	3.9
Igbo	6	2.6
Yoruba	4	1.7
Others***	3	1.3
Level of education		
Secondary	94	40.9
Tertiary	93	40.4
Primary	28	12.2
No formal education	15	6.5
Occupation		
Businesswoman	51	22.2
Trader	49	21.3
Civil servant	25	10.9
Housewife	25	10.9
Teacher	21	9.1
Fashion designer	15	6.5
Student	11	4.8
Nurse	9	3.9
Pharmacist	9	3.9
Hairdresser	8	3.5
Artisan	7	3.0
Socioeconomic status (SES)		
Low SES	41	17.8
Middle SES	130	56.5
High SES	59	25.7
Number of children		
<4	169	73.5
≥ 4	61	26.5
Mean ± SD	2.72± 1.38	
Age of index child (Months)		
<6	92	40.0
6–11	70	30.4
≥12	68	29.6
Mean ± SD	8.35± 6.20	
Monthly household income		
N140,000 and above	134	58.3
N70,000–N139,999	83	36.1
Less than N70,000	13	5.7

Others*** are Urohobo, Isoko, Ijaw Never Married** are Single 10(4.3%). Ever Married* are Married 179(77.8%), Divorced 22(9.6%), Widowed 13(5.7%), Separated 6 (2.6%)

A total of 230 nursing mothers participated in the study, with a mean age of 27.70 ± 2.72 years; the majority were aged 18–27 years (61.7%), followed by those aged 28–37 years (25.7%) and 38–47 years (12.6%), with most respondents being ever married (95.7%) compared to a small proportion who were never married (4.3%). The majority were Christians (76.1%), followed by Muslims (18.3%) and those practicing African Traditional Religion (5.7%), while the predominant ethnic group was Benin (53.0%), followed by Esan (30.0%) and smaller proportions from Hausa (7.4%) and other ethnic groups.

In terms of education and occupation, most respondents had secondary (40.9%) or tertiary education (40.4%), while fewer had primary (12.2%) or no formal education (6.5%). Respondents were mainly engaged in business-related activities, including businesswomen (22.2%) and traders (21.3%), followed by civil servants and housewives (10.9% each), with smaller proportions in other occupations such as teaching, fashion design, and healthcare professions. The majority belonged to the middle socioeconomic class (56.5%), followed by high (25.7%) and low (17.8%) socioeconomic status.

Regarding family characteristics, most respondents had fewer than four children (73.5%), with a mean of 2.72 ± 1.38 children, and the largest proportion of index children were aged less than 6 months (40.0%), followed by 6–11 months (30.4%) and 12 months or older (29.6%), with a mean age of 8.35 ± 6.20 months. In terms of income, more than half of respondents earned ₦140,000 and above monthly (58.3%), followed by those earning ₦70,000–₦139,999 (36.1%), while only a small proportion earned less than ₦70,000 (5.7%).

SECTION B:

KNOWLEDGE OF WASH AMONG NURSING MOTHERS

Table 2: Awareness and source of information about WASH among nursing mothers

Variables	Frequency (n = 230)	Percent
Have you heard of WASH		
Yes	195	84.8
No	25	15.2
Source of Information*		
Health workers	95	48.7
Antenatal clinic	85	43.6
Radio/TV	68	34.9
Social media	58	29.7
Friends/family	55	28.2
Community programs	20	10.3

* = **Multiple response question**

Regarding awareness of WASH, the majority of respondents (84.8%) reported that they had heard of WASH. With respect to sources of information, health workers were the most common source (48.7%), followed by antenatal clinics (43.6%). Other notable sources included radio/television (34.9%), social media (29.7%), and friends or family (28.2%), while a smaller proportion reported community programmes (10.3%).

Table 3: Knowledge of WASH among nursing mothers

Variables	Frequency (n = 230)	Percent
What does WASH stand for		
Water, Sanitation and Hygiene	182	79.1
Water and Sanitary Health	25	10.9
Waste and Sewage Handling	14	6.1
Don't know	9	3.9
According to safe water standards, drinking water should be:		
Free from germs and harmful chemicals	167	72.6
Clear in color only	25	10.9
From any available source	17	7.4
Tasteless only	12	5.2
Odourless only	9	3.9
Which of the following water sources is safest for drinking in Nigeria		
Piped treated water	124	53.9
Borehole water	45	19.6
Well water	34	14.8
River/stream	27	11.7
Poor WASH practices can lead to which of these diseases*		
Diarrhoea	185	80.4
Cholera	171	74.3
Typhoid	141	61.3
Malaria	124	53.9
Tuberculosis	63	27.4
Cancer	18	7.8
Handwashing with soap is most important		
All of the above	86	37.4
Before preparing food	50	21.7
After using the toilet	43	18.7
Before feeding your child	39	17.0
After handling garbage	12	5.2
Boiling water before drinking can		
Kill germs and pathogens	185	80.4
Improve taste	23	10.0
Make water unsafe	22	9.6
Proper disposal of a child's faeces helps to		
Prevent disease transmission	118	51.3
All of the above	73	31.7
Keep the house clean	39	17.0
Diarrhoea is defined as:		
Passing loose or watery stool three or more times in 24 hours	185	80.4
Hard stool with difficulty	19	8.3
Passing stool once daily	13	5.7
Don't know	13	5.7
Diarrhoea in children can be caused by:		
Contaminated water	137	59.6
Poor hand hygiene	130	56.5
All of the above	127	55.2
Unsafe disposal of faeces	105	45.7
Which is the most effective way to prevent diarrhoeal diseases in children		
All of the above	94	40.9
Proper handwashing with soap	72	31.3
Boiling water before drinking	42	18.3
Using a toilet for defecation	22	9.6
During diarrhoea, breastfeeding should be:		
Continued more frequently	126	54.8
Continued as usual	33	14.3
Reduced	32	13.9
Don't know	24	10.4
Stopped	15	6.5

* = Multiple response question $\alpha=0.750$

Regarding knowledge of WASH, the majority of respondents correctly identified WASH as Water, Sanitation and Hygiene (79.1%). Most respondents identified safe drinking water as being free from germs and harmful chemicals (72.6%), while others selected clear colour only (10.9%), any available source (7.4%), tasteless only (5.2%), and odourless only (3.9%). Over half of respondents identified piped treated water as the safest source (53.9%), followed by borehole water (19.6%), well water (14.8%), and river/stream water (11.7%).

In relation to diseases associated with poor WASH practices, diarrhoea (80.4%), cholera (74.3%), and typhoid (61.3%) were the most commonly identified, while malaria (53.9%), tuberculosis (27.4%), and cancer (7.8%) were also selected. For handwashing, 37.4% identified all key moments, while others selected specific instances such as before preparing food (21.7%), after using the toilet (18.7%), before feeding a child (17.0%), and after handling garbage (5.2%). The majority of respondents reported that boiling water kills germs and pathogens (80.4%), while others selected improve taste (10.0%) or make water unsafe (9.6%).

Regarding sanitation and diarrhoea-related knowledge, 51.3% identified prevention of disease transmission as the reason for proper disposal of child faeces, while 31.7% selected all of the above and 17.0% selected keeping the house clean. Most respondents correctly defined diarrhoea as passing loose or watery stool three or more times in 24 hours (80.4%), while others selected incorrect definitions or did not know. Causes of diarrhoea identified included contaminated water (59.6%), poor hand hygiene (56.5%), all of the above (55.2%), and unsafe disposal of faeces (45.7%). For prevention, 40.9% selected all of the above, while others chose proper handwashing with soap (31.3%), boiling water (18.3%), and use of toilets (9.6%). During diarrhoea, 54.8% reported that breastfeeding should be continued more frequently, while others selected continued as usual (14.3%), reduced (13.9%), don't know (10.4%), and stopped (6.5%).

Table 4: Correctness of knowledge responses on WASH among nursing mothers

Variables	Knowledge Responses (n=230)	
	Correct (%)	Incorrect (%)
What does WASH stand for		
Water, Sanitation and Hygiene	182 (79.1)	48 (20.9)
According to safe water standard, drinking water should be		
Free from germs and harmful chemicals	167 (72.6)	63 (27.4)
Which of the following water sources is safest for drinking in Nigeria		
Piped treated water	124 (53.9)	106 (46.1)
Poor WASH practices can lead to which of these diseases*		
Cholera	171 (74.3)	59 (25.7)
Typhoid	141 (61.3)	89 (38.7)
Diarrhea	185 (80.4)	45 (19.6)
Malaria	106 (46.1)	124 (53.9)
Tuberculosis	167 (72.6)	63 (27.4)
Cancer	212 (92.2)	18 (7.8)
Handwashing with soap is most important		
All of the above	86 (37.4)	144 (62.6)
Boiling water before drinking can		
Kill germs and pathogens	185 (80.4)	45 (19.6)
Proper disposal of a child's feces helps to		
All of the above	73 (31.7)	157 (68.3)
Diarrhoea is defined as		
Passing loose or watery stool three or more times in 24 hours	185 (80.4)	45 (19.6)
Diarrhoea in children can be caused by		
All of the above	127 (55.2)	103 (44.8)
Which is the most effective way to prevent diarrheal diseases in children		
All of the above	94 (40.9)	136 (59.1)
During diarrhoea, breastfeeding should be		
Continued more frequently	126 (54.8)	104 (45.2)

* = Multiple response question $\alpha=0.750$

Regarding correctness of knowledge on WASH among nursing mothers, the majority of respondents correctly identified the meaning of WASH as Water, Sanitation and Hygiene (79.1%) and that safe drinking water should be free from germs and harmful chemicals

(72.6%), while just over half correctly identified piped treated water as the safest source (53.9%). High proportions also correctly identified diarrhoea (80.4%), cholera (74.3%), and typhoid (61.3%) as diseases associated with poor WASH practices, while fewer correctly identified malaria (46.1%) and tuberculosis (72.6%), and the majority correctly rejected cancer (92.2%).

With respect to hygiene and diarrhoea-related knowledge, only about one-third of respondents correctly identified all key handwashing moments (37.4%), while a higher proportion correctly identified that boiling water kills germs (80.4%). Fewer respondents correctly identified all benefits of proper disposal of child faeces (31.7%) and the most effective methods of preventing diarrhoeal diseases (40.9%), while just over half correctly identified causes of diarrhoea in children (55.2%). A high proportion correctly defined diarrhoea (80.4%), and slightly more than half correctly indicated that breastfeeding should be continued more frequently during diarrhoea (54.8%).

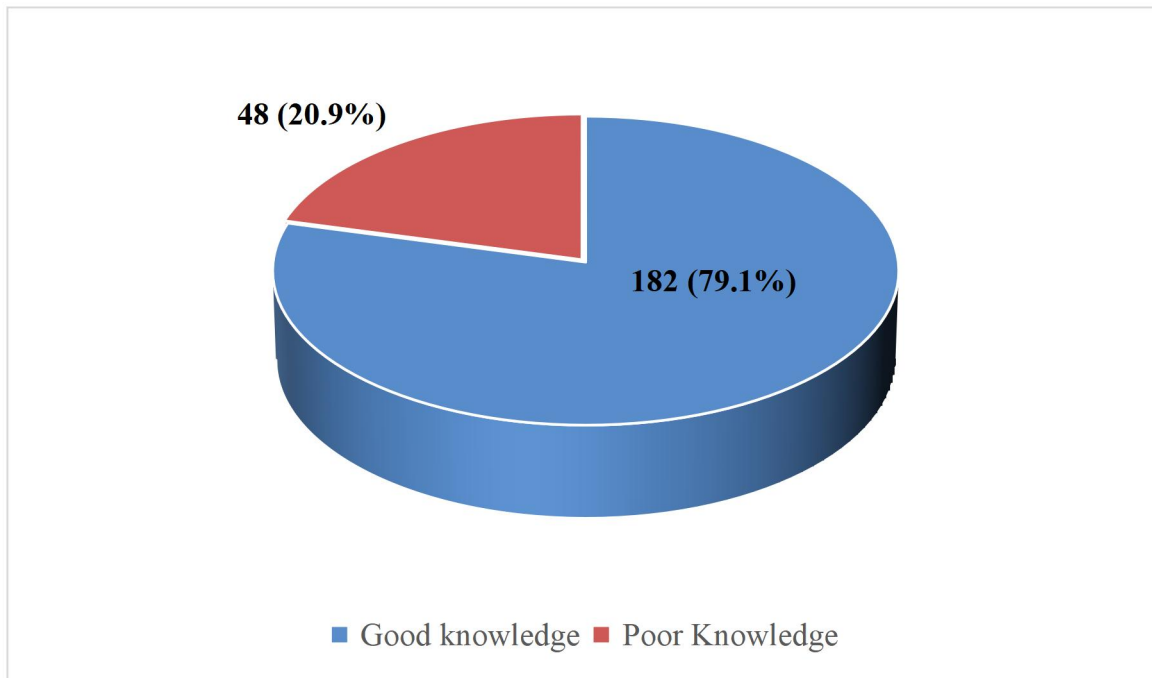


Figure 1: Knowledge level of WASH among nursing mothers

Approximately four-fifths of respondents 182 (79.1%) demonstrated poor knowledge of WASH, while about one-fifth 48 (20.9%) had good knowledge.

Table 5: Factors associated with knowledge of WASH among Nursing mothers

Variables	Knowledge of WASH		Test statistic	p-value
	Good (n=48) Freq(%)	Poor (n=182) Freq(%)		
Age (years)				
18–27	32 (22.5)	110 (77.5)	0.647	0.724
28–37	11 (18.6)	48 (81.4)		
38–47	5 (17.2)	24 (82.8)		
Marital status				
Never married	1 (10.0)	9 (90.0)	0.748*	0.692
Ever married	47 (21.4)	173 (78.6)		
Religion				
Christian	38 (21.7)	137 (78.3)	0.316	0.574
Non-Christian	10 (18.2)	45 (81.8)		
Ethnicity				
Edo Indigene	41 (20.5)	159 (79.5)	0.127	0.722
Non-Edo Indigene	7 (23.3)	23 (76.7)		
Level of education				
No formal education	6 (40.0)	9 (60.0)	5.339	0.149
Primary	4 (14.3)	24 (85.7)		
Secondary	16 (17.0)	78 (83.0)		
Tertiary	22 (23.7)	71 (76.3)		
Occupation				
Traders	22 (22.0)	78 (78.0)	3.427	0.330
Professionals	17 (26.6)	47 (73.4)		
Skilled artisans	4 (13.3)	26 (86.7)		
Non-working	5 (13.9)	31 (86.1)		
Socioeconomic status				
High SES	14 (23.7)	45 (76.3)	1.293	0.524
Middle SES	28 (21.5)	102 (78.5)		
Low SES	6 (14.6)	35 (85.4)		
Number of children				
<4 children	41 (24.3)	128 (75.7)	4.436	0.035
≥4 children	7 (11.5)	54 (88.5)		
Age of index child				
<6 months	11 (12.0)	81 (88.0)	7.643	0.022
6–11 months	20 (28.6)	50 (71.4)		
≥12 months	17 (25.0)	51 (75.0)		
Monthly income				
<₦70,000	3 (23.1)	10 (76.9)	0.214	0.898
₦70,000–₦139,999	16 (19.3)	67 (80.7)		
≥₦140,000	29 (21.6)	105 (78.4)		

*Fisher's Exact Test.

The proportion of respondents with good knowledge of WASH was highest among those aged 18–27 years (22.5%), followed by those aged 28–37 years (18.6%) and 38–47 years (17.2%); however, this association was not statistically significant ($\chi^2 = 0.647$, $p = 0.724$). There was no significant association between marital status and knowledge, although ever married respondents (21.4%) had higher good knowledge compared to never married (10.0%) (Fisher's Exact Test, $p = 0.692$). Similarly, religion ($p = 0.574$) and ethnicity ($p = 0.722$) were not significantly associated with knowledge. Knowledge also did not differ significantly by level of education ($\chi^2 = 5.339$, $p = 0.149$), occupation ($\chi^2 = 3.427$, $p = 0.330$), or socioeconomic status ($\chi^2 = 1.293$, $p = 0.524$).

However, number of children was significantly associated with knowledge ($\chi^2 = 4.436$, $p = 0.035$), with respondents having <4 children demonstrating higher good knowledge (24.3%) compared to those with ≥ 4 children (11.5%). Age of index child was also significantly associated ($\chi^2 = 7.643$, $p = 0.022$), with the highest proportion of good knowledge among those with children aged 6–11 months (28.6%), followed by ≥ 12 months (25.0%) and <6 months (12.0%). Monthly income was not significantly associated with knowledge ($p = 0.898$).

Table 6: Predictors of good knowledge of WASH among nursing mothers

Predictors	B	Odds ratio	95% CI for OR		p-value
			Lower	Upper	
Age of respondent (years)	-0.021	0.979	0.925	1.036	0.463
Marital status					
Ever Married*		1			
Never Married	-0.828	0.437	0.044	4.299	0.478
Religion					
Non-Christian*		1			
Christian	0.342	1.408	0.605	3.274	0.427
Ethnicity					
Non-Edo Indigene*		1			
Edo Indigene	-0.404	0.667	0.247	1.804	0.425
Level of education					
Tertiary*		1			
No formal education	2.211	9.125	0.882	94.426	0.064
Primary	0.303	1.354	0.167	10.974	0.777
Secondary	0.003	1.003	0.432	2.330	0.995
Occupation					
Non-working*		1			
Traders	0.172	1.188	0.335	4.211	0.790
Professionals	-0.077	0.926	0.069	12.400	0.954
Skilled artisans	-0.592	0.553	0.067	4.568	0.583
Socioeconomic status					
Low SES*		1			
High SES	1.633	5.118	0.151	173.563	0.364
Middle SES	1.247	3.480	0.503	24.083	0.206
Number of children					
≥4 children*		1			
<4 children	0.871	2.390	0.968	5.903	0.059
Age of index child					
≥12 months *		1			
< 6 months	-0.973	0.378	0.154	0.924	0.033
6-11 months	0.366	1.442	0.633	3.287	0.384
Monthly household income					
≥N140,000*		1			
< N70,000	0.133	1.142	0.258	5.059	0.861
N70,000-N139,999	-0.066	0.937	0.444	1.974	0.863

CI = Confidence interval; OR = Odd ratio; *reference category; R² = 10.7–16.7%

Number of children and age of the index child were identified as predictors of knowledge of WASH among respondents. Mothers with 1–3 children had higher odds of good knowledge compared to those with 4–6 children (OR = 2.390), although this was of borderline statistical significance (p = 0.059).

Age of the index child showed a significant association with knowledge. Compared to respondents with children aged 12 months or more (reference), those with children less than 6 months had significantly lower odds of good knowledge (OR = 0.378, $p = 0.033$). Those with children aged 6 to less than 12 months did not differ significantly from the reference group (OR = 1.442, $p = 0.384$).

SECTION C:

ATTITUDE OF NURSING MOTHERS TOWARDS WASH PRACTICES

Table 7: Attitudinal responses of nursing mothers towards WASH practices

Variables	Attitudinal Responses	SA (n=230) Freq (%)	A (n=230) Freq (%)	N(n=230) Freq (%)	D (n=230) Freq (%)	SD (n=230) Freq (%)
Spending money on safe drinking water is necessary for my child's health		103 (44.8)	76 (33.0)	24 (10.4)	16 (7.0)	11 (4.8)
Hand washing with soap is important to prevent disease		90 (39.1)	79 (34.3)	30 (13.0)	18 (7.8)	13 (5.7)
It is not important to store water in covered containers		6 (2.6)	16 (7.0)	30 (13.0)	87 (37.8)	91 (39.6)
I believe washing hands before feeding my baby prevents diseases		104 (45.2)	77 (33.5)	21 (9.1)	21 (9.1)	7 (3.0)
Cleaning the toilet regularly is not necessary to prevent infections		12 (5.2)	17 (7.4)	28 (12.2)	93 (40.4)	80 (34.8)
Cleanliness of water and household environment affects my child's well-being		100 (43.5)	78 (33.9)	25 (10.9)	19 (8.3)	8 (3.5)
I believe traditional beliefs sometimes prevent proper sanitation practices		40 (17.4)	82 (35.7)	47 (20.4)	47 (20.4)	14 (6.1)
Using modern toilets is better than traditional open defecation		104 (45.2)	74 (32.2)	30 (13.0)	13 (5.7)	9 (3.9)
Maintaining clean water, sanitation, and hygiene facilities at home is only the responsibility of the government		9 (3.9)	27 (11.7)	20 (8.7)	72 (31.3)	102 (44.3)
It is important to respect cultural practices even if they conflict with recommended hygiene practices		14 (6.1)	61 (26.5)	52 (22.6)	65 (28.3)	38 (16.5)

***SA=Strongly Agree, A = Agree, N = Neutral, D = Disagree, SD = Strongly Disagree
 $\alpha=0.710$**

Regarding attitude towards WASH practices, the majority of respondents expressed positive attitudes towards key hygiene behaviours. Most strongly agreed or agreed that spending money on safe drinking water is necessary for their child's health (77.8%), that handwashing with soap prevents disease (73.4%), and that washing hands before feeding a baby prevents illness (78.7%). Similarly, a high proportion agreed that cleanliness of water and the

household environment affects child well-being (77.4%) and that using modern toilets is preferable to open defecation (77.4%).

Conversely, most respondents disagreed or strongly disagreed with negative statements, including that storing water in covered containers is not important (77.4%) and that cleaning toilets regularly is unnecessary (75.2%). The majority also disagreed that maintaining WASH facilities is solely the responsibility of the government (75.6%). However, responses were more varied regarding the influence of traditional beliefs on sanitation practices and whether cultural practices should be maintained even when they conflict with recommended hygiene practices, with a more even distribution across response categories.

Table 8: Appropriateness of attitudinal responses towards WASH among nursing mothers

Variables	Attitudinal responses	Appropriate Freq(%)	Inappropriate Freq(%)
Spending money on safe drinking water is necessary for my child's health		179 (77.8)	51 (22.2)
Hand washing with soap is important to prevent disease		169 (73.5)	61 (26.5)
I believe washing hands before feeding my baby prevents diseases		181 (78.7)	49 (21.3)
Cleanliness of water and household environment affects my child's well-being		178 (77.4)	52 (22.6)
I believe traditional beliefs sometimes prevent proper sanitation practices		122 (53.0)	108 (47.0)
Using modern toilets is better than traditional open defecation		178 (77.4)	52 (22.6)
It is not important to store water in covered containers		178 (77.4)	52 (22.6)
Cleaning the toilet regularly is not necessary to prevent infections		173 (75.2)	57 (24.8)
Maintaining clean water, sanitation, and hygiene facilities at home is only the responsibility of the government		174 (75.7)	56 (24.3)
It is important to respect cultural practices even if they conflict with recommended hygiene practices		103 (44.8)	127 (55.2)

 $\alpha=0.710$

In terms of appropriateness of responses to attitudinal questions on WASH among nursing mothers, the majority demonstrated appropriate attitudes across most domains. High proportions showed appropriate responses towards spending money on safe drinking water (77.8%), handwashing with soap (73.5%), washing hands before feeding a child (78.7%), and recognizing the importance of water and household cleanliness for child well-being (77.4%). Similarly, most respondents gave appropriate responses regarding the use of modern toilets

(77.4%), the need to store water in covered containers (77.4%), regular cleaning of toilets (75.2%), and the shared responsibility for maintaining WASH facilities rather than attributing it solely to the government (75.7%).

However, appropriate responses were lower in some areas, particularly the influence of traditional beliefs on sanitation practices (53.0%), where responses were nearly evenly distributed. Additionally, less than half of respondents demonstrated appropriate responses on prioritizing recommended hygiene practices over conflicting cultural practices (44.8%), with a higher proportion giving inappropriate responses (55.2%). Overall, while appropriate attitudes predominated, some areas reflected mixed perceptions.

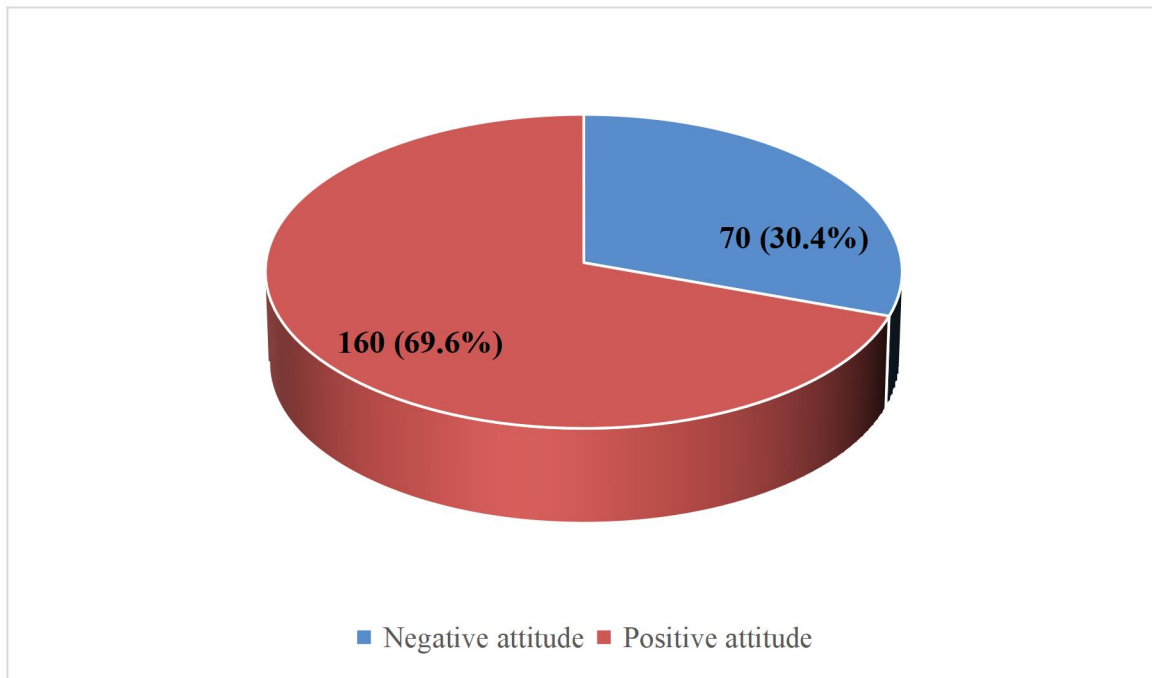


Figure 2: Attitude towards WASH among nursing Mothers

Approximately two-thirds of respondents demonstrated a positive attitude 160 (69.6%), whereas about one-third had a negative attitude 70 (30.4%).

Table 9: Factors associated with attitude towards WASH among nursing mothers

Variables	Attitude		Test statistic	p-value
	Positive (n=160) Freq(%)	Negative (n=70) Freq(%)		
Age (years)				
18–27	94 (66.2)	48 (33.8)	2.732	0.255
28–37	46 (78.0)	13 (22.0)		
38–47	20 (69.0)	9 (31.0)		
Marital status				
Never married	7 (70.0)	3 (30.0)	0.001*	>0.999
Ever married	153 (69.5)	67 (30.5)		
Religion				
Christian	128 (73.1)	47 (26.9)	4.424	0.035
Non-Christian	32 (58.2)	23 (41.8)		
Ethnicity				
Edo Indigene	137 (68.5)	63 (31.5)	0.822	0.365
Non-Edo Indigene	23 (76.7)	7 (23.3)		
Level of Education				
No formal education	10 (66.7)	5 (33.3)	3.984	0.263
Primary	17 (60.7)	11 (39.3)		
Secondary	72 (76.6)	22 (23.4)		
Tertiary	61 (65.6)	32 (34.4)		
Occupation				
Traders	72 (72.0)	28 (28.0)	9.884	0.020
Professionals	38 (59.4)	26 (40.6)		
Skilled artisans	27 (90.0)	3 (10.0)		
Non-working	23 (63.9)	13 (36.1)		
Socioeconomic status				
High SES	39 (66.1)	20 (33.9)	1.063	0.588
Middle SES	94 (72.3)	36 (27.7)		
Low SES	27 (65.9)	14 (34.1)		
Number of children				
<4 children	118 (69.8)	51 (30.2)	0.020	0.888
≥4 children	42 (68.9)	19 (31.1)		
Age of index child				
<6 months	65 (70.7)	27 (29.3)	1.478	0.478
6–11 months	45 (64.3)	25 (35.7)		
≥12 months	50 (73.5)	18 (26.5)		
Monthly household income				
<₦70,000	7 (53.8)	6 (46.2)	1.633	0.442
₦70,000–₦139,999	58 (69.9)	25 (30.1)		
≥₦140,000	95 (70.9)	39 (29.1)		
Knowledge level				
Poor knowledge	131 (72.0)	51 (28.0)	2.398	0.121
Good knowledge	29 (60.4)	19 (39.6)		

*Fisher's Exact Test.

The proportion of respondents with positive attitude towards WASH was highest among those aged 28–37 years (78.0%), followed by those aged 38–47 years (69.0%) and 18–27 years (66.2%); however, this association was not statistically significant ($\chi^2 = 2.732$, $p = 0.255$). There was no significant association between marital status and attitude, with similar proportions among ever married (69.5%) and never married respondents (70.0%) (Fisher's Exact Test, $p > 0.999$). Ethnicity ($p = 0.365$), level of education ($\chi^2 = 3.984$, $p = 0.263$), socioeconomic status ($\chi^2 = 1.063$, $p = 0.588$), number of children ($p = 0.888$), age of index child ($\chi^2 = 1.478$, $p = 0.478$), monthly income ($\chi^2 = 1.633$, $p = 0.442$), and knowledge level ($\chi^2 = 2.398$, $p = 0.121$) were also not statistically significantly associated with attitude.

However, religion was significantly associated with attitude ($\chi^2 = 4.424$, $p = 0.035$), with Christians having a higher proportion of positive attitude (73.1%) compared to non-Christians (58.2%). Occupation also showed a significant association ($\chi^2 = 9.884$, $p = 0.020$), with skilled artisans having the highest proportion of positive attitude (90.0%), followed by traders (72.0%), non-working respondents (63.9%), and professionals (59.4%).

Table 10: Predictors of Positive Attitude towards WASH among nursing mothers

Predictors	B	Odds ratio	95% CI for OR		p-value
			Lower	Upper	
Age of respondent (years)	0.011	1.011	0.965	1.060	0.647
Marital status					
Ever Married*		1			
Never Married	-0.107	0.898	0.180	4.480	0.896
Religion					
Non-Christian*		1			
Christian	0.733	2.081	1.049	4.127	0.036
Ethnicity					
Non-Edo Indigene*		1			
Edo Indigene	-0.448	0.639	0.244	1.672	0.361
Level of education					
Tertiary*		1			
No formal education	0.806	2.238	0.302	16.602	0.431
Primary	0.123	1.131	0.208	6.153	0.887
Secondary	0.624	1.867	0.855	4.078	0.117
Occupation					
Non-working*		1			
Traders	0.269	1.309	0.468	3.656	0.608
Professionals	-0.816	0.442	0.044	4.476	0.490
Skilled artisans	1.246	3.478	0.505	23.941	0.205
Socioeconomic status					
Low SES*		1			
High SES	1.052	2.863	0.141	58.014	0.493
Middle SES	0.464	1.591	0.352	7.196	0.546
Number of children					
≥4 children*		1			
<4 children	0.198	1.219	0.609	2.439	0.576
Age of index child					
≥12 months*		1			
< 6 months	-0.369	0.692	0.321	1.489	0.346
6-11 months	-0.400	0.671	0.304	1.479	0.322
Monthly household income					
≥N140,000*		1			
< N70,000	-0.780	0.459	0.127	1.662	0.235
N70,000-N139,999	0.007	1.007	0.527	1.925	0.982
Knowledge level					
Poor knowledge*		1			
Good knowledge	-0.574	0.564	0.268	1.187	0.131

CI = Confidence interval; OR = Odd ratio; *reference category; R² = 10.5–14.8%

Religion was the only statistically significant predictor of positive attitude towards WASH among nursing mothers. Christians had significantly higher odds of a positive attitude compared to non-Christians (OR = 2.081, 95% CI = 1.049–4.127, p = 0.036). Occupation was

not statistically significant overall; compared to non-working respondents (reference), traders had slightly higher odds (OR = 1.309, 95% CI = 0.468–3.656, $p = 0.608$), skilled artisans had higher odds (OR = 3.478, 95% CI = 0.505–23.941, $p = 0.205$), and professionals had lower odds (OR = 0.442, 95% CI = 0.044–4.476, $p = 0.490$).

SECTION D:

PRACTICE OF WASH BY NURSING MOTHERS

Table 11: Water-related WASH practices among Nursing mothers

Variables	Frequency (n = 230)	Percent
What is your household's main source of drinking water		
Sachet/bottled water	134	58.3
Rainwater	20	8.7
Piped water (house/yard)	18	7.8
Protected well	18	7.8
River/stream	17	7.4
Borehole	15	6.5
Unprotected well	8	3.5
How long does it take to fetch water and return		
Less than 30 minutes	177	77.0
30 minutes or more	53	23.0
Do you usually have enough water daily for cooking		
Yes	195	84.8
No	35	15.2
Do you usually have enough water daily for bathing		
Yes	184	80.0
No	46	20.0
Do you usually have enough water daily for cleaning		
Yes	162	70.4
No	68	29.6
Do you treat your drinking water before use		
Yes	125	54.3
No	105	45.7
If yes, how		
Boiling	68	61.8
Chlorine	26	23.6
None	10	9.1
Filter	6	5.5
How do you store drinking water		
Covered container with lid	137	59.6
Open bucket	39	17.0
Container with tap	37	16.1
Any container without cover	17	7.4
How often do you wash your water storage container		
At least once weekly	134	58.3
Once monthly	67	29.1
Rarely/never	29	12.6
How do you take water from the storage container		
Use clean cup with handle	161	70.0
Dip hand/cup directly	37	16.1
Pour through tap	32	13.9

$\alpha=0.832$

In terms of water-related practices among nursing mothers, the majority reported sachet or bottled water as their main source of drinking water (58.3%), while smaller proportions relied

on rainwater (8.7%), piped water (7.8%), protected wells (7.8%), river/stream (7.4%), borehole (6.5%), and unprotected wells (3.5%). Most respondents spent less than 30 minutes fetching water (77.0%), and the majority reported having sufficient water daily for cooking (84.8%), bathing (80.0%), and cleaning (70.4%).

With respect to water treatment and storage, just over half reported treating their drinking water before use (54.3%), mainly by boiling (61.8%), followed by chlorine use (23.6%) and filtration (5.5%). Most respondents stored drinking water in covered containers with lids (59.6%), while others used open buckets (17.0%), containers with taps (16.1%), or uncovered containers (7.4%). In addition, more than half reported washing their storage containers at least once weekly (58.3%), and the majority used a clean cup with a handle to draw water (70.0%), while others dipped cups or hands directly (16.1%) or used taps (13.9%).

Table 12: Sanitation related WASH practice among Nursing mothers

Variables	Frequency (n = 230)	Percent
What type of toilet does your household use		
Water closet (WC)	164	71.3
VIP/pit latrine with slab	46	20.0
Pit latrine without slab	8	3.5
Bush/field (open defecation)	6	2.6
How often is your household toilet cleaned		
Daily	120	52.2
Weekly	75	32.6
Rarely	35	15.2
The last time your child passed stool, what was done		
Put in toilet/latrine	155	67.4
Buried	29	12.6
Put in gutter/drain	24	10.4
Thrown in open	22	9.6
How do you dispose of household refuse		
Collected by waste service	130	56.5
Burned	72	31.3
Dumped in open space	28	12.2
Where is wastewater from washing disposed		
Soakaway/drainage	144	62.6
Compound ground	57	24.8
Roadside/open area	29	12.6

$\alpha=0.832$

In terms of sanitation practices among nursing mothers, the majority reported using water closet toilets (71.3%), followed by VIP or pit latrines with slabs (20.0%), while smaller proportions used pit latrines without slabs (3.5%) or practiced open defecation (2.6%). Over half of respondents cleaned their household toilets daily (52.2%), while others cleaned weekly (32.6%) or rarely (15.2%). With respect to disposal of children's faeces, most respondents reported disposing in toilets or latrines (67.4%), while others buried (12.6%), disposed in gutters or drains (10.4%), or threw in the open (9.6%).

Regarding waste management practices, more than half of respondents reported that household refuse was collected by waste services (56.5%), while others burned waste (31.3%) or dumped it in open spaces (12.2%). Similarly, most respondents disposed wastewater

through soakaway or drainage systems (62.6%), while others disposed it on compound ground (24.8%) or in roadside or open areas (12.6%).

Table 13: Hygiene related WASH practices among Nursing mothers

Variables	Frequency (n = 230)	Percent
Do you have a place for washing hands with soap and water		
Yes	186	80.9
No	44	19.1
Do you wash your hands with soap after using the toilet		
Yes	169	73.5
No	61	26.5
Do you wash your hands with soap before feeding your child		
Yes	150	65.2
No	80	34.8
How do you clean feeding bottles or cups		
Wash with soap and water	121	52.6
Rinse with water only	84	36.5
Water only	25	10.9

$\alpha=0.832$

In terms of hygiene practices among nursing mothers, the majority reported having a designated place for handwashing with soap and water (80.9%), while 19.1% did not; most respondents also reported washing their hands with soap after using the toilet (73.5%) and before feeding their child (65.2%), although a notable proportion did not practice these behaviors. With respect to cleaning feeding utensils, just over half reported washing feeding bottles or cups with soap and water (52.6%), while others reported rinsing with water only (36.5%) or using water alone (10.9%).

Table 14: Domains of WASH practice among nursing mothers

Variables	Frequency (n = 230)	Percent
Overall water-related practice		
Satisfactory	141	61.3
Unsatisfactory	89	38.7
Overall sanitation practice		
Satisfactory	175	76.1
Unsatisfactory	55	23.9
Overall Hygiene practice		
Satisfactory	138	60.0
Unsatisfactory	92	40.0

More than half of respondents demonstrated satisfactory water-related practices (61.3%), while 38.7% had unsatisfactory practices. A higher proportion reported satisfactory sanitation practices (76.1%), compared to 23.9% with unsatisfactory practices. For hygiene practices, 60.0% were satisfactory, while 40.0% were unsatisfactory. Overall, only 29.6% of respondents had good WASH practice, while the majority (70.4%) had poor WASH practice.

Table 15: Overall WASH practice among nursing mothers

Variable	Frequency (n = 230)	Percent
Good WASH practice	162	70.4
Poor WASH practice	68	29.6

The majority of respondents had good WASH practices 162 (70.4%), whereas 68 (29.6%) had poor WASH practices.

Table 16: Factors associated with WASH Practice among nursing mothers

Variables	WASH Practice		Test statistic	p-value
	Good (n=162) Freq(%)	Poor (n=68) Freq(%)		
Age (years)				
18–27	98 (69.0)	44 (31.0)	0.362	0.835
28–37	43 (72.9)	16 (27.1)		
38–47	21 (72.4)	8 (27.6)		
Marital status				
Never married	7 (70.0)	3 (30.0)	1.022*	>0.999
Ever married	155 (70.5)	65 (29.5)		
Religion				
Christian	119 (68.0)	56 (32.0)	1.623	0.203
Non-Christian	43 (78.2)	12 (21.8)		
Ethnicity				
Edo Indigene	141 (70.5)	59 (29.5)	0.100	>0.999
Non-Edo Indigene	21 (70.0)	9 (30.0)		
Level of Education				
No formal education	13 (86.7)	2 (13.3)	5.898	0.117
Primary	15 (53.6)	13 (46.4)		
Secondary	68 (72.3)	26 (27.7)		
Tertiary	66 (71.0)	27 (29.0)		
Occupation				
Traders	74 (74.0)	26 (26.0)	3.122	0.373
Professionals	40 (62.5)	24 (37.5)		
Skilled artisans	23 (76.7)	7 (23.3)		
Non-working	25 (69.4)	11 (30.6)		
Socioeconomic status				
High SES	40 (67.8)	19 (32.2)	0.507	0.776
Middle SES	94 (72.3)	36 (27.7)		
Low SES	28 (68.3)	13 (31.7)		
Number of children				
<4 children	115 (68.0)	54 (32.0)	1.339	0.247
≥4 children	47 (77.0)	14 (23.0)		
Age of index child				
<6 months	69 (75.0)	23 (25.0)	1.999	0.368
6–11 months	49 (70.0)	21 (30.0)		
≥12 months	44 (64.7)	24 (35.3)		
Monthly household income				
<₦70,000	10 (76.9)	3 (23.1)	1.046	0.593
₦70,000–₦139,999	61 (73.5)	22 (26.5)		
≥₦140,000	91 (67.9)	43 (32.1)		
Knowledge level				
Poor knowledge	131 (72.0)	51 (28.0)	0.674	0.412
Good knowledge	31 (64.6)	17 (35.4)		
Attitude level				
Negative attitude	47 (67.1)	23 (32.9)	0.321	0.571
Positive attitude	115 (71.9)	45 (28.1)		

*Fisher's Exact Test.

The proportion of respondents with good WASH practice was highest among those aged 28–37 years (72.9%), followed by 38–47 years (72.4%) and 18–27 years (69.0%); however, this association was not statistically significant ($\chi^2 = 0.362$, $p = 0.835$). Marital status was also not significantly associated with practice (Fisher’s Exact Test, $p = 1.000$), nor were religion ($\chi^2 = 1.623$, $p = 0.203$), ethnicity ($\chi^2 = 0.000$, $p = 1.000$), level of education ($\chi^2 = 5.898$, $p = 0.117$), occupation ($\chi^2 = 3.122$, $p = 0.373$), socioeconomic status ($\chi^2 = 0.507$, $p = 0.776$), number of children ($\chi^2 = 1.339$, $p = 0.247$), age of index child ($\chi^2 = 1.999$, $p = 0.368$), monthly income ($\chi^2 = 1.046$, $p = 0.593$), knowledge level ($\chi^2 = 0.674$, $p = 0.412$), or attitude level ($\chi^2 = 0.321$, $p = 0.571$) significantly associated with WASH practice. No variable was significantly associated with WASH practice at the bivariate level.

Table 17: Predictors of good practice of WASH among nursing mothers

Predictors	B	Odds ratio	95% CI for OR		p-value
			Lower	Upper	
Age of respondent (years)	-0.000	1.000	0.954	1.047	0.986
Marital status					
Never Married*		1			
Ever Married	-0.406	0.666	0.141	3.148	0.608
Religion					
Christian*		1			
Non-Christian	0.687	1.988	0.903	4.374	0.088
Ethnicity					
Edo Indigene*		1			
Non-Edo Indigene	0.115	1.122	0.451	2.795	0.804
Level of education					
No formal education*		1			
Primary	-2.085	0.124	0.020	0.762	0.024
Secondary	-2.023	0.132	0.017	1.030	0.053
Tertiary	-2.205	0.110	0.011	1.075	0.058
Occupation					
Traders*		1			
Professionals	-1.874	0.154	0.027	0.888	0.036
Skilled artisans	-0.354	0.702	0.216	2.281	0.556
Non-working	0.229	1.257	0.419	3.771	0.683
Socioeconomic status					
High SES*		1			
Middle SES	-1.410	0.244	0.043	1.401	0.114
Low SES	-2.415	0.089	0.005	1.521	0.095
Number of children					
1-3 children*		1			
4-6 children	0.416	1.516	0.736	3.123	0.259
Age of index child					
< 6 months*		1			
6-11 months	-0.059	0.942	0.438	2.027	0.879
≥12 months	-0.428	0.652	0.313	1.359	0.254
Monthly household income					
< N70,000*		1			
N70,000-N139,999	-0.281	0.755	0.177	3.221	0.704
≥N140,000	-0.548	0.578	0.139	2.401	0.451
Knowledge level					
Poor knowledge*		1			
Good knowledge	-0.339	0.712	0.339	1.496	0.370
Attitude level					
Negative attitude*		1			
Positive attitude	0.198	1.219	0.623	2.386	0.562

OR = Odd ratio; *reference category; R² = 8.4–11.9% CI =Confidence interval

Multivariate logistic regression analysis identified level of education and occupation as significant independent predictors of WASH practice. Compared to respondents with no formal education (reference), those with primary education had significantly lower odds of good WASH practice (OR = 0.124, 95% CI: 0.020–0.762, $p = 0.024$). Professionals had significantly lower odds of good WASH practice compared to traders (OR = 0.154, 95% CI: 0.027–0.888, $p = 0.036$). All other variables including age, marital status, religion, ethnicity, SES, number of children, age of index child, monthly income, knowledge level, and attitude level were not statistically significant after adjustment.

SECTION E:

FACTORS INFLUENCING WASH PRATICES AMONG NURSING MOTHERS

Table 18: Factors influencing WASH practices among nursing mothers

Variables	Frequency (n = 230)	Percent
Do you face challenges in using toilets or handwashing facilities		
Yes	82	35.7
No	148	64.3
What hygiene product do you have available at home*		
Bar soap	128	55.7
Liquid soap	98	42.6
Soapy water	47	20.4
Alcohol-based sanitizer	72	31.3
Detergent powder	96	41.7
Clean running water	65	28.3
Stored water in container with tap	44	19.1
Stored water in container without tap	26	11.3
None	4	1.7
Support from household encourage proper hygiene practices		
Yes	180	78.3
No	50	21.7
Affordability of hygiene products affect practice		
Yes	153	66.5
No	77	33.5
Cultural practices that affect practice of sanitation and hygiene		
Yes	70	30.4
No	160	69.6
Health education on WASH practices from health workers influence practice		
Yes	187	81.3
No	43	18.7

Overall, facilitators of good WASH practices were common, although some barriers were identified. The majority of respondents (64.3%) reported no challenges in using toilets or handwashing facilities, while 35.7% experienced challenges.

Regarding availability of hygiene products, bar soap (55.7%) and liquid soap (42.6%) were the most commonly available, alongside detergent powder (41.7%) and alcohol-based

sanitizers (31.3%). Fewer respondents reported access to clean running water (28.3%) or improved storage options such as containers with taps (19.1%).

Most respondents (78.3%) reported receiving encouragement for proper hygiene practices within their households, and about two-thirds (66.5%) indicated that hygiene products were affordable. Concerning sociocultural influences, about one-third of respondents (30.4%) reported that cultural practices affect sanitation or water use. Finally, the majority of respondents (81.3%) had received health education on WASH practices from health workers.

Table 19: Association between Factors influencing and Practice of WASH among nursing mothers

Variables	WASH Practice		Test statistic	p-value
	Good (n=224) Freq(%)	Poor (n=6) Freq(%)		
Support from household encourage proper hygiene practices				
Yes	51 (28.3)	129 (71.7)	0.603	0.437
No	17 (34.0)	33 (66.0)		
Affordability of hygiene products affect practice				
Yes	54 (35.3)	99 (64.7)	7.203	0.007
No	14 (18.2)	63 (81.8)		
Cultural practices affecting practice of sanitation and hygiene				
Yes	16 (22.9)	54 (77.1)	2.174	0.140
No	52 (32.5)	108 (67.5)		
Health education on WASH practices from health workers influence practice				
Yes	53 (28.3)	134 (71.7)	0.718	0.397
No	15 (34.9)	28 (65.1)		

*Fisher's Exact Test.

The proportion of respondents with good WASH practice was slightly higher among those whose household members did not encourage proper hygiene practices (34.0%) compared to those who did (28.3%); however, this association was not statistically significant ($\chi^2 = 0.603$, $p = 0.437$). Practice was significantly associated with affordability of hygiene products ($\chi^2 = 7.203$, $p = 0.007$), with respondents who reported that hygiene products were affordable demonstrating a higher proportion of good practice (35.3%) compared to those who reported they were not affordable (18.2%).

Cultural practices were not significantly associated with WASH practice, although respondents who reported no cultural influence had a higher proportion of good practice (32.5%) compared to those who reported cultural influence (22.9%) ($p = 0.140$). Similarly, receipt of health education on WASH from health workers was not significantly associated

with practice, despite slightly higher good practice among those who did not receive health education (34.9%) compared to those who did (28.3%) ($p = 0.397$).

Table 20: Predictors of good practice among factors influencing WASH practices of nursing mothers

Predictors	B	Odds ratio	95% CI for OR		p-value
			Lower	Upper	
Support from household encourage proper hygiene practices					
Yes*		1			
No	0.312	1.365	0.681	2.736	0.380
Affordability of hygiene products affect practice					
Yes*		1			
No	-0.846	0.429	0.219	0.841	0.014
Cultural practices affecting practice of sanitation and hygiene					
Yes*		1			
No	0.493	1.637	0.841	3.188	0.147
Health education on WASH practices from health workers influence practice					
Yes*		1			
No	0.362	1.437	0.691	2.989	0.332

CI = Confidence interval; OR = Odd ratio; *reference category; R² = 4.6–6.6%

Multivariate logistic regression analysis identified affordability of hygiene products as the only independent predictor of WASH practice. Respondents who reported that affordability of hygiene products influenced practice had significantly lower odds of having good WASH practices compared to those who reported affordability (OR = 0.429, 95% CI: 0.219–0.841, p = 0.014). Other factors were not significant after adjustment.

CHAPTER FIVE

DISCUSSION

This study assessed the knowledge, attitudes, practices, and influencing factors related to water, sanitation, and hygiene (WASH) among nursing mothers attending the immunization clinic at the University of Benin Teaching Hospital (UBTH), Benin City, Nigeria, with a total of 230 respondents. The findings are discussed below in line with the specific objectives of the study.

The respondents were mostly young women in their mid-twenties, and nearly all were ever married. This profile is not unexpected among women attending an immunization clinic, since such clinics are naturally used females within the reproductive age group of 15-49 years. The predominance of Christian respondents and the large share of Benin and Esan mothers reflects the religious and ethnic composition of Benin City and Edo State, where Christianity is the main religion and the Benin and Esan groups form the majority of the indigenous population. This is in keeping with the NDHS survey as Edo state is home to the Benin and Esan people as the major ethnic group in the state and they are predominantly Christians.¹⁰⁵

More than three-quarters had at least secondary education, and many were engaged in trading, small business, or other informal work. This educational and occupational profile suggests a population with reasonable exposure to general health information, though education alone does not guarantee deep understanding or sustained hygiene behaviour, especially once economic and cost pressures are considered. This sociodemographic pattern is similar to a 2024 study among 215 breastfeeding mothers attending immunization clinics in tertiary health facilities in Abakaliki, Ebonyi State, Nigeria, which found that the respondents were largely mothers already engaged with formal child-health services and with moderate exposure to hygiene information.⁸³ Similarly, a descriptive cross-sectional study among

mothers attending baby wellness clinics in Ekiti State, Nigeria, reported a population with reasonable health-service contact but with gaps in personal and environmental hygiene practice.⁸⁴ The public health implication of this is that immunization clinics offer regular, structured access to a relatively young and reachable group of mothers, and every contact point should be used deliberately for targeted, practical, and culturally sensitive WASH education tailored to the realities of nursing mothers in this setting.

This study found that although awareness of WASH was high, overall WASH knowledge among the nursing mothers was poor. Respondents performed reasonably well on recognising the meaning of WASH, understanding what constitutes safe drinking water, defining diarrhoea correctly, and identifying some diseases associated with poor hygiene. However, notable gaps were found in more applied areas, including identifying all the critical moments for handwashing, recognising the full range of benefits of safe child-faeces disposal, and selecting the most effective preventive approaches to diarrhoeal disease. This is not entirely surprising. Many of the mothers in this study were likely to have been reached benefited from information dissemination at antenatal and immunization clinic visits, which may account for the relatively good performance on basic definitional questions. That said, health talks in busy outpatient settings tend to be short and general in scope, often concentrating on immunization schedules and infant feeding rather than detailed hygiene instruction. As a result, mothers may pick up broad messages without developing the depth of understanding needed to correctly identify all protective hygiene behaviours. It is also worth noting that most respondents were managing busy households alongside childcare and income-generating activities, which may limit both the time and the mental space available to absorb and retain detailed preventive-health information. Long-standing home routines and cultural normalisation of certain water and sanitation practices may compound this, since mothers may continue familiar household habits without assessing whether these habits fully align

with recommended WASH standards. This findings differ from a 2024 study among breastfeeding mothers attending immunization clinics in Abakaliki, Ebonyi State, Nigeria which found that although hand hygiene and breast-milk hygiene knowledge were generally good.⁸³ This findings also differ from a 2023 Nigerian study among 330 nursing mothers attending under-five clinics which reported good overall knowledge showing that education level and occupation still influenced how mothers understood and applied hygiene information.⁸⁵ Poor depth of WASH knowledge among nursing mothers weakens household prevention of diarrhoeal and other hygiene-related childhood illnesses, even among mothers who are already connected to formal health services. This can lead to childhood diseases and in turn increase in under-5 mortality. Health workers at UBTH should therefore move beyond general WASH awareness messages in clinic health talks and adopt practical demonstration-based teaching that focuses on handwashing moments, safe water handling, child-faeces disposal, and diarrhoea prevention.

Number of children was significantly associated with WASH knowledge in this study, with mothers who had fewer children showing better knowledge than those with larger families. Mothers with fewer children may simply have more time, attention, and capacity to engage with health information at clinic visits and to reflect on hygiene recommendations at home. Those caring for more children face greater domestic workloads, financial demands, and divided attention, all of which can reduce the opportunity to absorb preventive-health messages in any meaningful depth. This pattern suggests that childcare burden itself can act as a practical barrier to knowledge retention, even among mothers who are in regular contact with clinic-based counselling. A similar pattern was noted in the 2023 Nigerian study among 330 nursing mothers attending under-five clinics, which found that maternal characteristics shaped hygiene knowledge and practice.⁸⁵ This is also in keeping with a 2023 study conducted among mothers in model and non-model households in Bibugn district, North

West Ethiopia which reported that enabling household conditions and maternal knowledge were jointly important determinants of hygiene behaviour.²⁴ The public health implication is that mothers from larger households may constitute a particularly vulnerable subgroup for incomplete WASH knowledge and, by extension, for inadequate child-health protection which can lead to increase in childhood diseases and under-5 mortality. Routine clinic counselling should therefore give deliberate extra attention to mothers with larger families, using simplified, repeated, and take-home hygiene guidance designed for mothers carrying heavy caregiving responsibilities.

Age of the index child was significantly associated with WASH knowledge, and on multivariate analysis, mothers whose index child was under six months had significantly lower odds of good knowledge compared with those whose child was at least twelve months old. In practical terms, mothers of very young infants may still be in the early stages of contact with the repeated counselling that builds WASH knowledge over time, whereas mothers with older infants have attended more clinic visits and had more opportunity for hygiene messages to be reinforced. WASH-related learning in maternal and child health services is largely cumulative rather than immediate; the more contacts a mother has had with the health system, the more likely it is that core hygiene messages have been reinforced, explained in different ways, and related to her specific caregiving situation. Mothers with older children may also have directly encountered challenges such as infant diarrhoea, bottle hygiene problems, and environmental contamination, which can sharpen practical understanding of why hygiene recommendations matter. A 2024 study among breastfeeding mothers attending immunization clinics in Abakaliki, Ebonyi State, Nigeria similarly highlighted the value of continued education and repeated hygiene reinforcement during clinical encounters.⁸³ A 2023 study conducted in Lafia, Nasarawa State, Nigeria, among 200 mothers of children aged 6–23 months also found that ongoing exposure to hygiene

information during caregiving shaped mothers' hygiene-related attitudes and practice.⁸² The key public health implication here is that the earliest months of life are when infants are most vulnerable to infection, yet this may also be the period when their mothers' WASH knowledge is least developed. Health workers should therefore intensify WASH counselling at the earliest immunization contacts, particularly for mothers of infants younger than six months, using short, practical, and visually supported messages that can be easily understood and acted on at home.

This study found that about two-thirds of the nursing mothers had a positive attitude towards water, sanitation, and hygiene practices. The most consistently favourable attitudes were around spending on safe drinking water, handwashing with soap, washing hands before feeding a child, keeping the household environment clean, using modern toilets, covering stored water, cleaning toilets regularly, and understanding that household WASH maintenance is not solely a government responsibility. Attitudinal strength was less consistent in areas where cultural practices and recommended hygiene behaviours came into conflict; respondents were more divided on whether cultural routines should be upheld when they contradict evidence-based hygiene guidance. This mixed picture is not hard to explain. The generally positive attitudes are consistent with what would be expected among mothers who are already attending a formal health service, where hygiene messages are routinely reinforced during maternal and child health contacts. The educational profile of the respondents may also have contributed, since most had at least secondary education, which typically improves receptiveness to preventive health information. In an urban setting like Benin City, regular contact with health workers, radio messaging, and social networks is also likely to have shaped favourable perceptions about WASH. The hesitancy around cultural issues, however, is well recognised in Nigerian public health research: even where mothers accept recommended hygiene measures in principle, they may defer to established household

customs or the preferences of older family members, particularly when those customs have not been directly challenged by education or health counselling. This finding is consistent with a cross-sectional study among 325 mothers in Noakhali, Bangladesh which reported that positive WASH attitudes were more common among those with better education, greater socioeconomic support, and stronger hygiene knowledge.⁸⁷ A 2024 study in Malawi involving postnatal mothers similarly found that although mothers generally had positive attitudes towards hygiene, these were often undermined in practice by fatigue, competing caregiving demands, limited soap availability, and inadequate handwashing facilities.⁸⁸ The public health implication is that positive attitudes provide an important foundation for behaviour change, but unresolved cultural ambivalence can still block the consistent adoption of protective hygiene behaviours for infants and young children. Health educators at UBTH should therefore supplement standard health talks with culturally sensitive, demonstration-based counselling that directly engages with traditional misconceptions and explains, in a respectful and practical way, why recommended hygiene practices should take precedence when child health is at stake.

Religion was significantly associated with attitude towards WASH in this study, with Christian respondents more likely to demonstrate a positive attitude than non-Christian respondents. This association probably has more to do with the social environments in which hygiene messages are shared and reinforced than with religious doctrine itself. In southern Nigeria, Christian mothers often belong to church-based women's fellowships and community groups where preventive health messages circulate informally alongside routine clinic counselling. This additional layer of social reinforcement may strengthen positive perceptions of hygiene, sanitation, and disease prevention beyond what is achieved through clinic contact alone. The pattern may also partly reflect the religious composition of the study area, where Christianity is dominant and its adherents may have greater access to health

campaigns and social support networks that promote maternal health-seeking behaviour. It is worth noting that this association may be acting as a proxy for broader contextual factors such as community integration, literacy, and urban support networks rather than religion in itself. A descriptive cross-sectional study among 360 mothers in Lagos State, Nigeria found that age, occupation, and education were significantly associated with positive attitudes towards diarrhoeal disease prevention and management, rather than religion.⁸⁹ Similarly, the cross-sectional study among 325 mothers in Noakhali, Bangladesh linked favourable WASH attitudes more closely to education, economic conditions, and hygiene knowledge than to religious identity.⁸⁷ The public health implication is that positive hygiene attitudes may be partly maintained through the social channels by which mothers receive and process health information, and that this is not evenly distributed across different social groups. WASH promotion activities should therefore extend beyond the clinic and engage women's groups and community structures across all religious communities, so that beneficial hygiene messages are accessible to and reinforced among all segments of the maternal population, not only those already well-connected to existing health communication channels.

Occupation was significantly associated with attitude towards WASH, with skilled artisans and traders showing more favourable attitudes than professionals and non-working respondents. Mothers in trading and artisanal work often combine income-generating activity with direct responsibility for childcare, food handling, water use, and household waste management, which may make the practical relevance of WASH more immediate and visible in their daily lives. Their livelihoods also tend to involve greater day-to-day contact with markets, shared water sources, and public environments where poor sanitation has tangible consequences, thereby reinforcing positive attitudes towards hygiene. The weaker attitudinal patterns among some professionals and non-working respondents may reflect role differences rather than genuine disregard for hygiene, since these groups may delegate certain domestic

tasks, have less direct contact with environmental sanitation challenges, or experience their workload and constraints quite differently. The fact that occupation lost statistical significance after adjustment also suggests that this association was partly confounded by overlapping factors such as religion, education, and broader social context rather than occupation acting as an independent driver. A cross-sectional study among 360 mothers in Lagos State, Nigeria similarly found that occupation was significantly associated with positive attitudes towards diarrhoeal disease prevention.⁸⁹ The cross-sectional study among 325 mothers in Noakhali, Bangladesh also found that mothers with better enabling conditions and socioeconomic support were more likely to hold favourable WASH attitudes.⁸⁷ This finding suggests that WASH messaging should be adapted to the occupational and daily realities of different groups of mothers, using short, practical, and role-specific communication that speaks to the circumstances in which each group actually lives and cares for their infants.

On multivariate analysis, religion remained the only statistically significant predictor of positive attitude towards WASH, with Christian respondents having approximately twice the odds of a positive attitude compared with non-Christian respondents. This means that even after accounting for age, marital status, ethnicity, education, occupation, socioeconomic status, number of children, age of index child, income, and knowledge level, religious affiliation still independently differentiated the likelihood of a favourable WASH attitude in this population. As discussed earlier, this association is likely contextual rather than strictly theological. In urban southern Nigeria, religious affiliation may reflect differences in social connectedness, participation in women's support structures, and exposure to organised community health messaging outside the clinic environment. Churches in this setting frequently host women's fellowships and health-sensitisation activities, so Christian mothers may receive repeated, socially embedded reinforcement of hygiene-promoting messages that

cumulatively strengthen their attitudinal orientation towards WASH. It is also plausible that religious affiliation functions here as a broader marker of community integration and social support, both of which can shape how mothers value and sustain preventive health behaviours over time. This is similar to a descriptive cross-sectional study among 360 mothers in Lagos State, Nigeria identified age, occupation, and education rather than religion as the main predictors of positive attitudes towards diarrhoeal disease prevention.⁸⁹ The cross-sectional study among 325 mothers in Noakhali, Bangladesh similarly linked favourable attitudes more closely to education, economic status, and hygiene knowledge.⁸⁷ The public health implication is that attitudinal change is shaped not only by individual knowledge but also by the social environments in which mothers are embedded and the channels through which health norms are regularly reinforced. The Edo State Ministry of Health and UBTH health educators should work actively with faith-based and community women's groups across religious lines to institutionalise inclusive WASH promotion, so that positive hygiene attitudes are built and sustained in all segments of the nursing-mother population, and not confined to those with access to existing health communication networks.

This study found that although nursing mothers demonstrated reasonably satisfactory performance in some individual WASH domains and overall WASH practice was good. The areas of stronger practice included having adequate water for domestic activities, using improved toilet facilities, cleaning the toilet regularly, having a designated handwashing point, and washing hands after toilet use. By contrast, weaker practices were found in household water treatment, safe disposal of children's faeces in all instances, handwashing before feeding a child, and proper cleaning of feeding bottles and cups, where many mothers still used less protective approaches. This divergence between good practices in some areas and poor practices in others is not surprising, because sustained WASH practice is more demanding than knowledge or attitude alone. It depends not only on what a mother knows or

believes but on what she can realistically and consistently do within the competing demands of a busy household. In this setting, many mothers are likely to face overlapping responsibilities for childcare, food preparation, income generation, and domestic upkeep, which may make it easier to sustain visible or socially expected behaviours like using a toilet or keeping a handwashing point than to maintain more effortful routines such as treating household water daily or washing feeding utensils thoroughly with soap every time. The Nigerian urban household context adds another layer of complexity: access to piped or sachet water can reduce the perceived urgency of household treatment, while long-established domestic routines learned within families may persist even when mothers have acquired some knowledge of safer alternatives. This is in contrast to a 2024 study among 424 mothers in peri-urban and informal settlements in Hosanna town found that proper handwashing at critical times was practiced by fewer than half of respondents, and that household water insecurity, limited handwashing facilities, and unsafe stool disposal contributed to poor WASH behaviour.²³ Also, a 2023 community-based comparative cross-sectional study among mothers in Bibugn district, North West Ethiopia in contrast reported that very few mothers practiced proper critical-time handwashing, and that access to water, handwashing facilities, and hygiene knowledge strongly shaped safe practice.²⁴ In contrast, shortfall was documented in a 2017 cross-sectional study among 154 mothers of children under five attending paediatric clinics in Port Harcourt, Nigeria, where handwashing and household hygiene practices were inadequate despite the obvious importance of these behaviours for child health.⁹² Good WASH practice among nursing mothers directly prevents the faeco-oral spread of pathogens in the home and reduces the risk of diarrhoeal and other preventable infections in infants. UBTH health workers should therefore continue practical, demonstration-based WASH counselling at every immunization contact, with particular focus on household water treatment, safe child-faeces disposal, handwashing before feeding, and

proper cleaning of feeding utensils, so that mothers apply these behaviours consistently at home.

There was no significant association between WASH practice and socio-demographic factors on bivariate analysis. On multivariate analysis, ethnicity and marital status were independent predictors of good WASH practice. Non-Edo indigenes had more odds of good WASH practice compared with Edo indigenes while ever-married respondents had significantly lower odds of good practice than never-married respondents. The continued significance of ethnicity after full adjustment suggests that this is not a statistical artefact but reflects a genuine difference in the domestic or social environments that support or hinder safe hygiene behaviour. The marital-status finding is particularly noteworthy because marital status was not significant at the bivariate level, which indicates that its effect only became visible once confounding from other variables was removed. This pattern is consistent with what one might expect if ever-married mothers carry a heavier and more complex set of household obligations, including childcare, cooking, cleaning, and negotiating family routines with spouses or older household members, all of which may reduce the time and consistency with which ideal WASH practices can be maintained. Never-married mothers, though few in number and therefore requiring cautious interpretation, may have had fewer household constraints or greater support from their natal families that made consistent good practice more feasible. A 2017 cross-sectional study among 154 mothers attending paediatric clinics in Port Harcourt, Nigeria highlighted that household handwashing behaviour was shaped by maternal circumstances and educational influences within the home environment.⁹² A 2023 community-based comparative cross-sectional study in Bibugn district, North West Ethiopia similarly showed that better-resourced and more supportive household conditions substantially improved critical-time handwashing behaviour.²⁴ These findings identify specific subgroups of nursing mothers who face a heightened risk of poor hygiene practice

even when they are attending formal health services regularly. UBTH and the Edo State Ministry of Health should therefore implement WASH interventions specifically targeted at married mothers and the dominant indigenous ethnic population, including household-focused counselling, engagement of partners and family members, and simplified behaviour-change strategies designed to fit the real demands of daily childcare and domestic life.

This study found that while several enabling conditions for WASH practice were present among the nursing mothers, important economic and structural constraints remained. Most respondents reported household encouragement for proper hygiene, prior WASH education from health workers, and access to common hygiene products such as bar and liquid soap. However, a sizeable minority still reported challenges in using toilet and handwashing facilities, only a smaller proportion had access to clean running water or improved water-dispensing containers, and close to one-third acknowledged that cultural practices influenced their sanitation and hygiene behaviour. This mixed picture reflects the multiple layers that govern WASH behaviour: individual willingness, household support, availability and affordability of supplies, and the physical ease with which recommended practices can be carried out at home all interact to determine whether good hygiene is actually practised consistently. In an urban Nigerian setting like Benin City, mothers attending a tertiary hospital are likely to have better exposure to health information and some degree of social support, which may explain the generally favourable background conditions in this study. But persistent inflation, irregular water access, and the real cost of maintaining soap, sanitizers, water-treatment materials, and storage containers can undermine day-to-day compliance even among mothers who fully understand the importance of hygiene. The continued influence of cultural practices also signals that domestic hygiene behaviour is partly regulated by inherited household routines and social expectations, so that recommended WASH practices must compete with and gradually displace familiar behaviours rather than automatically replacing

them. A 2023 Nigerian study among 361 mothers of under-five children living in urban slums of Lagos found that economic constraints and limited access to WASH facilities were common barriers to good hygiene practice, even where mothers were aware of the benefits.²⁸ A 2025 Nigerian study based on secondary analysis of 22,059 households from the 2021 Nigeria Multiple Indicator Cluster Survey found that household wealth, education, geographic region, and infrastructure substantially constrained access to water, sanitation, and hygiene services for children and their caregivers.⁹³ Good WASH behaviour among nursing mothers cannot be secured through clinic education alone when the material and household conditions needed to support that behaviour are not yet in place. UBTH health educators and the Edo State Ministry of Health should therefore complement routine health education with household-oriented WASH support strategies, providing practical guidance on affordable hygiene options and simple home adaptations that make safe practice easier and more sustainable for nursing mothers in this population.

Affordability of hygiene products was significantly associated with WASH practice in this study. Mothers who reported that hygiene products were affordable were more likely to demonstrate good practice than those who did not. This finding is not difficult to understand: consistent hygiene behaviour requires regular purchase of soap, detergent, disinfectants, and sometimes water-treatment products, all of which are recurring costs that compete with food, transport, and other household needs. Where these items are affordable, mothers are better placed to act on their knowledge and positive attitudes by maintaining hygiene at all the critical moments it is needed. Where affordability is a concern, mothers may conserve limited supplies for selective or more visible uses rather than applying them at every handwashing opportunity or cleaning session. For nursing mothers in particular, this constraint is heightened by the volume of hygiene-related tasks that infant care generates: frequent feeding, stool disposal, cleaning of bottles and utensils, and general infant hygiene all place ongoing

demands on household hygiene resources. This is similar to a 2023 Nigerian study among 361 mothers of under-five children in urban slums of Lagos which reported that limited access to WASH resources and economic pressures reduced consistency of household hygiene practices even among motivated mothers.²⁸ A 2025 Nigerian study on household determinants of unimproved WASH conditions found that poverty and low-resource living environments strongly predicted poor hygiene and sanitation outcomes, with material limitations often outweighing individual intention.²⁹ Affordability is not a secondary concern in WASH promotion: it is a central factor in determining whether protective behaviour can be maintained in households caring for young children. Public health planners should therefore build economic sensitivity into WASH interventions by encouraging low-cost hygiene alternatives, supporting community channels for distributing essential hygiene materials, and exploring ways to integrate WASH commodity support into maternal and child health outreach programmes where feasible.

On multivariate analysis, affordability of hygiene products was the only independent predictor among the assessed influencing factors. Respondents who reported poor affordability had significantly lower odds of good WASH practice than those who found hygiene products affordable. This means that after controlling for household encouragement, cultural influences, and health education received from health workers, affordability remained the single factor that still independently determined whether mothers were able to practise good hygiene. The reason for this is straightforward: supportive messages and family encouragement can improve a mother's willingness to change her hygiene behaviour, but they cannot remove the material barrier that arises when she cannot regularly afford the products needed to put that willingness into action. A mother may know exactly when she should use soap and may genuinely want to do so; she may even receive encouragement from a nurse or a family member. But if soap runs out and there is no money to replace it,

consistent practice becomes impossible. This also explains why factors like household encouragement and health education were not independently predictive after adjustment: they may raise intention, but they do not address the practical, material constraint that affordability represents. In that sense, affordability functions as a measure of the mother's actual capacity to translate knowledge and positive attitude into repeated daily action. A 2025 Nigerian study based on the 2021 Nigeria Multiple Indicator Cluster Survey found that economic position remained a major determinant of household access to hygiene facilities and WASH conditions broadly.⁹⁵ A comparable finding was reported in a 2025 Nigerian study on unimproved WASH conditions, where poverty and low-resource household environments strongly predicted poor sanitation and hygiene outcomes regardless of other background characteristics.²⁹ These findings collectively show that improvements in maternal WASH behaviour will be limited and fragile unless the economic burden of hygiene is addressed directly alongside education. The state ministry of health, UBTH management, and community health planners should prioritise affordability-focused WASH interventions, including practical guidance on low-cost hygiene practices, subsidised access to essential hygiene materials for vulnerable mothers, and behaviour-change messaging specifically designed for the financial realities of ordinary households in this setting.

5.2 CONCLUSION

Regarding knowledge of WASH, approximately four-fifths of the respondents had poor knowledge, while about one-fifth had good knowledge. Number of children and age of the index child were significantly associated with WASH knowledge, while age of the index child was the only independent predictor, with mothers whose index child was under six months being less likely to have good knowledge.

Regarding attitude towards WASH, about two-thirds of the respondents had a positive attitude, while about one-third had a negative attitude. Religion and occupation were significantly associated with attitude, while religion remained the only independent predictor, with Christian respondents being more likely to hold a positive attitude than non-Christian respondents.

Regarding WASH practice, more than three-fifths of the respondents had satisfactory water-related practice, about three-quarters had satisfactory sanitation practice, and three-fifths had satisfactory hygiene practice. Under the new composite WASH Practice Level scoring (Good = satisfactory in at least one domain; Poor = unsatisfactory in all three domains), the vast majority of respondents (97.4%) were classified as having Good WASH Practice, while only 2.6% had Poor WASH Practice. No variable was significantly associated with WASH Practice Level at the bivariate level, and no independent predictor was identified in multivariate analysis, reflecting the ceiling effect of the composite scoring approach.

Finally, with respect to factors influencing WASH practice, about two-thirds of the respondents reported that hygiene products were affordable, more than three-quarters reported household support for proper hygiene, and more than four-fifths reported having received WASH education from health workers. Despite these enabling conditions, affordability of hygiene products was the only factor significantly associated with WASH practice and the only independent predictor among the influencing variables, with

respondents who reported poor affordability being less likely to demonstrate good WASH practice.

5.3 RECOMMENDATIONS

Recommendations to the Government

1. The Federal Ministry of Health and the Edo State Ministry of Health should strengthen WASH promotion within maternal and child health programmes, with particular emphasis on nursing mothers attending immunization clinics who have repeated contact with health services.
2. Given that affordability was the only independent predictor of good WASH practice in this study, the government should support policies that reduce the cost burden of essential hygiene materials, including soap, detergent, and household water-treatment products, for low-income mothers and households.
3. The Edo State Ministry of Health should develop and implement culturally appropriate community-based WASH interventions specifically designed for indigenous populations, given that ethnicity was an independent predictor of WASH practice and Edo indigenes demonstrated weaker practice patterns in this study.
4. Government at all levels should work to improve access to reliable household water supply and adequate sanitation infrastructure in urban and peri-urban communities in Edo State, as physical and infrastructural barriers continue to limit consistent hygiene practice at the household level.

Recommendations to UBTH and Hospital Management

1. UBTH management should strengthen the WASH content of routine health education at the immunization clinic by moving beyond general messages to include practical demonstrations on household water treatment, safe water storage, safe disposal of child faeces, handwashing before feeding, and proper cleaning of feeding utensils.
2. Health workers should intensify WASH counselling for mothers of infants under six months, since this group was found to be less likely to have good knowledge of WASH and represents a period of high infant vulnerability to hygiene-related illness.
3. Health education sessions at the immunization clinic should be repeated at every contact point and kept practical and simple, since good attitude did not consistently translate into good overall practice in this study, suggesting that frequency and practical relevance of the messages need to be improved.
4. UBTH should collaborate with community health extension workers and community volunteers to reinforce WASH education beyond the clinic environment, particularly for mothers who may need additional support in implementing hygiene practices at home.

Recommendations to Nursing Mothers and Households

1. Nursing mothers should make deliberate efforts to practise household water treatment, safe water storage, handwashing with soap at critical moments, and safe disposal of their children's faeces, recognising that these actions directly protect their infants from preventable illness.
2. Household members, including spouses and older family members, should provide practical and material support that makes it easier for nursing mothers to maintain

good hygiene practices consistently, including ensuring soap and water are available at handwashing points.

3. Families should treat basic hygiene materials, including soap and cleaning agents, as essential household items rather than optional expenses, given that poor affordability was found in this study to independently reduce the likelihood of good WASH practice among nursing mothers.

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APPENDIX I

INFORMED CONSENT FORM

TITLE OF STUDY: ASSESSMENT OF WATER, SANITATION, AND HYGIENE (WASH) PRACTICES AMONG NURSING MOTHERS ATTENDING IMMUNIZATION CLINIC IN UNIVERSITY OF BENIN TEACHING HOSPITAL (UBTH)

INVESTIGATOR: Orobosa Evelyn Igbiosa

SUPERVISOR: Prof. Andrew I. OBI

FINANCIAL SPONSORSHIP: This research project is self-sponsored.

PURPOSE OF THE STUDY: The purpose of this study is to assess the knowledge, attitudes, and practices of water, sanitation and hygiene (WASH) among nursing mothers attending immunization clinics in the University of Benin Teaching Hospital, and to examine factors influencing these practices and their relationship with breastfeeding and diarrhoeal occurrence among children aged 0–24 months.

PROCEDURES INVOLVED IN THE STUDY

You are requested to complete a structured questionnaire designed to assess your knowledge, attitudes, and household practices relating to water, sanitation and hygiene (WASH). The questionnaire will also include questions on infant feeding practices and diarrhoeal episodes among your child. The information collected will be used strictly for academic and research purposes.

COMPENSATION

There will be no financial compensation for participating in this study.

VOLUNTARY PARTICIPATION

Participation in this study is entirely voluntary. You are free to decline participation or withdraw at any time without any penalty, loss of benefits, or discrimination. Your decision will not affect the care you or your child receive at this facility.

RISKS / SIDE EFFECTS

There are no anticipated risks or side effects associated with participating in this study.

BENEFITS

This study aims to generate evidence on WASH practices among nursing mothers, which may inform public health education strategies, improve hygiene promotion programs, and contribute to better child health outcomes.

CONFIDENTIALITY

All information provided will be treated with strict confidentiality. Names or personal identifiers will not be collected. Data will be stored securely and used solely for research purposes.

CONSENT

By completing and submitting this questionnaire, you confirm that you have read and understood the information above and voluntarily agree to participate in this study.

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Ethics and Research Committee

University of Benin Teaching Hospital Benin City

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CERTIFICATE OF CONSENT

I have read the above information (or it has been read to me). I had the opportunity to ask questions and the questions were answered to my satisfaction.

I voluntarily consent to take part in this study.

Signed _____

APPENDIX II

QUESTIONNAIRE ON ASSESSMENT OF WASH PRACTICES AMONG NURSING MOTHERS ATTENDING IMMUNIZATION CLINICS IN UBTH

I am a 600-level student of the University of Benin, Benin City and this study is designed to understand your knowledge, attitudes, and practices regarding water, sanitation, and hygiene (WASH). Your responses will be kept confidential. Please mark and fill any area as appropriate. Thank you.

SECTION A: SOCIODEMOGRAPHIC CHARACTERISTICS

1. Age (in years as at last birthday) _____
2. Marital status: Single Married Widowed Divorced Separated
3. Religion: Christian Islam ATR Others
4. Ethnicity: Benin Esan Etsako Igbo Yoruba Hausa
Others _____
5. What is your level of education? No formal education Primary level of education
Secondary level of education Tertiary level of education
6. Occupation: _____
7. Type of family: Monogamous Polygamous Others _____
8. How many children do you have? _____
9. Age of index child _____
10. What is your monthly income? Less than ₦70, 000 ₦70, 000 - ₦139, 000 ₦140, 000 and above

SECTION B: KNOWLEDGE OF WASH AMONG RESPONDENTS

11. Have you heard of Water, Sanitation and Hygiene (WASH)? Yes No
If no, skip to number 13
12. If yes, what is your main source of information (tick all that apply): Health workers
Antenatal clinic Media (Radio/TV) Social media Friends/family
Community programs Others _____
13. What does WASH stand for? Water, Sanitation and Hygiene
Water and Sanitary Health Waste and Sewage Handling Don't know
14. According to safe water standard, drinking water should be: Free from germs and harmful chemicals Clear in color only From any available source Tasteless only
Odourless only
15. How often should hands be washed during childcare? Before feeding the baby After using the toilet After changing diapers All of the above

16. Which of the following water sources is safest for drinking in Nigeria? River/stream Well water Piped treated water Borehole water
17. Poor WASH practices can lead to which of these diseases? Tick all that apply
Cholera Typhoid Diarrhea Malaria Tuberculosis Cancer
18. Handwashing with soap is most important? Before preparing food Before feeding your child After using the toilet After handling garbage All of the above
19. Boiling water before drinking can? Kill germs and pathogens Improve taste Make water unsafe Not important
20. What is proper disposal of child's faeces? Disposal into toilet/latrine Throwing into refuse dump Leaving in open environment
21. Proper disposal of a child's feces helps to? Prevent disease transmission Keep the house clean Protect the environment All of the above
30. Exclusive breastfeeding means: Giving only breast milk Giving breast milk and water Giving breast milk and infant formula Don't know
31. Exclusive breastfeeding should be practiced for how long? Less than 3 months 3-5 months 6 months More than 6 months
32. Diarrhoea is defined as: Passing loose or watery stool three or more times in 24 hours Passing stool once daily Hard stool with difficulty Don't know
33. Diarrhoea in children can be caused by: Contaminated water Poor hand hygiene Unsafe disposal of faeces All of the above
34. Which of the following is the most effective way to prevent diarrheal diseases in children? Boiling water before drinking Proper handwashing with soap Using a toilet for defecation All of the above
35. During diarrhoea, breastfeeding should be: Stopped Reduced Continued more frequently Continued as usual Don't know

SECTION C: ATTITUDE TOWARDS WASH AMONG RESPONDENTS

KEY: SD – Strongly Disagree, D – Disagree, U – Undecided, A - Agree, SA – Strongly Agree

S/N	ITEMS	SA	A	U	D	SD
36.	Boiling water is necessary even if it looks clean					
37.	Spending money on safe drinking water is necessary for my child's health					
38.	Hand washing with soap is important to prevent disease					

39.	It is not important to store water in covered containers					
40.	Open defecation does not affect my child's health					
41.	Using toilet is safer than defecating in bush					
42.	I believe washing hands before feeding my baby prevents diseases.					
43.	Cleaning the toilet regularly is not necessary to prevent infections					
44.	Washing hands with soap is necessary even when hands do not look dirty					
45.	Cleanliness of water and household environment affects my child's well-being.					
46.	I am willing to adopt new hygiene practices if they improve health.					
47.	I believe traditional beliefs sometimes prevent proper sanitation practices.					
48.	Using only water without soap is enough for proper handwashing					
49.	Using modern toilets is better than traditional open defecation					
50.	Maintaining clean water, sanitation, and hygiene facilities at home is only the responsibility of the government					
51.	It is important to respect cultural practices even if they conflict with recommended hygiene practices					

SECTION D: WASH PRACTICES AMONG NURSING MOTHERS

52. What is your household's main source of drinking water? Piped water (house/yard) []
 Borehole [] Protected well [] Unprotected well [] River/stream []
 Sachet/bottled water [] Rainwater []
53. How long does it take to fetch water and return? Less than 30 minutes [] 30 minutes or more []
54. In the past two weeks, has your household had days without water? Yes [] No []
55. Do you usually have enough water daily for cooking? Yes [] No []
56. Do you usually have enough water daily for bathing? Yes [] No []
57. Do you usually have enough water daily for cleaning? Yes [] No []

58. Do you treat your drinking water before use? Yes [] No []
59. If Yes, how? Boiling [] Chlorine [] Filter [] Others _____
60. How do you store drinking water? Covered container with lid [] Container with tap [] Open bucket [] Any container without cover []
61. How often do you wash your water storage container? At least once weekly [] Once monthly [] Rarely/never []
62. How do you take water from the storage container? Pour through tap [] Use clean cup with handle [] Dip hand/cup directly []
63. What type of toilet does your household use? Water closet (WC) [] VIP/pit latrine with slab [] Pit latrine without slab [] Bush/field (open defecation) []
64. How often is your household toilet cleaned? Daily [] Weekly [] Rarely []
65. The last time your child passed stool, what was done? Put in toilet/latrine [] Buried [] Thrown in open [] Put in gutter/drain []
66. How do you dispose of household refuse? Collected by waste service [] Burned [] Dumped in open space []
67. Where is wastewater from washing disposed? Soakaway/drainage []
Compound ground [] Roadside/open area []
68. Do you have a place for washing hands with soap and water? Yes [] No []
69. Do you wash your hands with soap after using the toilet? Yes [] No []
70. Do you wash your hands with soap before feeding your child? Yes [] No []
71. Do you wash your hands with soap after cleaning your child's stool? Yes [] No []
72. How do you clean feeding bottles or cups? Wash with soap and water [] Rinse with water only []

SECTION E: FACTORS AFFECTING WASH PRACTICES

73. Do you face challenges in using toilets or handwashing facilities? Yes [] No []
74. If yes, what challenges do you face? _____
75. What hygiene product do you have available at home? Bar soap [] Liquid soap [] Soapy water [] Alcohol-based sanitizer [] Detergent powder [] Clean running water [] Stored water in container with tap [] Stored water in container without tap [] None []
76. Does anyone in your household encourage proper hygiene practices? Yes [] No []
77. Are hygiene products (soap, disinfectants, chlorine) affordable for you? Yes [] No []
78. Are there cultural practices that affect sanitation or water use in your community?
Yes [] No []

79. If yes, what cultural practices affect sanitation or water use in your community?

80. Have you ever received health education on WASH practices from health workers?

Yes [] No []

SECTION F: BREASTFEEDING AND DIARRHOEA

81. Has your child had diarrhoea in the past 2 weeks? Yes [] No []

82. If yes, what did you do? Continued breastfeeding [] Stopped breastfeeding []

Gave ORS [] Visited hospital [] Used herbal remedies []

83. During diarrhoea, how often do you breastfeed? More frequently [] Same as usual [] Less frequently []

84. Are you currently breast feeding your baby? Yes [] No []

85. If yes, how long have you been breastfeeding? Less than 1 month [] 1 – 3 months []


4 – 6 months [] 7 – 12 months [] 13 – 24 months [] More than 24 months []

86. If no, when did you stop? Less than 1 month [] 1 – 3 months [] 4 – 6 months []

7 – 12 months [] 13 – 24 months [] More than 24 months []

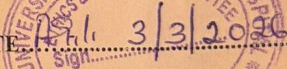
APPENDIX III

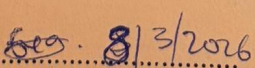
ETHICAL APPROVAL


**HEALTH RESEARCH ETHICS COMMITTEE (HREC)**
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PROTOCOL NUMBER: ADM/E 22/A/VOL. VII/1486549127290
PROPOSAL TITLE: "ASSESSMENT OF WATER, SANITATION, AND HYGIENE (WASH) PRACTICES AMONG NURSING MOTHERS ATTENDING IMMUNIZATION CLINIC IN UNIVERSITY OF BENIN TEACHING HOSPITAL (UBTH)"
PRINCIPAL INVESTIGATOR(S): OROBOSA EVELYN IGBINOSA
DEPARTMENT/INSTITUTION: DEPARTMENT OF PUBLIC HEALTH AND COMMUNITY MEDICINE, SCHOOL OF MEDICINE, UNIVERSITY OF BENIN, BENIN CITY, EDO STATE, NIGERIA
DATE CONSIDERED: MARCH 3RD, 2026
DECISION OF THE COMMITTEE: APPROVED
THIS APPROVAL DATES 3/03/2026 TO 2/03/2027. IF THERE IS DELAY IN STARTING THE RESEARCH, PLEASE INFORM THE HREC SO THAT THE DATES OF APPROVAL CAN BE ADJUSTED ACCORDINGLY
REMARK:
CHAIRMAN: PROF. (MRS) A.N. OFILI SIGNATURE & DATE:  3/3/2026
SUPERVISOR (S): PROF. A. OBI
DECLARATION BY INVESTIGATOR(S):
PROTOCOL NUMBER (please quote in all enquiries)
Note that no participant accrual or activity related to this research may be conducted outside of these dates and you are to furnish the committee with the research activities at the completion of the study. All informed consent forms used in this study must carry the HREC assigned number and duration of HREC approval of the study. In multiyear research, endeavor to submit your annual report to the HREC early in order to obtain renewal of your approval and avoid disruption of your research. No changes are permitted in the research without prior approval by the HREC except in circumstances outlined in the Code. The HREC reserves the right to conduct compliance visit your research site without previous notification.

Signature & Date:  8/3/2026

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APPENDIX IV
PLAGIARISM TEST

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