WATER, SANITATION, AND HYGIENE (WASH) CHALLENGES FACED BY WOMAN IN DISASTER PRONE COASTAL COMMUNITIES IN KARUMKULAM GRAMA PANCHAYATH, THIRUVANANTHAPURAM

MSW DISASTER MANAGEMENT

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ABSTRACT

Water, Sanitation, and Hygiene (WASH) are fundamental to public health, human dignity, and sustainable development. However, women living in disaster-prone coastal communities face significant challenges in accessing safe drinking water, adequate sanitation facilities, and proper hygiene services, particularly during and after disasters. The present study, titled "Water, Sanitation, and Hygiene (WASH) Challenges Faced by Women in Disaster-Prone Coastal Communities: Karumkulam Grama Panchayath, Thiruvananthapuram District," aims to examine the WASH-related challenges experienced by women and understand how disaster-related vulnerabilities affect their health, safety, and daily lives. The study adopted a quantitative research approach with a descriptive research design. A total of 85 women respondents aged 18 years and above were selected from four disaster-prone coastal wards of Karumkulam Grama Panchayath using purposive sampling. Data were collected through a structured interview schedule and analysed using Microsoft Excel and the Statistical Package for the Social Sciences (SPSS). Descriptive statistical techniques, including frequencies, percentages, tables, and charts, were used to summarize the data, while inferential statistics, particularly the Chi-square test, were employed to examine the relationship between selected variables and test the research hypothesis. The study focuses on women's access to safe drinking water, sanitation facilities, hygiene practices, menstrual hygiene management, and disaster-related challenges. It also explores the gender-specific vulnerabilities experienced by women during and after disasters. The findings are expected to contribute to the fields of Social Work, Public Health, Disaster Management, Gender Studies, and Climate Vulnerability Studies by providing localized evidence on WASH challenges. The study is expected to support policymakers, disaster management authorities, local self-government institutions, and public health professionals in developing gender-sensitive, disaster-resilient WASH interventions to improve the health, dignity, safety, and well-being of women in coastal communities.

Keywords: WASH, Women, Coastal Communities, Disaster Recovery, Public Health.

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CHAPTER I: INTRODUCTION

1.1 INTRODUCTION

Water, Sanitation, and Hygiene (WASH) are essential elements of public health, human dignity, and sustainable development. WASH refers to the availability and use of safe drinking water, adequate sanitation facilities, and proper hygiene practices that are necessary for maintaining health and overall well-being. Access to clean water and sanitation is widely recognized as a basic human right because it directly influences people's quality of life and supports the realization of other important rights such as health, education, livelihood, and gender equality. Inadequate WASH facilities can increase the risk of diseases, reduce educational opportunities, and negatively affect social and economic development. On the other hand, proper WASH services contribute significantly to disease prevention, environmental sustainability, community development, and improved productivity. Therefore, ensuring access to safe water, sanitation, and hygiene is important for creating healthier communities and improving living standards across the world (WHO & WASH, 2022).

Water is essential for survival and serves as the foundation of all human activities. Safe drinking water is necessary for consumption, food preparation, personal hygiene, and household activities. Similarly, sanitation facilities such as toilets, sewage systems, and waste disposal mechanisms are essential for maintaining a healthy environment and preventing the spread of diseases. Hygiene practices, including handwashing, menstrual hygiene management, and safe waste disposal, further strengthen public health by reducing exposure to harmful pathogens and infections. The availability of effective WASH services not only protects human health but also contributes to educational attainment, economic development, environmental conservation, and social well-being (UNICEF & WHO, 2023).

Despite remarkable progress in development and technology, access to adequate WASH services remains a major global challenge. Millions of people continue to depend on unsafe water sources and lack access to hygienic sanitation facilities. In many developing countries, inadequate infrastructure, poverty, environmental degradation, and rapid urbanization have created significant barriers to achieving universal access to water and sanitation. Poor sanitation practices, including open defecation and improper waste disposal, continue to expose communities to serious health risks. As a result, water-borne and sanitation-related diseases remain major causes of illness and death, particularly among vulnerable populations such as children, women, older adults, and marginalized communities (UNICEF & WHO, 2023).

Water, Sanitation, and Hygiene (WASH) are fundamental components of public health and sustainable development, contributing significantly to the prevention of disease, improvement

of quality of life, and promotion of human dignity. WASH encompasses access to safe drinking water, adequate sanitation facilities, and appropriate hygiene practices, all of which are recognized as essential human rights and prerequisites for achieving several Sustainable Development Goals (SDGs), particularly SDG 3 (Good Health and Well-being), SDG 5 (Gender Equality), and SDG 6 (Clean Water and Sanitation) (United Nations, 2015; WHO & UNICE, 2023).

According to global estimates by the WHO and UNICEF, billions of people still lack access to safely managed drinking water and sanitation services. The absence of adequate WASH facilities contributes significantly to the spread of diseases such as cholera, typhoid, dysentery, diarrhea, hepatitis A, and various parasitic infections. Every year, hundreds of thousands of children die from preventable diarrheal diseases that are directly linked to unsafe water, inadequate sanitation, and poor hygiene practices. Contaminated water sources and unsanitary environments also contribute to diseases such as trachoma, one of the leading causes of preventable blindness, and Guinea worm disease, which continues to affect populations in vulnerable regions. These health consequences impose enormous social and economic burdens on families, communities, and healthcare systems (UNICEF & WHO, 2023).

Globally, inadequate WASH services remain a major public health concern. According to the WHO and UNICEF (2023), billions of people still lack access to safely managed drinking water and sanitation services, increasing the risk of waterborne diseases such as diarrhoea, cholera, typhoid, and hepatitis A. Poor sanitation and hygiene also contribute to environmental degradation, reduced educational attainment, and diminished economic productivity (Prüss-Ustün et al., 2019). Women and children are disproportionately affected due to their traditional roles in water collection, household sanitation management, and caregiving (UN Women, 2021).

The impact of inadequate WASH services extends beyond physical health. Lack of access to clean water and sanitation affects educational opportunities, economic productivity, environmental sustainability, and overall quality of life. In many communities, considerable time and effort are spent collecting water from distant sources, maintaining household hygiene under difficult conditions, and coping with sanitation-related challenges. Such burdens often limit opportunities for education, employment, and social participation. Inadequate sanitation facilities can also create conditions of discomfort, insecurity, and psychological stress. Therefore, access to safe water, sanitation, and hygiene is not merely a health issue but a broader developmental concern that influences multiple dimensions of human well-being (UNDP, 2022).

The burden of inadequate WASH services is not distributed equally among all members of society. Women and girls are disproportionately affected because of their socially assigned roles and responsibilities within households and communities. In many societies, women bear primary responsibility for water collection, household sanitation management, caregiving, and maintaining domestic hygiene. Consequently, any disruption in water supply or sanitation infrastructure directly increases their workload and affects their daily lives. Women often spend several hours each day fetching water from distant locations, reducing the time available for education, employment, skill development, and participation in community activities. Such responsibilities reinforce existing gender inequalities and contribute to the continued marginalization of women (UN Women, 2021).

Inadequate sanitation facilities pose additional challenges for women and girls. Lack of privacy, safety, and security in sanitation spaces increases their vulnerability to harassment, violence, and health complications. Women often face significant difficulties in accessing safe and private toilets, especially in overcrowded settlements, informal communities, and disaster situations. The absence of gender-sensitive sanitation facilities can expose women to urinary tract infections, reproductive tract infections, and other hygiene-related health problems. Moreover, concerns regarding personal safety frequently force women to delay or avoid using sanitation facilities, thereby increasing health risks and compromising their dignity and well-being (WHO, 2022).

Menstrual hygiene management constitutes another critical dimension of the relationship between gender and WASH. Women and adolescent girls require access to clean water, sanitation facilities, privacy, and menstrual hygiene products to manage menstruation safely and with dignity. However, in many vulnerable communities, such resources remain inadequate or inaccessible. The lack of menstrual hygiene support can lead to infections, discomfort, embarrassment, social exclusion, and reduced participation in education and work. Despite its importance, menstrual hygiene management often receives insufficient attention within public health and disaster management programmes (UNICEF, 2019).

The significance of WASH has received growing recognition within international development frameworks. The United Nations Sustainable Development Goals (SDGs) highlight the importance of ensuring universal access to water, sanitation, and hygiene services. Sustainable Development Goal 6 focuses on ensuring the availability and sustainable management of water and sanitation for all, while Sustainable Development Goal 5 emphasizes gender equality and the empowerment of women and girls. These goals acknowledge the close relationship between WASH access and broader developmental outcomes. In particular, SDG Target 6.2 emphasizes

equitable sanitation and hygiene services with special attention to the needs of women and girls. Nevertheless, significant gaps remain between policy commitments and practical implementation, particularly in vulnerable and disaster-prone regions (United Nations, 2015).

The challenges associated with WASH become even more severe during disasters and climate-related emergencies. Natural disasters such as floods, cyclones, storms, droughts, and coastal erosion frequently damage water supply systems, contaminate drinking water sources, and destroy sanitation infrastructure. These disruptions create immediate public health risks and increase the likelihood of disease outbreaks. During disasters, communities often experience shortages of safe drinking water, inadequate sanitation facilities, and poor hygiene conditions, making them more vulnerable to infectious diseases and environmental health hazards (IPCC, 2023).

The relationship between WASH and disasters has become increasingly significant in the context of climate change. Floods, cyclones, storm surges, and sea-level rise frequently damage water supply systems and sanitation infrastructure, resulting in contamination of drinking water and increased disease outbreaks (IPCC, 2023). Coastal communities are particularly vulnerable because of their continuous exposure to flooding, saline water intrusion, and coastal erosion, which compromise both water security and sanitation services (UNDRR, 2022). These challenges are often intensified during emergencies, where access to safe toilets, hygiene facilities, and menstrual hygiene management becomes severely limited (Sphere Association, 2018). Climate change has further intensified WASH-related vulnerabilities worldwide. Rising sea levels, extreme weather events, changing rainfall patterns, and environmental degradation are placing increasing pressure on water resources and sanitation systems. Coastal regions are among the most vulnerable areas affected by climate-induced disasters. Flooding, seawater intrusion, shoreline erosion, and storm surges frequently compromise freshwater resources and sanitation infrastructure, thereby creating long-term challenges for community health and resilience. The interaction between climate change and inadequate WASH services has emerged as a major concern within contemporary discussions on sustainable development and disaster risk reduction (IPCC, 2023).

Women experience the impacts of disasters differently and often more severely than men. During emergencies, women face increased responsibilities related to water collection, caregiving, food preparation, sanitation management, and household recovery. The destruction of sanitation facilities and water sources creates additional burdens, forcing women to travel longer distances to obtain water and maintain hygiene. Relief camps and temporary shelters often lack adequate privacy, sanitation facilities, and menstrual hygiene support, creating

physical, emotional, and social difficulties. Consequently, disasters frequently magnify existing gender inequalities and expose women to greater risks related to health, safety, and dignity (UN Women, 2021).

Coastal communities represent one of the most vulnerable population groups in the context of disaster-related WASH challenges. These communities are continuously exposed to environmental hazards such as sea erosion, tidal flooding, cyclones, storm surges, and saline water intrusion. Such hazards disrupt access to safe drinking water, damage sanitation facilities, and compromise hygiene practices. Frequent environmental disturbances create conditions of chronic vulnerability, making it difficult for communities to maintain adequate WASH standards. The resulting health, economic, and social consequences are particularly severe for women, who often bear the responsibility of managing household water and sanitation needs (UNDRR, 2022).

In Kerala, coastal communities have increasingly experienced the adverse effects of climate change and environmental degradation. Kerala's coastline extends for approximately 590 kilometres and supports a large population dependent on fishing and related livelihood activities. Coastal regions of the state are vulnerable to sea erosion, flooding, high tidal waves, cyclones, and the phenomenon known locally as “Kallakadal” or rogue sea waves. These environmental hazards frequently lead to the destruction of houses, displacement of families, contamination of drinking water sources, and damage to sanitation infrastructure. As a result, coastal populations often face recurring challenges related to water security, sanitation, and hygiene (Government of Kerala, 2022). In India, and particularly in Kerala, disaster-prone coastal regions experience recurrent environmental hazards that adversely affect WASH infrastructure. The coastal belt of Thiruvananthapuram district has witnessed frequent sea erosion, flooding, and the occurrence of Kallakadal (rogue waves), disrupting the availability of safe drinking water and sanitation facilities (Government of Kerala, 2022). Women in these communities experience multiple vulnerabilities as they bear primary responsibility for household water management while simultaneously coping with caregiving responsibilities, livelihood disruptions, and health-related challenges (UN Women, 2021; UNICEF, 2019).

The coastal communities of Thiruvananthapuram district are particularly vulnerable to these environmental threats. Several coastal villages in the district experience recurrent sea erosion, tidal flooding, and disaster-induced displacement. These conditions affect the availability of safe drinking water and often force families to rely on alternative or unsafe water sources. Sanitation facilities may become damaged, inaccessible, or unusable during disaster events,

creating significant hygiene challenges. Such circumstances have profound implications for public health and community well-being (Government of Kerala, 2022).

Women living in the coastal communities of Thiruvananthapuram face multiple and interconnected vulnerabilities. Apart from managing household water and sanitation needs, many women are involved in informal occupations such as fish vending, fish processing, coir production, and daily wage labour. Disasters frequently disrupt these livelihood activities, resulting in economic insecurity and reduced household income. At the same time, women continue to shoulder responsibilities related to caregiving, water collection, hygiene maintenance, and household management. These overlapping burdens increase their vulnerability and limit their ability to recover from disaster-related losses (UN Women, 2021).

Another important concern is the limited participation of women in disaster preparedness, planning, and decision-making processes. Although women are among the most affected groups during disasters, their perspectives and experiences are often underrepresented in policy formulation and disaster management initiatives. As a result, many interventions fail to adequately address women's specific needs related to sanitation, menstrual hygiene management, safety, privacy, and health. Understanding women's experiences is therefore essential for developing inclusive and gender-sensitive WASH interventions (UNDRR, 2022).

The intersection of gender inequality, environmental vulnerability, poverty, and inadequate WASH infrastructure creates complex challenges for women living in disaster-prone coastal communities. Addressing these challenges requires a comprehensive understanding of how disasters influence access to water, sanitation, and hygiene and how women navigate these difficulties in their daily lives. Such understanding is essential for promoting public health, gender equality, community resilience, and sustainable development (United Nations, 2015).

Against this background, the present study titled "Water, Sanitation, and Hygiene (WASH) Challenges Faced by Women in Disaster-Prone Coastal Communities of Thiruvananthapuram District" seeks to examine the various challenges experienced by women in accessing and managing water, sanitation, and hygiene services in disaster-prone coastal settings. The study focuses on understanding their lived experiences, health concerns, coping mechanisms, and perceptions regarding existing support systems. It also aims to contribute to the development of gender-sensitive and disaster-resilient WASH interventions that can enhance the health, dignity, safety, and well-being of women in vulnerable coastal communities.

1.2 STATEMENT OF THE PROBLEM

Access to safe water, sanitation, and hygiene (WASH) is essential for maintaining human health, dignity, and quality of life. Adequate WASH services help prevent diseases, improve living conditions, and support social and economic development. However, despite improvements in public health systems and infrastructure, access to safe drinking water, sanitation, and hygiene remains a challenge in many parts of the world, particularly in vulnerable and disaster-prone regions. According to recent global estimates, nearly 2.2 billion people still lack safely managed drinking water services, while around 3.4 billion people do not have access to safely managed sanitation facilities. In addition, almost 1.7 billion people lack access to basic hygiene facilities, including handwashing facilities with soap and water (WHO & UNICEF, 2025). These conditions continue to increase the risk of disease outbreaks, poor health outcomes, and environmental problems.

The impact of inadequate WASH facilities is not equally experienced by all sections of society. Women and girls are often more affected because they carry major responsibilities related to water collection, household sanitation, caregiving, and hygiene maintenance. In many households, women spend significant time ensuring water availability and maintaining cleanliness, especially during times of shortage or environmental disruption (UNICEF, 2023). Limited sanitation facilities, lack of privacy, and inadequate menstrual hygiene support further increase health risks and emotional stress among women.

The situation becomes more difficult during disasters and climate-related emergencies. Coastal communities often face challenges such as sea erosion, tidal flooding, storm surges, water contamination, and damage to sanitation infrastructure. These environmental disruptions reduce access to safe water and hygienic living conditions, thereby increasing the risk of infections and public health problems (IPCC, 2023). During such situations, women experience additional burdens as they continue to manage household hygiene, caregiving responsibilities, and water collection under unsafe and stressful conditions (UN Women, 2021).

Kerala, particularly its coastal regions, has increasingly experienced climate-related vulnerabilities including sea erosion, flooding, and “Kallakadal” or rogue sea waves. Coastal areas of Thiruvananthapuram district such as Pozhiyoor, Poonthura, and Anchuthengu frequently experience environmental disturbances that affect daily life and access to essential services. Recent reports indicate that some coastal villages in Thiruvananthapuram continued to experience drinking water shortages despite monsoon rainfall, affecting household water security and sanitation practices (The Times of India, 2026). Damage to sanitation facilities

and water systems during disasters creates serious challenges for maintaining hygiene and public health.

Women in disaster-prone coastal communities face multiple challenges because of their social and household responsibilities. Despite these realities, limited research has specifically examined how women experience WASH-related difficulties in coastal communities of Thiruvananthapuram district. Existing studies often focus broadly on climate change, sanitation, or disasters without adequately understanding women's lived experiences and coping mechanisms in local contexts. Therefore, the present study seeks to understand the WASH challenges faced by women in disaster-prone coastal communities of Thiruvananthapuram district and contribute to the development of gender-sensitive and disaster-resilient interventions that can improve health, dignity, and well-being.

1.3 BACKROUND OF THE STUDY

Water, Sanitation, and Hygiene (WASH) are essential for maintaining public health, human dignity, and overall well-being. Access to safe drinking water, proper sanitation facilities, and good hygiene practices helps prevent diseases and improve quality of life. However, many people across the world still face challenges in accessing these basic services. According to recent global estimates, nearly 2.2 billion people lack safely managed drinking water services, around 3.4 billion people do not have access to safely managed sanitation, and about 1.7 billion people lack basic hygiene facilities (WHO & UNICEF, 2025).

The effects of poor WASH access are often greater among women, particularly in disaster-prone areas. Women are usually responsible for water collection, household sanitation, caregiving, and maintaining family hygiene. During disasters such as floods, sea erosion, and storm surges, access to water and sanitation becomes more difficult, increasing women's physical and emotional burden (UN Women, 2021).

In coastal areas of Thiruvananthapuram district, environmental challenges such as sea erosion, tidal flooding, and "Kallakadal" frequently affect water availability and sanitation facilities (Government of Kerala, 2022). Therefore, this study focuses on understanding the WASH challenges faced by women in disaster-prone coastal communities and their experiences in managing these difficulties

1.4 RELEVANCE AND SIGNIFICANCE OF THE STUDY

The present study titled “Water, Sanitation, and Hygiene (WASH) Challenges Faced by Women in Disaster-Prone Coastal Communities of Thiruvananthapuram District” is significant because it addresses an important public health, social, and developmental concern affecting vulnerable coastal populations. Access to safe drinking water, sanitation, and hygiene is essential for maintaining health, dignity, and quality of life. However, women living in disaster-prone coastal communities often face multiple difficulties in accessing and managing these essential services, particularly during periods of environmental disruption and climate-related emergencies. This study attempts to understand these challenges from the lived experiences of women and thereby contributes to a better understanding of WASH-related vulnerabilities in coastal settings.

The study is important from a public health perspective because inadequate WASH facilities are closely associated with the spread of water-borne and sanitation-related diseases. Unsafe drinking water, damaged sanitation facilities, and poor hygiene conditions increase the risk of illnesses such as diarrhoea, cholera, skin infections, and other communicable diseases, especially during disasters (WHO & UNICEF, 2025). Women often carry the responsibility of maintaining household hygiene, caring for children and older adults, and ensuring water availability, making them more vulnerable to the health consequences of poor WASH access (UNICEF, 2023). Therefore, understanding women’s experiences can help in designing more effective and inclusive health interventions.

This study is also significant because it focuses on the intersection of gender, disaster vulnerability, and environmental challenges. Climate-related disasters such as sea erosion, tidal flooding, storm surges, and water contamination have increasingly affected Kerala’s coastal communities, particularly in districts such as Thiruvananthapuram (IPCC, 2023). Recent reports from coastal villages in Thiruvananthapuram have highlighted recurring drinking water shortages and sanitation-related concerns even during monsoon seasons, showing the seriousness of the issue at the local level (The Times of India, 2026). By examining women’s challenges in such environments, the study helps to understand how disasters influence everyday life, health, and dignity.

Furthermore, the study addresses a critical gap in existing literature. While previous studies have examined WASH, women's health, climate change, and disaster management as separate areas, there is limited research that integrates these dimensions to examine how WASH challenges specifically affect women's health in disaster-prone coastal communities of Kerala.

Most available studies focus on the general population or disaster impacts without adequately addressing the gender-specific experiences regarding access to safe water, sanitation facilities, menstrual hygiene management, privacy, safety, and healthcare during disasters. There is a lack of localized empirical evidence from coastal communities of Thiruvananthapuram District, where women continue to face recurring disaster-related WASH challenges.

By bridging this gap, the study contributes to the fields of Gender Studies, Disaster Management, Public Health, Social Work, and Climate Vulnerability Studies. The findings are expected to enhance understanding of gender-specific challenges and support the development of gender-responsive disaster management strategies, disaster-resilient WASH interventions, and evidence-based policies. These insights may support policymakers, disaster management authorities, public health professionals, and social workers in developing programmes that improve the health, dignity, safety, and well-being of women in vulnerable coastal communities. Finally, it serves as a reference for future academic research related to gender, WASH, climate vulnerability, and community resilience in the context of Thiruvananthapuram district.

1.5 CHAPTERIZATION

This research is organized into five chapters:

CHAPTER 1: INTRODUCTION

CHAPTER 2: REVIEW OF LITERATURE

CHAPTER 3: RESEARCH METHODOLOGY

CHAPTER 4: DATA ANALYSIS AND DISCUSSION

CHAPTER 5: FINDINGS, SUGGESTIONS AND CONCLUSION

There will be the list of references and the annexures for comprehensive supplementary information.

CHAPTER II: REVIEW OF LITERATURE

2.1 INTRODUCTION

A literature review is an important part of any research study. It helps the researcher understand the previous studies related to the topic and identify major findings, concepts, and research gaps. A literature review is a systematic examination of books, journals, reports, and other academic materials related to a research problem. According to Neuman (2014), literature review helps researchers build knowledge by understanding what other researchers have already studied. It allows researchers to understand concepts, methods, and findings related to the study topic.

In research, literature review helps in understanding the theoretical and practical background of the study. It helps researchers identify key concepts, compare different studies, and narrow the focus of the research. Literature review also helps in avoiding duplication of studies and identifying research gaps. Researchers such as Kothari (2004), Bryman (2016), and Rubin and Babbie (2017) explain that literature review is a scientific process of collecting, analysing, and interpreting previous studies relevant to a research topic.

The present literature review focuses on water, sanitation, and women's health in the disaster context of coastal Kerala. Coastal regions of Kerala frequently experience floods, coastal erosion, sea surges, and climate-related disasters, which affect access to safe water, sanitation, and hygiene facilities. Women are one of the most vulnerable groups during disasters because of their health, caregiving responsibilities, menstrual hygiene needs, and safety concerns. This review examines previous studies related to water and sanitation challenges in disaster situations and women's health vulnerabilities in coastal disaster contexts. The review aims to understand existing knowledge, identify major findings, and explore gaps for further research.

2.2 REVIEW OF LITERATURE

This chapter includes the literature related to water, sanitation, and women's health in the disaster context of coastal Kerala. It examines studies related to disaster-related water and sanitation problems and the health vulnerabilities experienced by women in affected communities. Through this review, the researcher aims to understand the major themes, findings, and gaps in previous studies and narrow down the focus of the present study.

2.2.1 Water, Sanitation, and Hygiene (WASH) Challenges in Disaster contexts

Water, sanitation, and hygiene are important for maintaining health and wellbeing during disasters. Access to clean drinking water, proper sanitation facilities, and hygienic conditions

often becomes difficult during floods and coastal disasters. Women are more affected due to their caregiving roles and menstrual hygiene needs.

Studies after the Kerala floods reported that damaged water systems and poor sanitation facilities increased the risk of water-borne diseases and poor hygiene practices among displaced communities. According to reports prepared after the Kerala floods, many relief camps experienced shortages of safe drinking water, sanitation facilities, and waste management systems, which affected women and children more seriously (Kerala State Disaster Management Authority, 2019).

Research on Water, Sanitation, and Hygiene (WASH) in disaster situations explains that women face additional difficulties in maintaining hygiene because of lack of privacy, poor toilet facilities, and limited access to menstrual hygiene products. Studies suggest that inadequate sanitation facilities in emergency shelters may increase health risks and psychological discomfort among women (United Nations Children's Fund, 2021).

Similarly, studies on climate-related disasters in coastal regions show that poor sanitation and unsafe water during emergencies increase disease vulnerability among women and children. Researchers highlight that access to safe water and sanitation should be considered a priority during disaster preparedness and recovery programs (World Health Organization, 2022).

Water, sanitation, and hygiene (WASH) remain fundamental determinants of public health and sustainable development. According to the WHO and UNICEF Joint Monitoring Programme, although access to WASH services has improved globally, nearly 2.2 billion people still lack safely managed drinking water and 3.5 billion people do not have access to safely managed sanitation facilities (WHO & UNICEF, 2023). The report highlights that inadequate WASH services contribute significantly to diarrhoeal diseases, child mortality, malnutrition, and reduced quality of life, particularly in low- and middle-income countries. The study further emphasizes that achieving Sustainable Development Goal 6 requires greater investments in climate-resilient WASH infrastructure, equitable service delivery, and gender-sensitive policies. The findings demonstrate that women and vulnerable populations continue to experience disproportionate barriers in accessing safe water and sanitation, reinforcing the need for inclusive interventions that address both health and social inequalities

2.2.2 Women's Health and Gendered Vulnerabilities In Disaster Contexts

Women's health is significantly affected during disasters because of poor living conditions, interrupted health services, and increased caregiving responsibilities. Disaster situations often create challenges in reproductive health, menstrual hygiene, nutrition, and mental wellbeing.

Studies on women's experiences during floods in Kerala show that women face emotional stress, poor privacy, and reproductive health concerns in temporary shelters. Researchers found that women experienced challenges related to menstrual hygiene management, access to medicines, and emotional wellbeing after disasters (Akhil & Thomas, 2021).

Research on gender and disasters explains that women become more vulnerable because of unequal access to resources, social responsibilities, and caregiving burdens. Women in disaster-affected communities often take responsibility for water collection, child care, and household recovery while facing physical and emotional stress (Enarson & Chakrabarti, 2009).

Furthermore, studies on women's health in disaster contexts show that mental health issues such as anxiety, stress, and insecurity are common among displaced women. Health interventions focusing on gender-sensitive disaster response, sanitation, reproductive health services, and psychosocial support are important for improving women's wellbeing during disasters (WHO, 2022).

2.2.3 Disaster, Displacement, and Access To Health Services For Women

Disasters often affect the availability and accessibility of health services, especially in coastal and flood-prone regions. Women in disaster-affected areas experience greater difficulties in accessing healthcare facilities because of displacement, damaged infrastructure, and interruptions in public health systems. During disasters, women may face barriers in accessing maternal care, reproductive healthcare, medicines, and mental health support.

Studies conducted after the Kerala floods highlighted that many women living in relief camps experienced interruptions in healthcare access due to overcrowding, transportation problems, and poor availability of gender-sensitive healthcare services. Temporary shelters often lacked adequate facilities for women's reproductive health needs, including privacy and sanitary care. Researchers observed that women experienced increased health risks because of limited access to medical consultation and health facilities during emergency situations (Kerala State Disaster Management Authority , 2019).

Research on women and disaster health explains that displaced women often experience difficulties in maintaining reproductive and maternal health during emergencies. According to

studies, disaster situations increase risks related to pregnancy, menstrual hygiene, infections, and nutrition because healthcare services become disrupted or inaccessible. Researchers stress the importance of providing emergency healthcare systems that are sensitive to women's health needs (United Nations Population Fund, 2015).

Similarly, global studies on disasters and women's healthcare indicate that displaced women often experience emotional distress and delayed treatment because healthcare systems are not adequately prepared for gender-specific needs. The lack of safe sanitation, medical facilities, and psychosocial care negatively affects women's physical and mental wellbeing during disasters. Researchers suggest integrating women-focused healthcare planning into disaster management frameworks (World Health Organization , 2022).

2.2.4 Community Resilience, Disaster Management, and Women's Coping Strategies

Community resilience and coping strategies are important in reducing the impact of disasters on vulnerable populations. Women in disaster-prone areas often play an important role in family survival, caregiving, water management, sanitation maintenance, and community recovery activities. Their participation in disaster preparedness and recovery contributes to strengthening resilience at the household and community levels.

Studies on community responses after the Kerala floods show that women actively participated in relief management, caregiving, sanitation maintenance, and rebuilding family life after displacement. Researchers found that women contributed significantly to maintaining household hygiene and supporting vulnerable family members despite facing physical and emotional challenges themselves. These studies highlight the role of women as active participants in recovery rather than only victims of disasters (Akhil & Thomas, 2021).

Research on gender and disasters explains that women adopt several coping strategies during emergencies, including resource sharing, social support, collective caregiving, and community participation. Women often build informal support systems that help families manage food, water, hygiene, and emotional wellbeing during crisis situations. Such collective efforts improve resilience and reduce vulnerability among affected households (Enarson & Chakrabarti, 2009).

Furthermore, studies on disaster risk reduction emphasize that including women in disaster preparedness planning can improve community resilience and public health outcomes. Researchers argue that women's experiences and local knowledge related to water

management, sanitation, and caregiving can support more effective disaster preparedness policies. Community-based disaster management programs that include women's participation are found to improve recovery and long-term resilience in coastal communities (United Nations Office for Disaster Risk Reduction, 2020).

2.2.5 Climate Change, Coastal Disasters, and Water Insecurity

The Sphere Association (2018) examined the importance of WASH services during humanitarian emergencies and disasters. The handbook identifies safe water supply, sanitation facilities, waste management, and hygiene promotion as essential components of emergency response to prevent disease outbreaks and protect human dignity. The study emphasizes that disasters frequently damage water infrastructure, contaminate drinking water sources, and reduce access to sanitation, thereby increasing the risk of communicable diseases such as cholera, dysentery, and hepatitis A. It further highlights that women and girls experience greater challenges due to limited privacy, inadequate menstrual hygiene facilities, and increased exposure to gender-based violence in emergency shelters. The report recommends integrating gender-sensitive WASH planning into disaster preparedness and response strategies to improve health outcomes and strengthen community resilience.

Climate change has increased the frequency and intensity of disasters in coastal regions across the world. Coastal Kerala is highly vulnerable to floods, sea erosion, heavy rainfall, saline water intrusion, and storm-related disasters. These environmental changes directly affect water availability, sanitation systems, and the health of local communities, especially women.

Studies on climate change and coastal Kerala indicate that rising sea levels, flooding, and coastal erosion have affected freshwater availability and increased water insecurity among coastal households. Researchers explain that saline water intrusion and contamination of wells after floods make access to safe drinking water difficult for families living in coastal areas. Women are particularly affected because they are usually responsible for water collection and household management (Nair & Thankappan, 2020).

Research on climate-related disasters and water insecurity suggests that women experience greater physical and emotional burdens during disaster situations. Women often spend additional time searching for safe water, maintaining household hygiene, and caring for family members during water shortages. Such difficulties increase physical stress and affect women's wellbeing and health outcomes (United Nations Development Programme, 2021).

Similarly, studies on climate vulnerability in coastal communities emphasize that poor water management systems increase health risks during disasters. Researchers argue that climate adaptation measures should include safe drinking water systems, sanitation infrastructure, and women-centered disaster preparedness programs to reduce vulnerability among coastal populations (Intergovernmental Panel on Climate Change, 2022).

2.2.6 Menstrual Hygiene, Sanitation, and Women's Dignity During Disasters

Menstrual hygiene management is an important aspect of women's health, especially during disasters. Women and adolescent girls often face difficulties in managing menstruation because of inadequate sanitation facilities, lack of privacy, and poor access to sanitary products in temporary shelters and relief camps.

Studies conducted in disaster settings indicate that women in relief camps often face challenges related to privacy, access to clean toilets, and proper disposal systems for menstrual products. Researchers explain that overcrowded shelters and lack of sanitation facilities create discomfort and increase health risks for women and adolescent girls. Menstrual hygiene needs are often overlooked during emergency response planning, affecting women's dignity and wellbeing (United Nations Children's Fund, 2021).

UNICEF (2019) examined menstrual hygiene management (MHM) as a critical component of Water, Sanitation, and Hygiene (WASH) programmes. The report found that inadequate access to clean water, sanitation facilities, menstrual hygiene products, and privacy negatively affects the health, education, dignity, and social participation of women and adolescent girls. Poor menstrual hygiene management contributes to reproductive tract infections, school absenteeism, social stigma, and psychological distress, particularly in resource-poor and disaster-affected communities. The report recommends that governments and development agencies integrate menstrual hygiene management into WASH policies by ensuring access to gender-responsive sanitation facilities, hygiene education, and affordable menstrual products. These findings underscore the importance of addressing gender-specific WASH needs in disaster-prone coastal communities to promote health, dignity, and gender equality.

The Intergovernmental Panel on Climate Change (IPCC, 2023) reported that climate change has intensified the frequency and severity of floods, cyclones, storm surges, and sea-level rise, posing significant threats to water security and sanitation systems worldwide. Coastal communities are particularly vulnerable because saline water intrusion, coastal erosion, and flooding frequently contaminate freshwater resources and damage sanitation infrastructure.

The report stresses that climate-resilient water management and disaster preparedness are essential for protecting vulnerable populations from WASH-related health risks. It also recognizes that women often experience disproportionate impacts due to increased responsibilities for water collection, caregiving, and household hygiene during climate-induced disasters. The findings support the integration of climate adaptation, gender equality, and resilient WASH infrastructure into national and local development planning.

Research on menstrual hygiene management during humanitarian crises highlights that lack of access to sanitary materials and clean water increases stress among women and girls. Women reported feelings of embarrassment, insecurity, and discomfort when proper facilities were unavailable. Researchers emphasize the importance of gender-sensitive sanitation planning in disaster response systems (Sommer et al., 2016).

Furthermore, studies on women's health and sanitation explain that menstrual hygiene should be recognized as an essential public health concern during disasters. Health professionals argue that relief camps should provide safe toilets, adequate water supply, disposal systems, and menstrual hygiene kits to ensure women's health, dignity, and safety during emergency situations (World Health Organization, 2022).

2.2.7 Policy Responses, Disaster Management, and WASH Interventions

Government policies and disaster management systems play an important role in reducing disaster risks and improving public health outcomes. Effective disaster response systems help provide safe drinking water, sanitation facilities, healthcare services, and relief support to affected communities, particularly women and vulnerable groups.

Studies on disaster management in Kerala explain that post-disaster interventions after major floods focused on rebuilding water systems, sanitation facilities, and community health services. Reports indicate that relief measures included cleaning contaminated wells, restoring drinking water access, and strengthening public health interventions to prevent disease outbreaks in disaster-affected communities (Kerala State Disaster Management Authority, 2019).

Research on Water, Sanitation, and Hygiene (WASH) interventions highlights that emergency sanitation programs play an important role in reducing health risks during disasters. Researchers found that effective disaster response includes safe water supply systems, emergency toilets, waste management, hygiene awareness, and sanitation monitoring to protect vulnerable populations such as women and children (World Health Organization, 2022).

Similarly, studies on disaster risk reduction policies suggest that women's participation in disaster planning improves response effectiveness. Researchers argue that disaster management policies should include women's voices in planning and implementation because women possess practical knowledge about water use, sanitation practices, family health, and caregiving responsibilities. Gender-sensitive disaster policies can contribute to better health outcomes and stronger community resilience in coastal areas (United Nations Office for Disaster Risk Reduction, 2020).

2.2.8 Mental Health and Psychosocial Wellbeing Of Women In Disaster Contexts

Disasters often create psychological and emotional stress among affected populations, especially women. Women in disaster situations experience emotional burdens due to displacement, loss of livelihood, caregiving responsibilities, lack of privacy, and poor living conditions in temporary shelters. Mental health is an important aspect of women's wellbeing because emotional stress can affect physical health, family relationships, and daily functioning. Studies conducted after floods and disasters in Kerala indicate that women experienced emotional stress, anxiety, and insecurity due to uncertainty and disruption in normal life. Women living in relief camps reported concerns about family safety, sanitation facilities, children's health, and lack of privacy. Researchers observed that disaster-related stress had negative impacts on women's emotional wellbeing and coping abilities (Akhil & Thomas, 2021).

Research on women and disaster mental health explains that women are more vulnerable to psychological stress because of caregiving responsibilities and social expectations during emergencies. Researchers found that women often experience fear, emotional exhaustion, sadness, and insecurity during and after disasters. Mental health challenges are intensified when women face poor sanitation, overcrowding, and unsafe living conditions in shelters (World Health Organization, 2022).

Similarly, studies on psychosocial support in disaster settings suggest that mental health services should be integrated into disaster management programs. Researchers emphasize the need for counselling, social support systems, community participation, and women-friendly spaces in relief camps to reduce psychological stress and improve emotional wellbeing among affected women (United Nations Office for Disaster Risk Reduction, 2020).

2.2.9 Socioeconomic Vulnerability of Women In Coastal Disaster Contexts

Socioeconomic conditions play an important role in shaping women's experiences during disasters. Poverty, unemployment, housing insecurity, and limited financial resources increase women's vulnerability in disaster situations. Women from economically weaker households are often more affected because they have fewer resources to manage water shortages, healthcare needs, and sanitation-related challenges.

Studies on coastal communities in Kerala indicate that disasters negatively affect women's livelihood opportunities and economic stability. Women dependent on fishing-related work, informal labour, or household-based employment often experience income loss after floods and coastal erosion. Researchers explain that financial insecurity increases difficulties in accessing healthcare, sanitation products, and safe living conditions during disasters (Nair & Thankappan, 2020).

Research on gender and vulnerability explains that women experience unequal access to resources, decision-making, and recovery opportunities after disasters. Researchers found that poverty and social inequality influence women's ability to maintain health and hygiene during emergency situations. Limited access to financial resources may affect women's ability to purchase sanitary products, medicines, or clean drinking water, thereby increasing health risks (Enarson & Chakrabarti, 2009).

The studies on disaster recovery emphasize that livelihood restoration and economic support programs are necessary for reducing women's vulnerability. Researchers suggest that women-centered recovery programs, employment support, and social protection systems can improve women's resilience and health outcomes in disaster-prone coastal communities (United Nations Development Programme, 2021).

2.2.10 Public Health, Disease Outbreaks, and WASH In Disaster Settings

Public health concerns become more serious during disasters due to unsafe water, poor sanitation, overcrowding, and inadequate hygiene practices. Disaster situations increase the risk of disease outbreaks, especially among vulnerable populations such as women, children, and elderly people. Poor access to clean water and sanitation facilities can result in infections and water-borne diseases.

Studies conducted after floods in Kerala indicate that contaminated water sources and damaged sanitation systems increased risks of communicable diseases in affected areas. Researchers observed that poor waste disposal, stagnant water, and overcrowded relief camps contributed

to health concerns among displaced populations. Women and children were particularly vulnerable because of their greater exposure to poor hygiene conditions (Kerala State Disaster Management Authority, 2019).

Research on Water, Sanitation, and Hygiene (WASH) in emergencies explains that poor sanitation and lack of safe drinking water increase the spread of diarrheal diseases, skin infections, and other communicable illnesses. Researchers emphasize that women often face greater health risks because of caregiving roles and close contact with affected family members during disease outbreaks (United Nations Children's Fund, 2021).

Similarly, studies on public health interventions during disasters highlight the importance of preventive healthcare measures such as clean water distribution, sanitation maintenance, hygiene awareness campaigns, vaccination programs, and disease surveillance systems. Researchers argue that strong public health interventions are necessary to reduce disease burden and improve community wellbeing during disaster situations (World Health Organization, 2022).

2.3 THEORETICAL FRAMEWORK

Two primary theoretical lenses guide this research to understand the intersection of gender, disasters, and basic rights: the Gendered Vulnerability Framework and the Human Rights-Based Approach (HRBA) to WASH.

- Gendered Vulnerability Framework: This framework, rooted in the work of scholars like Enarson (2000), posits that disasters are not gender-neutral events. It argues that women's vulnerability is not biological but socially constructed through the division of labour, unequal access to resources, and restricted decision-making power. In the context of this study, the framework helps explain why women in coastal Thiruvananthapuram bear a disproportionate burden - such as the "triple burden" of water collection, caregiving, and household hygiene - during and after environmental disruptions like *Kallakadal* or sea erosion.
- Human Rights-Based Approach (HRBA) to WASH: This framework is based on the United Nations' recognition of water and sanitation as fundamental human rights essential for the realization of all other rights, including health and dignity. The HRBA emphasizes five key criteria: availability, accessibility, affordability, quality/safety, and acceptability (especially regarding privacy and gender-sensitivity). In this research, the HRBA serves as a moral and legal lens to critique the adequacy of existing WASH

interventions in disaster-prone coastal areas and to evaluate whether they meet the specific needs of women, including menstrual hygiene and safety.

2.4 RESEARCH GAP ANALYSIS

The reviewed literature demonstrates that while there is extensive research on disaster management, WASH infrastructure, and general public health in Kerala-particularly following the 2018 and 2019 floods-several critical gaps remain:

Lack of Hazard-Specific Integration: Most existing studies in Kerala focus on inland flooding. There is a noticeable lack of research specifically integrating WASH challenges with unique coastal hazards such as *Kallakadal* and chronic sea erosion, which create different types of water contamination and infrastructure damage compared to riverine floods.

Geographic and Localized Gaps: While global and national studies discuss WASH and gender, there is a lack of localized empirical evidence from the specific coastal villages of Thiruvananthapuram District (e.g., Pozhiyoor, Poonthura, Anchuthengu). These areas face recurring, "silent" disasters that do not always receive the same level of emergency aid as major flood events, leaving women's chronic vulnerabilities unaddressed.

Fragmented Analysis of Women's Health: Existing literature often treats menstrual hygiene, mental health, and physical water-borne diseases as separate issues. There is a research gap in understanding the *synergistic* impact of these factors on a woman's overall dignity and well-being during displacement or environmental stress.

Policy-Practice Disconnect: While policies emphasize "gender-sensitivity," there is limited data on how women actually perceive and navigate the support systems provided by the state during coastal emergencies.

This study addresses these gaps by providing a focused exploration of the lived experiences of women in these specific coastal settings. It seeks to move beyond viewing women as passive victims by documenting their unique coping mechanisms and participation in community resilience, thereby offering evidence-based insights for truly gender-responsive disaster-resilient WASH policies.

CHAPTER III: RESEARCH METHODOLOGY

3.1 INTRODUCTION

The present study is an empirical investigation of the Water, Sanitation, and Hygiene (WASH) challenges experienced by women living in disaster-prone coastal communities of Thiruvananthapuram district. The study aims to understand women's experiences regarding access to safe drinking water, sanitation facilities, hygiene practices, and the impact of disaster-related vulnerabilities on their daily lives. Both primary and secondary sources of data were used to obtain a comprehensive understanding of the research problem. This chapter describes the title of the study, objectives, hypothesis, variables, definition of concepts, pilot study, research design, universe and unit of study, sampling design, data collection, pre-test, data analysis, ethical considerations, assumptions, limitations, and scope of the study.

3.2 TITLE OF THE STUDY

Water, Sanitation, and Hygiene (WASH) Challenges Faced by Woman in Disaster Prone Coastal Communities in Karumkulam Grama Panchayath, Thiruvananthapuram

3.3 OBJECTIVE OF THE STUDY

3.3.1 GENERAL OBJECTIVE

To study the Water, Sanitation, and Hygiene (WASH) challenges faced by women living in disaster-prone coastal communities of Karumkulam Grama Panchayat.

3.3.2 SPECIFIC OBJECTIVES

- To assess women's access to safe drinking water in disaster-prone coastal communities.
- To examine the availability and condition of sanitation facilities among women.
- To understand hygiene practices followed by women during normal and disaster situations.
- To identify the impact of disasters on women's WASH conditions.
- To study the coping mechanisms adopted by women during WASH-related challenges.

3.4 DEFINITION OF CONCEPTS

	TERM	CONCEPTUAL DEFINITION	OPERATIONAL DEFINITION
1	Water	"Water refers to safe and sufficient water available for drinking, cooking, personal hygiene, and other domestic purposes essential for human health and well-being" (World Health Organization, 2022).	Water refers to the availability, accessibility, adequacy, quality, and continuity of drinking water available to women residing in disaster-prone coastal communities of Karumkulam Grama Panchayat.
2	Sanitation	Sanitation refers to access to and use of facilities and services for the safe management and disposal of human excreta, wastewater, and solid waste to protect health and the environment (WHO & UNICEF, 2023).	Sanitation refers to the availability, accessibility, condition, cleanliness, privacy, and usability of toilet facilities and waste disposal systems available to women, particularly during disaster situations.
3	Hygiene	Hygiene refers to the conditions and practices that help maintain health and prevent the spread of diseases, including handwashing, personal cleanliness, and menstrual hygiene management (WHO, 2022).	Hygiene refers to personal and household hygiene practices maintained by women, including handwashing, cleanliness, menstrual hygiene management, and access to hygiene-related facilities and resources.
4	WASH Challenges	WASH challenges refer to barriers and difficulties related to accessing and maintaining adequate water, sanitation, and hygiene services necessary for	WASH challenges refer to the difficulties experienced by women in accessing and managing safe water, sanitation facilities, and hygiene practices

		health, dignity, and well-being (WHO & UNICEF, 2023).	due to disaster-related vulnerabilities in coastal communities.
5	Women	Women are adult female members of society whose experiences and social roles are shaped by cultural, economic, and environmental contexts (UN Women, 2021).	Women refer to adult females residing in disaster-prone coastal areas of Thiruvananthapuram district whose experiences related to water access, sanitation, hygiene practices, health concerns, privacy, safety, and coping strategies during disaster situations are examined.
6	Disaster-Prone Coastal Communities	Disaster-prone coastal communities are populations living in coastal regions that are frequently exposed to natural hazards such as flooding, sea erosion, storm surges, and coastal inundation, making them vulnerable to environmental and livelihood disruptions (United Nations Office for Disaster Risk Reduction , 2022).	Disaster-prone coastal communities refer to coastal areas of Thiruvananthapuram district that experience recurring environmental hazards such as sea erosion, tidal flooding, water contamination, and Kallakadal, which affect access to water, sanitation, and hygiene services.

3.5 PILOT STUDY

A pilot study was conducted before the main data collection to assess the clarity, relevance, and suitability of the research instrument. The structured interview was administered to a small group of women from a coastal community who were not included in the final sample. Based on their responses and feedback, necessary modifications were made to improve the wording, sequence, and clarity of the questions. The pilot study helped ensure the feasibility and effectiveness of the data collection process.

3.6 RESEARCH DESIGN

The study adopted a cross-sectional research design as part of a quantitative study. Data were collected from respondents at a single point in time to understand the existing WASH (Water, Sanitation, and Hygiene) challenges experienced by women in disaster-prone coastal communities. This design was considered appropriate because it provides a snapshot of current conditions regarding water availability, sanitation access, hygiene practices, and disaster-related vulnerabilities.

The cross-sectional design is particularly well-suited for exploratory research in rapidly evolving contexts, such as the intersection of disaster preparedness and WASH accessibility in vulnerable populations (Creswell, 2014). This approach enables researchers to efficiently collect information on prevalence and relationships without the necessity of long-term longitudinal follow-up, which is especially valuable when studying time-sensitive issues affecting women in disaster-prone coastal communities. The design fits well to meet the goals of the study since it will measure the rate and extent of WASH challenges, the impact of disaster exposure on access to safe water and sanitation facilities, coping mechanisms employed by women and their households, and the intersecting vulnerabilities that compound poor WASH conditions.

The study followed a quantitative research approach, as it enabled the collection of measurable data using a structured questionnaire and facilitated statistical analysis of the findings. With the help of structured surveys, the cross-sectional design enables investigation of several variables at the same time, including the presence of correlation between disaster exposure frequency and availability of WASH services, as well as between household economic status and access to safe water and sanitation facilities (Fowler, 2014). The quantitative approach allows for identification of patterns, prevalence rates, and associations relevant to understanding WASH challenges across the target population, enabling the generation of generalizable findings that can inform policy and intervention development.

Although the cross-sectional design provides a valuable snapshot of current conditions, it carries certain limitations that have been acknowledged. The design does not allow for evaluation of causal relationships or temporal changes, meaning that while associations can be identified between variables such as disaster vulnerability and WASH access, the direction and nature of causality cannot be definitively established. Given the dynamic nature of coastal environments and the evolving impacts of climate change on WASH infrastructure, the inability to track changes over time represents a significant limitation (Reamer, 2018).

Additionally, WASH challenges in coastal communities may be seasonal or cyclical, particularly related to monsoon patterns or hurricane seasons, which a single-point-in-time data collection may not fully capture. Despite these constraints, the cross-sectional design remains appropriately aligned with the primary research objectives of documenting current WASH conditions, identifying specific vulnerabilities faced by women, understanding multifaceted factors contributing to poor WASH access, and providing evidence-based information to inform targeted interventions in disaster-prone coastal communities.

3.7 UNIVERSE AND UNIT OF STUDY

3.7.1 UNIVERSE OF THE STUDY

The universe of the study comprised all women residing in the disaster-prone coastal wards of Karumkulam Grama Panchayat in Thiruvananthapuram district.

3.7.2 UNIT OF STUDY

The unit of study was individual women aged 18 years and above residing in the selected coastal wards who had experience with WASH-related issues.

3.8 SAMPLING

The present study adopted a convenience sampling method, which is a non-probability sampling technique. In convenience sampling, respondents are selected based on their availability, accessibility, and willingness to participate in the study. This method was considered appropriate as it enabled the researcher to collect data from women residing in disaster-prone coastal communities within the available time and resources.

The study was conducted in Karumkulam Grama Panchayat of Thiruvananthapuram district. The Panchayat consists of 14 wards, among which four disaster-prone coastal wards were selected for the study. Women residing in these selected wards who fulfilled the inclusion criteria and voluntarily consented to participate were included in the study. The respondents were selected based on their accessibility during the period of data collection and their experience with Water, Sanitation, and Hygiene (WASH)-related challenges.

3.8.1 INCLUSION CRITERIA

- Women aged 18 years and above.

- Permanent residents of the selected disaster-prone coastal wards of Karumkulam Grama Panchayat.
- Willing to participate voluntarily in the study.
- Residing in the study area during the period of data collection.
- Women with direct experience of Water, Sanitation, and Hygiene (WASH) challenges and disaster-related vulnerabilities in the selected communities.

3.8.2 EXCLUSION CRITERIA

- Men were excluded from the study.
- Women below 18 years of age were excluded.
- Temporary residents and visitors in the selected study area were excluded.
- Individuals who were unwilling to participate in the study were excluded.
- Women who were not residing in the selected coastal wards during the data collection period were excluded.

3.8.3 SAMPLE SIZE

The final sample for the study consisted of 85 women respondents residing in the selected disaster-prone coastal wards of Karumkulam Grama Panchayat, selected using the convenience sampling method based on their availability, accessibility, and willingness to participate, providing a representative snapshot of women's WASH experiences and disaster vulnerabilities in the study area.

3.9 DATA COLLECTION

3.9.1 SOURCES OF DATA

The study was based on both primary and secondary sources of data to ensure comprehensive understanding of WASH challenges and disaster vulnerabilities experienced by women in coastal communities. Primary data were collected directly from women respondents through structured interviews conducted over a one-month period, enabling the researcher to capture lived experiences, perceptions, and contextual information that would not be accessible through secondary sources alone. The primary data collection focused on gathering information regarding drinking water availability, sanitation facilities, hygiene practices, health concerns, disaster experiences, and coping mechanisms employed by women and their households. Data

collection was adjusted based on the availability and accessibility of respondents in the selected disaster-prone coastal wards, with the structured interview schedule administered through face-to-face interactions within their communities. This in-person approach facilitated rapport-building with participants, enhanced response quality, enabled immediate clarification of questions, and allowed the researcher to contextualize responses within the respondents' lived environments and understand their narratives in greater depth. Secondary data were collected from books, research journals, government reports, disaster management authority publications, policy documents, research articles, and academic dissertations, all sourced from reliable online databases and institutional repositories. These secondary sources provided theoretical support, contextual background information, and comparative insights into WASH challenges and disaster risk reduction approaches in similar coastal communities, strengthening the analytical framework and evidence base for the study.

3.9.2 TOOL FOR DATA COLLECTION

The primary data collection tool was a interview schedule administered through personal interaction with women respondents residing in the selected disaster-prone coastal wards of Karumkulam Grama Panchayat. The interview schedule contained standardized questions designed to elicit information on WASH-related challenges, disaster experiences, and coping strategies, while allowing for open-ended responses that captured the richness of respondents' lived experiences and contextual variations. The structured format ensured that comparable and systematic data were gathered across all respondents, facilitating consistent analysis and pattern identification, while the flexibility built into the tool allowed for contextual exploration of unique circumstances and challenges faced by individual respondents or households. Follow-up interactions were conducted as needed based on respondent availability to complete interviews or gather additional clarifying information, ensuring comprehensive data collection within the one-month timeframe while respecting respondents' daily schedules and household responsibilities. Secondary data collection relied on literature review, document analysis, and systematic compilation of information from government reports, academic sources, and disaster management publications, utilizing online databases and institutional repositories as the primary sources for accessing relevant secondary materials to provide theoretical grounding and evidence context for the study findings.

3.10 PRE TEST

Prior to initiating the main data collection, a pretest was conducted to determine the clarity, comprehensibility, and overall usefulness of the interview schedule. The pretest was essential to ensure that the questions were simple to comprehend, directly relevant to the study objectives, and not confusing, ambiguous, or repetitive. The pretest was administered among 10 respondents from disaster-prone coastal communities who possessed direct experience with WASH-related challenges but did not represent the final sample participating in the main study. The participants were requested to provide detailed feedback concerning the contents, terminology, phrasing, and format of the interview schedule including identifying questions that were unclear, difficult to answer, culturally inappropriate, or redundant. Using the recommendations and observations gathered from the pretest participants, necessary revisions were implemented to enhance the quality of the instrument. Certain questions were rephrased to improve clarity and ensure they accurately captured the intended constructs, others were dropped or consolidated to eliminate repetition and reduce survey fatigue, and the general structure and sequencing of the interview schedule were enhanced to ensure a logical flow that would facilitate respondent understanding. The use of the pretest drove quality assurance into the data collection tool, ensuring that it would reliably and accurately gather data in the real research work among the target group and strengthen the validity and reliability of the instrument in capturing the lived experiences and challenges of women in WASH-vulnerable coastal communities facing disaster risks.

3.11 DATA ANALYSIS

The present study employed quantitative methods of data analysis to examine the Water, Sanitation, and Hygiene (WASH) challenges faced by women in disaster-prone coastal communities of Thiruvananthapuram District. The data collected through the structured interview schedule were carefully checked for completeness, consistency, and accuracy before analysis. The responses were systematically edited, coded, classified, and entered into Microsoft Excel for preliminary organization and data cleaning, which included identifying missing values, correcting data entry errors, and ensuring the accuracy of the dataset. The cleaned data were then imported into the Statistical Package for the Social Sciences (SPSS) for statistical analysis. Descriptive statistical techniques such as frequencies, percentages, tables were used to summarize and present the demographic characteristics of the respondents and the various dimensions of WASH challenges experienced by women in the selected coastal

communities. Where necessary, inferential statistical techniques, particularly the Chi-square test, were employed to examine the relationship between selected variables and to test the research hypothesis. The analysed data were presented in the form of tables and graphical representations to facilitate easy interpretation and meaningful discussion. The findings obtained through the statistical analysis formed the basis for interpreting the results, drawing conclusions, and making appropriate recommendations in relation to the objectives of the study.

3.12 ETHICAL CONSIDERATIONS

Ethical principles were strictly followed throughout the research process to ensure the rights, dignity, safety, and well-being of all participants, and the study was conducted in accordance with accepted ethical standards for social science research involving human participants. Prior to data collection, informed consent was obtained from every respondent after clearly explaining the purpose, objectives, nature, significance, and procedures of the study in a language they could easily understand. Participants were informed that their participation was entirely voluntary and that they had the right to refuse participation or withdraw from the study at any stage without providing any reason or facing any negative consequences. Confidentiality and anonymity were strictly maintained by ensuring that personal identifiers such as names, addresses, and other identifying information were not disclosed in the research report or shared with any third party. All information collected was used solely for academic and research purposes, and respondents' identities were protected during data analysis, interpretation, and presentation of the findings. Privacy was ensured by conducting interviews in a comfortable and appropriate setting that allowed participants to express their views freely without fear of judgment or interference.

3.13 ASSUMPTIONS, LIMITATIONS AND SCOPE

3.13.1 ASSUMPTIONS

- Women in the selected wards of Karumkulam Grama Panchayat experience Water, Sanitation, and Hygiene (WASH) challenges, particularly during and after disasters.
- Women face gender-specific challenges related to water, sanitation, hygiene, privacy, and safety during disaster situations.

- Disaster-related events negatively affect women's access to safe drinking water, sanitation facilities, and hygiene services.
- Women play a major role in household water management, hygiene maintenance, and caregiving during disasters.
- Improved gender-responsive WASH interventions can enhance the health, safety, and well-being of women in disaster-prone coastal communities.

3.13.2 LIMITATIONS

- The study was confined to four selected wards of Karumkulam Grama Panchayat in Thiruvananthapuram district.
- The sample size was limited to 85 women respondents, which may restrict the generalizability of the findings.
- The study focused only on women and did not include the perspectives of men or other stakeholders.
- The study relied on self-reported data, which may have been influenced by personal perceptions, recall bias, or social desirability bias.
- Time and resource constraints limited the geographical coverage and sample size of the study.
- The findings are specific to the selected study area and may not represent all disaster-prone coastal communities in Kerala.

3.13.3 SCOPE

- Helps identify the WASH and disaster-related challenges faced by women in the selected coastal wards of Karumkulam Grama Panchayat.
- Provides evidence for policy formulation and planning related to water, sanitation, hygiene, and disaster management in coastal communities.
- Supports the development of gender-sensitive and disaster-responsive WASH interventions for women.
- Contributes to a better understanding of the relationship between gender, disasters, and public health vulnerabilities in coastal settings.

- Serves as a useful reference for social workers, public health professionals, local self-government institutions, and disaster management authorities in designing community-based programmes and future research.

CHAPTER IV: ANALYSIS AND INTERPRETATION

4.1 INTRODUCTION

Analysis and interpretation constitute one of the most important stages of any research, as they facilitate the meaningful presentation and understanding of the data collected from the respondents. This chapter presents the analysis and interpretation of data collected from 85 women residing in disaster-prone coastal communities of Thiruvananthapuram district. The data were collected using a structured interview schedule and analysed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistical tools such as frequency, percentage, mean and standard deviation were used to describe the respondents' perceptions and experiences, while Cronbach's Alpha was employed to assess the reliability of the research instrument and Pearson's correlation was used to examine the relationships among the major study variables. The analysis is organised according to the specific objectives of the study, namely women's access to safe drinking water, availability and condition of sanitation facilities, hygiene practices during normal and disaster situations, the impact of disasters on women's WASH conditions, and the coping mechanisms adopted to address WASH-related challenges. The findings are presented through tables, charts and interpretations to provide a clear understanding of the WASH conditions experienced by women in disaster-prone coastal communities.

4.2 SOCIO-DEMOGRAPHIC ANALYSIS

Table No. 4.2.1Socio-demographic Profile of Respondents

Variable	Category	Frequency	Percentage
Marital Status	Married	72	84.7
	Unmarried	4	4.7
	Widowed	9	10.6
Occupation	Fishing vending	38	44.7

	Fish processing/fish selling	10	11.8
	Household work	28	32.9
	Daily wage labour	9	10.6
Distance from Sea	Less than 500 m	17	20.0
	500 m–1 km	28	32.9
	More than 1 km	40	47.1
Type of House	Own house	81	95.3
	Rented house	3	3.5
	Relative's house	1	1.2
Duration of Stay	5–10 years	28	32.9
	11–20 years	38	44.7
	More than 20 years	19	22.4
Experienced Disaster	Yes	65	76.5
	No	20	23.5
Type of Disaster	Coastal erosion	5	5.9
	Flooding	48	56.5
	Saline intrusion	20	23.5

	Heavy rainfall	12	14.1
Main Drinking Water Source	Public tap	24	28.2
	Well	53	62.4
	Borewell	6	7.1
	Tanker	2	2.4
Water Source Affected	Yes	70	82.4
	No	3	3.5
	Sometimes	12	14.1
Time Collecting Water	<30 min	5	5.9
	30–60 min	54	63.5
	>60 min	26	30.6
Water Collected By	Women	83	97.6
	Both men & women	2	2.4
Household Toilet	Yes	83	97.6
	No	2	2.4
Water in Toilet	Always	3	3.5

	Sometimes	74	87.1
	Rarely	2	2.4
	Not available	6	7.1
Bathing Facility Access	Very easy	1	1.2
	Easy	3	3.5
	Neutral	62	72.9
	Difficult	18	21.2
	Very difficult	1	1.2

Socio-demographic analysis of the 85 respondents indicates that the majority were married (84.7%) and primarily engaged in fishing vending (44.7%). Most respondents lived more than 1 km from the sea (47.1%), owned their houses (95.3%), and had resided in the community for 11–20 years (44.7%). A large proportion (76.5%) had experienced a disaster during the past five years, with flooding (56.5%) being the most common disaster. Wells (62.4%) were the principal source of drinking water, and 82.4% reported that their water source was affected during disasters. Most respondents spent 30–60 minutes collecting water (63.5%), and women were primarily responsible for water collection (97.6%). Nearly all households had toilet facilities (97.6%), although water availability in toilets during disasters was mostly only intermittent (87.1%). Access to bathing facilities during disasters was predominantly rated as neutral (72.9%), indicating moderate accessibility.

Table 4.2.2 Cross-tabulation showing the association between Occupation and Hygiene Practices

Occupation	Low Hygiene n (%)	High Hygiene n (%)	Total
Fishing vending	29 (76.3%)	9 (23.7%)	38
Fish processing/Fish selling	0 (0.0%)	10 (100.0%)	10
Household work	17 (60.7%)	11 (39.3%)	28
Daily wage labour	3 (33.3%)	6 (66.7%)	9
Total	49	36	85

Chi-square Test

Test	Value	df	p-value
Pearson Chi-square	21.323	3	<0.001

Table 4.2.2 presents the association between respondents' occupation and hygiene practices. The findings reveal considerable variation in hygiene practices across occupational groups. Among women engaged in fishing vending, 76.3% reported lower hygiene practice scores, while only 23.7% demonstrated higher hygiene practice scores. In contrast, all respondents involved in fish processing and fish selling (100%) were classified under the higher hygiene practice category.

Among homemakers, 60.7% belonged to the lower hygiene practice category, whereas 39.3% demonstrated higher hygiene practice scores. Similarly, among daily wage labourers, 66.7% reported higher hygiene practice scores.

The Chi-square test produced a value of $\chi^2 = 21.323$ ($df = 3$, $p < 0.001$). Since the p-value is less than 0.05, the null hypothesis is rejected and the alternative hypothesis is accepted. This indicates that there is a statistically significant association between occupation and hygiene practices among women in disaster-prone coastal communities.

Table 4.2.3 Cross-tabulation showing the association between Occupation and Coping Strategies

Occupation	Low Coping n (%)	High Coping n (%)	Total
Fishing vending	20 (52.6%)	18 (47.4%)	38
Fish processing/Fish selling	9 (90.0%)	1 (10.0%)	10
Household work	21 (75.0%)	7 (25.0%)	28
Daily wage labour	9 (100.0%)	0 (0.0%)	9
Total	59	26	85

Chi-square Test

Test	Value	df	p-value
Pearson Chi-square	11.414	3	0.010

Table 4.2.3presents the association between respondents' occupation and the coping strategies adopted during WASH-related challenges. The results indicate noticeable differences among occupational groups.

Among women engaged in fishing vending, 47.4% reported higher coping strategy scores, while 52.6% belonged to the lower coping category. In comparison, 90.0% of respondents involved in fish processing and fish selling demonstrated lower coping strategy scores. Similarly, 75.0% of homemakers and 100.0% of daily wage labourers were classified under the lower coping category.

The Pearson Chi-square analysis yielded a value of $\chi^2 = 11.414$ ($df = 3$, $p = 0.010$). Since the p-value is less than 0.05, the null hypothesis is rejected and the alternative hypothesis is accepted. The findings indicate that occupation has a statistically significant association with the coping strategies adopted by women during WASH-related challenges.

4.3 OBJECTIVE – WISE ANALYSIS AND DISCUSSION

Objective 1: To assess women's access to safe drinking water in disaster-prone coastal communities

Table 4.3.1.1 Women Access to safe drinking water

Item	Mean	Standard Deviation	Level of Agreement
Q31	3.91	0.48	High
Q33	3.96	0.45	High
Q34	3.86	0.56	High
Q35	3.95	0.41	High
Q36	3.88	0.57	High
Q37	3.92	0.52	High
Q38	3.86	0.52	High
Q39	3.52	0.70	Moderate
Q40	4.54	0.73	Very High
Q41	3.94	0.39	High

Overall Mean = 3.93

Table 4.3.1.1 presents the descriptive statistics relating to women's access to safe drinking water in disaster-prone coastal communities. The overall mean score of 3.93 indicates a generally high level of agreement with the statements related to drinking water. This suggests

that respondents perceive access to safe drinking water as a major concern in their daily lives, particularly during disaster situations.

Among the ten statements, Q40 recorded the highest mean score (Mean = 4.54; SD = 0.73). This indicates that almost all respondents strongly agreed with this aspect of drinking water management. The comparatively higher mean demonstrates that this issue is widely experienced by women across the study area and represents one of the most significant concerns related to water accessibility.

The statements represented by Q33 (Mean = 3.96), Q35 (Mean = 3.95) and Q41 (Mean = 3.94) also recorded high levels of agreement. These findings suggest that respondents consistently reported similar experiences regarding the availability and management of drinking water. The relatively low standard deviations for these items indicate that the responses were fairly consistent among the participants.

Similarly, Q31 (Mean = 3.91), Q37 (Mean = 3.92), Q36 (Mean = 3.88), Q34 (Mean = 3.86) and Q38 (Mean = 3.86) also received high mean scores. This reflects that most women perceived these issues as important components influencing access to safe drinking water. The moderate standard deviations indicate slight variations in responses, which may be attributed to differences in geographical location, severity of disaster exposure and availability of public water supply facilities.

In contrast, Q39 recorded the lowest mean score (Mean = 3.52; SD = 0.70). Although the level of agreement remains above the midpoint of the scale, respondents expressed comparatively lower agreement with this statement. The higher standard deviation also suggests greater variation in perceptions, indicating that experiences related to this aspect differed among respondents.

Overall, the findings reveal that women living in disaster-prone coastal communities experience considerable challenges in ensuring continuous access to safe drinking water. Although some aspects of water availability may remain satisfactory under normal conditions, disasters significantly increase the risk of water scarcity, contamination and disruption of supply. These findings highlight the importance of strengthening disaster-resilient water infrastructure, improving emergency water distribution systems and enhancing community preparedness to ensure uninterrupted access to safe drinking water during and after disasters.

The analysis demonstrates that access to safe drinking water remains a critical component of women's WASH conditions in disaster-prone coastal communities. The consistently high mean scores indicate that respondents recognise drinking water accessibility as a major issue requiring policy attention and effective disaster management interventions.

Objective 2:To examine the availability and condition of sanitation facilities among women

Table 4.3.2.1 Availability of Sanitation facilities among women

Descriptive Statistics of Availability and Condition of Sanitation Facilities (n = 85)

Sl. No.	Item	Mean	Standard Deviation	Level
1	Q42	3.35	0.59	Moderate
2	Q43	3.27	0.59	Moderate
3	Q44	3.91	0.50	High
4	Q45	3.39	0.64	Moderate
5	Q46	3.29	0.59	Moderate
6	Q47	3.32	0.58	Moderate
7	Q48	3.74	0.54	High
Overall Mean		3.47		Moderately High

Table 4.3.2.1 presents the descriptive statistics relating to the availability and condition of sanitation facilities among women living in disaster-prone coastal communities. The overall mean score of 3.47 indicates that respondents generally perceived the sanitation facilities as moderately satisfactory. However, the findings also reveal that several sanitation-related issues persist, particularly during disaster situations when normal services are disrupted.

Among all the statements, Q44 recorded the highest mean score (Mean = 3.91; SD = 0.50). This indicates a high level of agreement among the respondents regarding this aspect of sanitation. The relatively low standard deviation demonstrates that respondents expressed

similar opinions, suggesting consistency in their experiences. Likewise, Q48 (Mean = 3.74; SD = 0.54) also received a comparatively high mean score, indicating that respondents viewed this aspect of sanitation positively.

The remaining statements, namely Q42 (Mean = 3.35), Q43 (Mean = 3.27), Q45 (Mean = 3.39), Q46 (Mean = 3.29) and Q47 (Mean = 3.32), recorded moderate mean scores. These values suggest that respondents experienced certain limitations in accessing or maintaining adequate sanitation facilities. Although sanitation facilities may be available under normal circumstances, their condition and accessibility appear to deteriorate during floods and other coastal disasters. The moderate standard deviation values indicate that these experiences were fairly similar among the respondents.

The findings imply that damage to toilets, poor drainage systems, inadequate maintenance and limited sanitation infrastructure remain important concerns in the study area. Women often face additional challenges such as lack of privacy, inconvenience during night-time use and increased exposure to health risks when sanitation facilities become unusable after disasters. These challenges affect not only physical health but also psychological well-being and personal dignity.

The results emphasise the need for strengthening disaster-resilient sanitation infrastructure in coastal communities. Improving toilet facilities, ensuring proper drainage systems, establishing emergency sanitation units and promoting regular maintenance can significantly reduce sanitation-related difficulties experienced by women during disasters. Such interventions will contribute towards improving overall WASH conditions and enhancing community resilience.

The analysis indicates that women have only moderately satisfactory access to sanitation facilities. While certain sanitation services are available, disasters significantly affect their condition and usability. Strengthening sanitation infrastructure and ensuring uninterrupted access during emergencies are therefore essential for improving the quality of life of women in disaster-prone coastal communities.

Objective 3:To understand hygiene practices followed by women during normal and disaster situations

4.3.3.1 Hygiene practice followed by women

Descriptive Statistics of Hygiene Practices Followed by Women (n = 85)

Sl. No.	Item	Mean	Standard Deviation	Level
1	Q49	2.11	0.44	Low
2	Q50	3.39	0.69	Moderate
3	Q52	3.48	0.88	Moderate
4	Q53	3.95	0.43	High
5	Q54	3.92	0.54	High
6	Q55	3.24	0.61	Moderate
7	Q56	3.54	0.84	High

Overall Mean = 3.37

Table 4.3.3.1 presents the descriptive statistics relating to the hygiene practices followed by women living in disaster-prone coastal communities. The overall mean score of 3.37indicates that respondents generally reported moderately satisfactory hygiene practices. While several positive hygiene behaviours were observed, the findings also suggest that maintaining proper hygiene becomes more difficult during disaster situations.

Among all the statements, Q53 recorded the highest mean score (Mean = 3.95; SD = 0.43), indicating a high level of agreement among the respondents. The relatively low standard deviation shows that respondents shared similar views regarding this aspect of hygiene. Similarly, Q54 (Mean = 3.92; SD = 0.54) also received a high level of agreement, suggesting that women continue to practice certain essential hygiene measures despite the challenges created by disasters.

The responses for Q56 (Mean = 3.54; SD = 0.84), Q52 (Mean = 3.48; SD = 0.88) and Q50 (Mean = 3.39; SD = 0.69) indicate a moderate to high level of agreement. These findings suggest that although respondents attempt to maintain hygienic practices, their ability to do so varies depending on the availability of clean water, sanitation facilities and hygiene materials during emergency situations. The comparatively higher standard deviations for Q52 and Q56

indicate greater variation in respondents' experiences, reflecting differences in disaster severity, access to resources and household circumstances.

Q55 (Mean = 3.24; SD = 0.61) also recorded a moderate level of agreement, indicating that respondents experienced some limitations in maintaining this particular hygiene practice. These difficulties may arise due to inadequate water availability, damaged sanitation infrastructure or limited access to hygiene products during disasters.

The lowest mean score was recorded for Q49 (Mean = 2.11; SD = 0.44). This indicates that respondents generally disagreed or reported limited practice regarding this particular aspect of hygiene. The low standard deviation suggests that this opinion was shared consistently by most respondents. The finding highlights an area that requires immediate attention through awareness programmes, behavioural interventions and improved access to hygiene resources.

The analysis demonstrates that women strive to maintain good hygiene practices even during adverse circumstances. However, disaster-related disruptions significantly affect their ability to sustain these practices consistently. Limited access to clean water, sanitation facilities and hygiene materials creates additional challenges that increase the risk of waterborne and communicable diseases. These findings underline the need for emergency WASH interventions that ensure the continuous availability of essential hygiene facilities and supplies during disasters.

Objective 4: To identify the impact of disasters on women WASH conditions

4.3.4.1 Impact of disasters on women WASH Challenges

Descriptive Statistics of the Impact of Disasters on Women's WASH Conditions (n = 85)

Sl. No.	Item	Mean	Standard Deviation	Level
1	Q57	3.25	0.53	Moderate
2	Q58	3.94	1.37	High
3	Q59	3.82	1.24	High
4	Q60	3.45	0.89	Moderate

5	Q61	2.07	0.43	Low

Overall Mean = 3.31

Table 4.3.4.1 presents the descriptive statistics regarding the impact of disasters on women's Water, Sanitation and Hygiene (WASH) conditions. The overall mean score of 3.31indicates that disasters have a moderate impact on the WASH conditions experienced by women in the selected coastal communities. Although women continue to adopt various measures to manage their daily needs, disasters considerably affect their access to safe water, sanitation facilities and hygiene resources.

Among the five statements, Q58 recorded the highest mean score (Mean = 3.94; SD = 1.37). This finding indicates that respondents strongly agreed with this statement, suggesting that it represents one of the most significant disaster-related challenges affecting WASH conditions. However, the relatively high standard deviation indicates that the intensity of this impact differed among respondents, possibly due to variations in disaster severity, locality and household circumstances.

The second highest mean score was observed for Q59 (Mean = 3.82; SD = 1.24). The high mean reflects that respondents widely recognised this issue as an important consequence of disasters. Similar to Q58, the larger standard deviation indicates variations in experiences among women from different coastal communities. These differences may be attributed to the availability of emergency services, local infrastructure and disaster preparedness measures.

The statements represented by Q60 (Mean = 3.45; SD = 0.89) and Q57 (Mean = 3.25; SD = 0.53) recorded moderate levels of agreement. These findings suggest that disasters moderately disrupt women's WASH conditions. The comparatively lower standard deviation for Q57 indicates greater consistency in respondents' opinions, implying that this challenge is experienced similarly across the study population.

In contrast, Q61 recorded the lowest mean score (Mean = 2.07; SD = 0.43). This indicates that respondents generally reported lower agreement with this statement. The low standard deviation demonstrates that respondents held similar views regarding this aspect of disaster impact. Although this issue appears less prominent compared to the other indicators, it still contributes to the overall WASH challenges experienced during disasters.

The findings collectively demonstrate that disasters have a substantial influence on women's daily lives by disrupting access to safe drinking water, sanitation facilities and hygiene resources. These disruptions increase women's workload, expose them to health risks and reduce their ability to maintain adequate hygiene standards. The results emphasise the

importance of integrating WASH components into disaster risk reduction and emergency response programmes, particularly in vulnerable coastal regions.

Objective 5:To study the coping mechanisms adopted by women during WASH-related challenges

Table 4.3.5.1 coping mechanisms adopted by women during WASH-related challenges

Descriptive Statistics of Coping Mechanisms Adopted by Women During WASH-related Challenges (n = 85)

Sl. No.	Item	Mean	Standard Deviation	Level
1	Q62	2.07	0.43	Low
2	Q63	2.39	0.66	Low
3	Q64	2.07	0.46	Low
4	Q65	3.58	1.03	High
5	Q66	2.13	0.57	Low
6	Q67	3.36	0.94	Moderate
7	Q68	4.73	0.81	Very High

Overall Mean = 2.90

Table 4.3.5.1 presents the descriptive statistics relating to the coping mechanisms adopted by women during WASH-related challenges in disaster-prone coastal communities. The overall mean score of 2.90 indicates that the respondents reported a moderate level of coping. This suggests that although women adopt several strategies to manage WASH-related difficulties

during disasters, their coping capacity is influenced by the availability of resources, external support and the severity of disaster impacts.

Among all the statements, Q68 recorded the highest mean score (Mean = 4.73; SD = 0.81). This indicates a very high level of agreement among the respondents and suggests that this coping strategy is widely practised across the study area. The relatively moderate standard deviation indicates that most respondents shared similar views, highlighting the importance of this strategy in managing disaster-related WASH challenges.

The second highest mean score was observed for Q65 (Mean = 3.58; SD = 1.03). This finding indicates that respondents frequently adopted this coping mechanism, although the comparatively higher standard deviation reflects differences in its use among households. Variations in economic status, availability of resources and previous disaster experience may explain these differences.

Q67 (Mean = 3.36; SD = 0.94) also recorded a moderate level of agreement. This suggests that many women utilise this coping strategy when faced with disruptions in water supply or sanitation services. However, the variation in responses indicates that not all households have equal access to the resources or support required to implement this strategy effectively.

The remaining statements, namely Q62 (Mean = 2.07), Q63 (Mean = 2.39), Q64 (Mean = 2.07) and Q66 (Mean = 2.13), obtained comparatively lower mean scores. These findings indicate that these coping mechanisms are adopted less frequently by the respondents. The lower scores may reflect limited awareness, inadequate financial resources, insufficient institutional support or the absence of appropriate facilities during disaster situations. Nevertheless, the relatively low standard deviations indicate that respondents expressed fairly consistent opinions regarding these strategies.

the findings reveal that women primarily rely on a limited number of effective coping strategies while several other potential mechanisms remain underutilised. The dependence on a few coping practices may reduce resilience during prolonged or repeated disasters. Therefore, strengthening community preparedness, improving access to emergency WASH resources and enhancing awareness regarding disaster-resilient practices are essential to improve women's coping capacity.

Table 4.4:Reliability Statistics of the Study Variables

Variable	Number of Items	Cronbach's Alpha	Interpretation

Women's Access to Safe Drinking Water (WASH Score)	10	0.901	Excellent Reliability
Menstrual Hygiene, Privacy and Safety	7	0.938	Excellent Reliability
Coping Strategies	7	0.506	Low Reliability
Perception on Disaster Management	5	0.789	Good Reliability

Table 4.4 presents the Cronbach's Alpha coefficients for the four major constructs included in the study. The results indicate that the research instrument possesses satisfactory internal consistency for most of the variables.

The Women's Access to Safe Drinking Water (WASH Score) recorded a Cronbach's Alpha value of 0.901, indicating excellent reliability. This demonstrates that the items included under this construct consistently measure women's access to safe drinking water in disaster-prone coastal communities. The high reliability coefficient suggests that respondents answered the items consistently, making the scale suitable for further statistical analysis.

Similarly, the Menstrual Hygiene, Privacy and Safety scale obtained a Cronbach's Alpha coefficient of 0.938, representing excellent internal consistency. This is the highest reliability coefficient among all the constructs included in the study. The result indicates that the items measuring menstrual hygiene, privacy and safety are highly interrelated and effectively capture the experiences of women in the selected coastal communities.

The Perception on Disaster Management scale recorded a Cronbach's Alpha value of 0.789, which falls within the range of good reliability. This indicates that the items included under this construct adequately measure respondents' perceptions regarding disaster management and emergency response systems. The reliability coefficient confirms that the scale is suitable for inferential statistical analysis.

The Coping Strategies scale obtained a Cronbach's Alpha value of 0.506, which is below the commonly accepted threshold of 0.70. This indicates relatively low internal consistency among the items measuring coping strategies. The lower reliability may be attributed to the diverse coping behaviours adopted by women during disasters, as respondents may rely on different strategies depending on their socioeconomic background, availability of resources and severity

of disaster exposure. Although the reliability coefficient is comparatively low, the scale can still provide useful insights for exploratory analysis and interpretation within the context of the present study.

Overall, the reliability analysis demonstrates that three of the four constructs exhibit good to excellent internal consistency. Therefore, the research instrument can be considered reliable for analysing women's WASH conditions in disaster-prone coastal communities.

4.5 Correlation Analysis

Pearson's Product Moment Correlation was employed to examine the relationship among the major variables included in the study. Correlation analysis helps determine the direction and strength of the relationship between two continuous variables. The correlation coefficient (r) ranges from -1 to +1, where positive values indicate a positive relationship, negative values indicate an inverse relationship, and values closer to zero indicate a weaker relationship. A significance value (p) less than 0.05 indicates that the relationship is statistically significant.

Table 4.5.Correlation Analysis

Variables	WASH Score	Menstrual Hygiene	Coping Strategies	Perception on Disaster Management
WASH Score	1.000	0.447**	0.564**	0.475**
Menstrual Hygiene, Privacy and Safety	0.447**	1.000	-0.163	0.130
Coping Strategies	0.564**	-0.163	1.000	0.681**
Perception on Disaster Management	0.475**	0.130	0.681**	1.000

Correlation is significant at the 0.01 level ($p < 0.01$).

Table 4.5 presents the Pearson correlation coefficients among the four major constructs of the study. The findings indicate several statistically significant positive relationships.

A moderate positive correlation was observed between WASH Score and Menstrual Hygiene, Privacy and Safety ($r = 0.447$, $p < 0.001$). This indicates that improvements in women's WASH conditions are associated with better menstrual hygiene management, privacy and safety. The

relationship is statistically significant, suggesting that access to adequate water and sanitation facilities plays an important role in supporting menstrual hygiene.

The analysis further revealed a moderately strong positive relationship between WASH Score and Coping Strategies ($r = 0.564$, $p < 0.001$). This finding suggests that women with better WASH conditions are more likely to adopt effective coping strategies during disaster situations. Improved access to water and sanitation resources may strengthen women's ability to respond to disaster-related challenges and maintain household hygiene.

Similarly, WASH Score showed a significant positive correlation with Perception on Disaster Management ($r = 0.475$, $p < 0.001$). This indicates that respondents who reported better WASH conditions also expressed more positive perceptions regarding disaster management initiatives. Effective disaster preparedness and response measures may therefore contribute to improved WASH conditions within coastal communities.

A strong positive correlation was observed between Coping Strategies and Perception on Disaster Management ($r = 0.681$, $p < 0.001$). This is the strongest relationship identified in the study. The finding suggests that women who perceive disaster management systems positively are more likely to adopt effective coping strategies during WASH-related challenges. The result highlights the importance of community awareness programmes, institutional support and effective disaster response mechanisms in strengthening resilience among women.

However, the relationship between Menstrual Hygiene and Coping Strategies ($r = -0.163$, $p = 0.136$) was weak and not statistically significant. Likewise, the relationship between Menstrual Hygiene and Perception on Disaster Management ($r = 0.130$, $p = 0.236$) was also not statistically significant. These findings suggest that menstrual hygiene practices are influenced by factors other than coping strategies or perceptions of disaster management, such as cultural practices, household resources, privacy and access to menstrual hygiene products.

the correlation analysis demonstrates that women's WASH conditions, coping strategies and perceptions of disaster management are positively associated. These findings support the view that strengthening disaster preparedness and improving WASH infrastructure can enhance women's resilience and reduce their vulnerability during disasters.

The analysis revealed that women in disaster-prone coastal communities experience several challenges related to water, sanitation and hygiene, particularly during disaster situations. The descriptive analysis indicated varying levels of access to safe drinking water, sanitation facilities, hygiene practices and coping mechanisms. Reliability analysis confirmed that the research instrument demonstrated good to excellent internal consistency for most constructs. Furthermore, Pearson's correlation analysis revealed significant positive relationships between

WASH conditions, coping strategies and perceptions of disaster management. These findings emphasise the importance of improving WASH infrastructure, promoting disaster preparedness and implementing gender-sensitive interventions to enhance the resilience and well-being of women in coastal communities.

CHAPTER V: FINDINGS, SUGGESTIONS AND CONCLUSION

5.1 INTRODUCTION

The present study found that women residing in the disaster-prone coastal communities of Karumkulam Grama Panchayat generally had adequate access to safe drinking water under normal conditions. However, the findings revealed that access to drinking water became significantly disrupted during disaster situations due to flooding, saline water intrusion, contamination of wells, damage to water supply infrastructure, and interruptions in public water distribution systems. These disruptions considerably reduced both the availability and quality of drinking water, forcing women to spend additional time and physical effort collecting water from alternative sources. Since women were primarily responsible for managing household water requirements, they experienced increased workloads while ensuring sufficient water for drinking, cooking, cleaning, washing, and other domestic purposes. Many respondents also reported difficulties in meeting the water requirements of children, older adults, and sick family members, thereby increasing their caregiving responsibilities during disaster situations. Although several respondents adopted coping measures such as boiling, filtering, and safely storing drinking water before consumption, emergency water supplies provided during disasters were often perceived as inadequate and irregular to meet household needs.

These findings strongly support the Gendered Vulnerability Framework, which argues that disasters do not affect all individuals equally but instead magnify existing social and gender inequalities (Enarson, 2000). According to this framework, women experience greater vulnerability because of socially assigned gender roles that place primary responsibility for household water management, caregiving, food preparation, and maintaining family health upon them. The increased burden of collecting water, managing scarce resources, and ensuring household survival observed in the present study reflects the unequal responsibilities carried by women before, during, and after disasters. Rather than being biologically vulnerable, women become disproportionately affected because social structures assign them greater domestic responsibilities while limiting their access to resources and decision-making opportunities. The findings also align with the Human Rights-Based Approach (HRBA) to Water, Sanitation and Hygiene, which recognizes access to sufficient, safe, physically accessible, affordable, and acceptable water as a fundamental human right essential for realizing the rights to health, dignity, and an adequate standard of living (United Nations General Assembly [UNGA], 2010). The disruption of drinking water services during disasters indicates that several key HRBA principles, particularly availability, accessibility, and quality,

were compromised in the study area. Limited access to safe drinking water not only affected household activities but also undermined women's health, dignity, and overall well-being, demonstrating the importance of ensuring uninterrupted WASH services during emergencies.

The findings of the present study are consistent with the WHO and UNICEF Joint Monitoring Programme (JMP), which reports that climate-related disasters frequently damage water infrastructure, contaminate drinking water sources, and reduce equitable access to safe water, particularly for women and other vulnerable populations (World Health Organization & United Nations Children's Fund, 2023). Similarly, the Intergovernmental Panel on Climate Change (IPCC) has identified coastal regions as highly vulnerable to flooding, saline water intrusion, and climate-related hazards that threaten freshwater availability and increase water insecurity among coastal households (IPCC, 2023). Studies conducted following the 2018 Kerala floods also documented severe contamination of wells, disruption of piped water systems, and shortages of safe drinking water in affected communities, with women experiencing greater difficulties due to their domestic and caregiving responsibilities (Kerala State Disaster Management Authority, 2019).

The findings further indicate that although women demonstrated resilience by adopting household water treatment methods and alternative water collection strategies, these measures alone are insufficient to ensure sustainable access to safe drinking water during disasters. Strengthening disaster-resilient water infrastructure, protecting freshwater sources from contamination, improving emergency water distribution systems, and integrating gender-sensitive WASH planning into disaster management programmes are therefore essential for reducing women's vulnerability in disaster-prone coastal communities. Ensuring equitable access to safe drinking water is not only a public health priority but also a fundamental human rights obligation that contributes to community resilience and sustainable disaster risk reduction.

5.2 FINDINGS AND DISCUSSIONS

The major findings of the study are presented below.

Objective 1: To assess women's access to safe drinking water in disaster-prone coastal communities

The present study found that women residing in the disaster-prone coastal communities of Karumkulam Grama Panchayat generally had adequate access to safe drinking water under

normal conditions. However, the findings revealed that access to drinking water became significantly disrupted during disaster situations due to flooding, saline water intrusion, contamination of wells, damage to water supply infrastructure, and interruptions in public water distribution systems. These disruptions considerably reduced both the availability and quality of drinking water, forcing women to spend additional time and physical effort collecting water from alternative sources. Since women were primarily responsible for managing household water requirements, they experienced increased workloads while ensuring sufficient water for drinking, cooking, cleaning, washing, and other domestic purposes. Many respondents also reported difficulties in meeting the water requirements of children, older adults, and sick family members, thereby increasing their caregiving responsibilities during disaster situations. Although several respondents adopted coping measures such as boiling, filtering, and safely storing drinking water before consumption, emergency water supplies provided during disasters were often perceived as inadequate and irregular to meet household needs.

These findings strongly support the Gendered Vulnerability Framework, which argues that disasters do not affect all individuals equally but instead magnify existing social and gender inequalities (Enarson, 2000). According to this framework, women experience greater vulnerability because of socially assigned gender roles that place primary responsibility for household water management, caregiving, food preparation, and maintaining family health upon them. The increased burden of collecting water, managing scarce resources, and ensuring household survival observed in the present study reflects the unequal responsibilities carried by women before, during, and after disasters. Rather than being biologically vulnerable, women become disproportionately affected because social structures assign them greater domestic responsibilities while limiting their access to resources and decision-making opportunities.

The findings also align with the Human Rights-Based Approach (HRBA) to Water, Sanitation and Hygiene, which recognizes access to sufficient, safe, physically accessible, affordable, and acceptable water as a fundamental human right essential for realizing the rights to health, dignity, and an adequate standard of living (United Nations General Assembly, 2010). The disruption of drinking water services during disasters indicates that several key HRBA principles, particularly availability, accessibility, and quality, were compromised in the study area. Limited access to safe drinking water not only affected household activities but also undermined women's health, dignity, and overall well-being, demonstrating the importance of ensuring uninterrupted WASH services during emergencies.

The findings of the present study are consistent with the WHO and UNICEF Joint Monitoring Programme (JMP), which reports that climate-related disasters frequently damage water infrastructure, contaminate drinking water sources, and reduce equitable access to safe water, particularly for women and other vulnerable populations (World Health Organization & United Nations Children's Fund, 2023). Similarly, the Intergovernmental Panel on Climate Change (IPCC) has identified coastal regions as highly vulnerable to flooding, saline water intrusion, and climate-related hazards that threaten freshwater availability and increase water insecurity among coastal households (IPCC, 2023). Studies conducted following the 2018 Kerala floods also documented severe contamination of wells, disruption of piped water systems, and shortages of safe drinking water in affected communities, with women experiencing greater difficulties due to their domestic and caregiving responsibilities (Kerala State Disaster Management Authority, 2019).

The findings further indicate that although women demonstrated resilience by adopting household water treatment methods and alternative water collection strategies, these measures alone are insufficient to ensure sustainable access to safe drinking water during disasters. Strengthening disaster-resilient water infrastructure, protecting freshwater sources from contamination, improving emergency water distribution systems, and integrating gender-sensitive WASH planning into disaster management programmes are therefore essential for reducing women's vulnerability in disaster-prone coastal communities. Ensuring equitable access to safe drinking water is not only a public health priority but also a fundamental human rights obligation that contributes to community resilience and sustainable disaster risk reduction.

Objective 2: To examine the availability and condition of sanitation facilities among women

The findings of the study revealed that sanitation facilities were moderately available among women residing in the selected disaster-prone coastal communities under normal circumstances. However, the condition and accessibility of sanitation facilities deteriorated significantly during disaster situations due to flooding, heavy rainfall, waterlogging, and damage to toilets, drainage systems, septic tanks, and other sanitation infrastructure. Many respondents reported that damaged or inaccessible sanitation facilities created considerable inconvenience in carrying out their daily sanitation needs. Poor maintenance of public and household toilets, coupled with inadequate drainage and waste disposal systems, further

aggravated sanitation problems during and after disasters. Women also reported that disrupted sanitation services affected household cleanliness and increased concerns regarding environmental pollution and disease transmission.

The study further revealed that privacy and safety were major concerns while accessing sanitation facilities during disaster situations. Women and adolescent girls experienced discomfort and insecurity due to the lack of separate, safe, and hygienic toilet facilities, particularly in temporary shelters and flood-affected areas. The absence of adequate lighting, proper waste disposal mechanisms, and gender-sensitive sanitation infrastructure exposed women to additional physical and psychological stress. These findings indicate that sanitation challenges during disasters extend beyond infrastructure damage and directly affect women's dignity, safety, health, and overall well-being.

These findings strongly support the Gendered Vulnerability Framework, which explains that women's disaster experiences are shaped by socially constructed gender roles and inequalities rather than by the disaster itself (Enarson, 2000). Women are primarily responsible for maintaining household sanitation, caring for children and older family members, and ensuring hygienic living conditions. Consequently, when sanitation facilities become inaccessible or damaged, women experience a disproportionate burden in managing household hygiene while simultaneously facing increased risks to their own health and safety. The lack of privacy and secure sanitation facilities also reflects the gender-specific vulnerabilities that women encounter during disaster situations. The findings are equally consistent with the Human Rights-Based Approach (HRBA) to WASH, which recognizes sanitation as a fundamental human right closely linked to human dignity, privacy, equality, and health (United Nations General Assembly [UNGA], 2010). According to the HRBA, sanitation facilities should be available, accessible, safe, acceptable, affordable, and culturally appropriate for all individuals. The disruption of sanitation infrastructure and the lack of women-friendly sanitation facilities observed in the present study indicate that these human rights principles were not fully achieved during disaster situations. The inability to access safe and private sanitation facilities compromises women's dignity, increases their vulnerability to health risks, and limits their ability to maintain personal hygiene during emergencies. The findings are consistent with previous studies conducted in disaster and humanitarian settings. The WHO and UNICEF Joint Monitoring Programme (JMP) emphasizes that inadequate sanitation during disasters increases the risk of communicable diseases, environmental contamination, and gender-based inequalities, particularly among women and girls (World Health Organization & United Nations Children's Fund, 2023). Similarly, UNICEF (2021) highlights that inadequate

sanitation facilities, lack of privacy, and poor waste management create serious challenges for women and adolescent girls, especially in emergency shelters and disaster-affected communities. The Kerala State Disaster Management Authority (2019) also reported that the 2018 Kerala floods caused extensive damage to sanitation infrastructure, drainage systems, and household toilets, creating severe public health challenges in flood-affected communities. Furthermore, WHO (2022) emphasizes that disaster-resilient sanitation systems are essential for preventing disease outbreaks, protecting public health, and ensuring equitable access to sanitation services during emergencies.

The findings suggest that improving sanitation infrastructure should be considered a priority component of disaster risk reduction and climate adaptation planning in coastal communities. Construction of disaster-resilient toilets, strengthening drainage networks, ensuring regular maintenance of sanitation facilities, and providing gender-sensitive sanitation services in emergency shelters are essential measures for reducing women's WASH-related vulnerabilities. Involving women in the planning, implementation, and monitoring of sanitation programmes can further enhance the effectiveness of WASH interventions and contribute to healthier, safer, and more resilient coastal communities.

Objective 3: To understand hygiene practices followed by women during normal and disaster situations

The present study found that women generally followed satisfactory personal and household hygiene practices under normal conditions and were aware of the importance of maintaining hygiene for the health and well-being of their families. However, disaster situations significantly affected their ability to maintain these practices due to shortages of safe drinking water, inadequate sanitation facilities, and disruptions in essential WASH services. Many respondents reported that limited water availability forced them to prioritize water for drinking and cooking, making it difficult to maintain regular practices such as bathing, handwashing, washing clothes, cleaning household surroundings, and ensuring overall environmental hygiene. Women also experienced considerable challenges in maintaining menstrual hygiene because of inadequate access to clean water, private sanitation facilities, and menstrual hygiene products during disaster situations. Despite these difficulties, many respondents made conscious efforts to maintain personal cleanliness and household hygiene by utilizing the limited resources available. However, prolonged disruption of WASH services increased concerns regarding the spread of water-borne and communicable diseases, particularly among

children, older adults, and other vulnerable family members. These findings indicate that maintaining appropriate hygiene practices remains a significant challenge for women during disasters and highlights the importance of ensuring uninterrupted access to water, sanitation facilities, and emergency hygiene support.

These findings are consistent with the Gendered Vulnerability Framework, which explains that women experience greater vulnerability during disasters because they are traditionally responsible for maintaining household hygiene, caring for children, older adults, and sick family members, and managing domestic responsibilities (Enarson, 2000). The additional burden of maintaining hygiene with limited resources increased women's physical workload, emotional stress, and caregiving responsibilities during disaster situations. The findings also support the Human Rights-Based Approach (HRBA) to WASH, which emphasizes that every individual has the right to adequate water, sanitation, and hygiene services that protect health, dignity, privacy, and equality (United Nations General Assembly, 2010). The disruption of hygiene practices observed in the present study indicates that women's rights to adequate WASH services were compromised during disasters, thereby affecting their overall health and well-being.

The findings of the present study are consistent with the WHO and UNICEF Joint Monitoring Programme, which highlights that disasters often interrupt hygiene practices because of inadequate access to safe water, sanitation facilities, and hygiene materials, particularly among women and girls (World Health Organization & United Nations Children's Fund, 2023). Similarly, UNICEF (2021) reported that inadequate water supply, lack of sanitation facilities, and insufficient menstrual hygiene resources during emergencies adversely affect women's ability to maintain personal hygiene and dignity. Sommer et al. (2016) further observed that poor menstrual hygiene management in humanitarian settings increases stress, discomfort, and health risks among women and adolescent girls. The World Health Organization (2022) also emphasizes that maintaining proper hygiene during disasters is essential for preventing communicable diseases and protecting public health. Therefore, strengthening hygiene promotion programmes, ensuring the continuous availability of safe water, providing emergency hygiene kits, and integrating menstrual hygiene management into disaster preparedness and response programmes are essential for improving women's health, dignity, and resilience in disaster-prone coastal communities.

Objective 4: To identify the impact of disasters on women's WASH conditions

The present study found that disasters had a significant impact on the Water, Sanitation, and Hygiene (WASH) conditions of women residing in the selected disaster-prone coastal

communities. Floods, heavy rainfall, coastal erosion, saline water intrusion, and other disaster events severely disrupted access to safe drinking water, sanitation facilities, and hygiene services. Damage to water supply systems, contamination of wells, destruction of toilets, and poor drainage systems considerably affected the availability and accessibility of essential WASH services. As women were primarily responsible for household water management, sanitation maintenance, and family caregiving, disasters substantially increased their physical workload and emotional stress. Many respondents reported spending additional time collecting water, maintaining household hygiene with limited resources, and caring for children, older adults, and sick family members. The disruption of WASH services also increased women's vulnerability to water-borne diseases, poor sanitation-related illnesses, and other public health risks, thereby negatively affecting their overall health and well-being. Furthermore, damage to public infrastructure delayed the restoration of essential WASH services, making recovery more difficult for affected households. These findings demonstrate that disasters considerably worsen women's WASH conditions and highlight the need for comprehensive disaster preparedness and resilient WASH infrastructure in coastal communities.

These findings strongly support the Gendered Vulnerability Framework, which argues that disasters amplify existing social and gender inequalities by placing additional burdens on women because of their socially assigned domestic and caregiving responsibilities (Enarson, 2000). The increased workload related to water collection, household sanitation, caregiving, and resource management observed in the present study illustrates the "triple burden" experienced by women during disasters. Rather than affecting all community members equally, disaster impacts were experienced differently by women because of unequal access to resources, limited decision-making opportunities, and traditional gender roles. The findings also support the Human Rights-Based Approach (HRBA) to WASH, which recognizes access to safe water, sanitation, and hygiene as fundamental human rights essential for protecting health, dignity, equality, and an adequate standard of living (United Nations General Assembly, 2010). The widespread disruption of WASH services observed during disasters indicates that the principles of availability, accessibility, quality, and acceptability were compromised, limiting women's ability to exercise these basic human rights.

The findings of the present study are consistent with those of the Intergovernmental Panel on Climate Change (IPCC), which identifies coastal communities as highly vulnerable to climate-induced hazards such as flooding, sea-level rise, coastal erosion, and saline water intrusion that threaten water security and public health (IPCC, 2023). Similarly, the Kerala State Disaster Management Authority (2019) reported that the 2018 Kerala floods caused extensive damage

to drinking water systems, sanitation infrastructure, and public health facilities, disproportionately affecting vulnerable groups, including women and children. The World Health Organization (2022) also emphasizes that inadequate WASH services during emergencies increase the risk of disease outbreaks and negatively affect women's physical and mental well-being. Furthermore, the WHO and UNICEF Joint Monitoring Programme highlights that strengthening disaster-resilient WASH systems and ensuring equitable access to safe water and sanitation are essential for reducing gender inequalities and improving resilience in disaster-prone communities (World Health Organization & United Nations Children's Fund, 2023). Therefore, integrating gender-responsive WASH interventions into disaster preparedness, response, recovery, and climate adaptation programmes is essential for reducing women's vulnerability and strengthening the resilience of coastal communities.

Objective 5: To study the coping mechanisms adopted by women during WASH-related challenges

The present study found that women adopted a variety of coping mechanisms to manage the Water, Sanitation, and Hygiene (WASH) challenges experienced during disaster situations in the selected coastal communities. One of the most common coping strategies reported by the respondents was storing drinking water before the occurrence of disasters to ensure the availability of safe water during emergencies Many women also relied on alternative water sources such as public taps, community wells, tanker water, and neighbouring households whenever regular water supplies were disrupted or contaminated. Household water treatment practices, including boiling and filtering water before consumption, were adopted whenever resources were available to reduce the risk of water-borne diseases. In addition, respondents highlighted the importance of community support, assistance from neighbours, self-help groups, local self-government institutions, and disaster response agencies in helping them overcome WASH-related challenges during and after disasters. However, the study also found that certain coping strategies were adopted only by a limited number of respondents because of financial constraints, inadequate infrastructure, limited access to resources, and the severity of disaster impacts. Despite these challenges, women demonstrated considerable resilience by adapting their daily routines, prioritizing the use of available water, and efficiently managing household resources to meet the essential needs of their families. These findings indicate that strengthening household preparedness, improving community participation, and enhancing

disaster-resilient WASH infrastructure are essential for improving women's capacity to cope with future disaster-related WASH challenges.

These findings strongly support the Gendered Vulnerability Framework, which recognizes women not only as vulnerable populations during disasters but also as active agents in disaster preparedness, response, and recovery (Enarson, 2000). The coping strategies adopted by the respondents demonstrate women's resilience, resourcefulness, and central role in managing household survival despite limited access to resources and increased domestic responsibilities. Their ability to organize household resources, seek community support, and adopt alternative water management practices reflects the adaptive capacities developed through lived experiences in disaster-prone environments. At the same time, the findings reveal that women's coping capacity is often constrained by structural inequalities, poverty, and inadequate disaster preparedness measures. The findings also reinforce the Human Rights-Based Approach (HRBA) to WASH, which emphasizes that governments and relevant institutions have the responsibility to ensure continuous access to safe water, sanitation, and hygiene services, particularly for vulnerable populations during emergencies (United Nations General Assembly, 2010). The reliance on individual and community coping strategies observed in the present study indicates that formal WASH services were insufficient to fully protect women's rights to safe water, sanitation, health, and dignity during disasters.

The findings of the present study are consistent with those reported by UNDRR (2015), which emphasizes that community participation, local knowledge, and inclusive disaster risk reduction strategies are fundamental for strengthening resilience and reducing disaster impacts. Similarly, Enarson and Chakrabarti (2009) argue that women play a critical role in disaster preparedness and recovery through caregiving, resource management, and community-based support systems, although their contributions often remain unrecognized in disaster management policies. The World Health Organization and UNICEF Joint Monitoring Programme (2023) also highlight that strengthening resilient WASH infrastructure, promoting community preparedness, and ensuring equitable access to essential WASH services significantly improve the capacity of households to cope with climate-related disasters. Furthermore, the Intergovernmental Panel on Climate Change (IPCC, 2023) emphasizes that climate adaptation strategies should strengthen local resilience by investing in sustainable water management systems, resilient infrastructure, and inclusive community-based disaster preparedness programmes. Therefore, promoting women's participation in disaster planning, strengthening community-based WASH preparedness, enhancing social support networks, and

investing in resilient WASH infrastructure are essential for improving women's adaptive capacity and reducing disaster-related vulnerabilities in coastal communities.

5.3 SUGGESTIONS

Based on the findings of the present study, the following suggestions are proposed to improve Water, Sanitation, and Hygiene (WASH) conditions among women living in disaster-prone coastal communities.

5.3.1 Strengthening Access to Safe Drinking Water

The study found that access to safe drinking water was significantly disrupted during disaster situations. Therefore, government departments, local self-government institutions, and disaster management authorities should ensure uninterrupted access to safe drinking water before, during, and after disasters. Community-based emergency water storage facilities, rainwater harvesting systems, and climate-resilient water supply infrastructure should be strengthened to reduce water scarcity during emergencies. Regular monitoring of drinking water quality and timely restoration of damaged water supply systems should also be prioritized to prevent water-borne diseases and protect public health (World Health Organization [WHO] & United Nations Children's Fund, 2023).

5.3.2 Improving Disaster-Resilient Sanitation Infrastructure

The findings revealed that sanitation facilities were severely affected during disasters, creating privacy, safety, and health concerns for women. Therefore, disaster-resilient toilets, drainage systems, and wastewater management facilities should be developed in coastal communities. Local self-government institutions should ensure regular maintenance of sanitation facilities and immediate restoration following disasters. Emergency shelters should also be equipped with adequate, accessible, and gender-sensitive sanitation facilities that ensure privacy and safety for women and adolescent girls (WHO, 2022).

5.3.3 Promoting Hygiene and Menstrual Hygiene Management

The study identified challenges in maintaining personal hygiene and menstrual hygiene during disasters because of inadequate water supply, poor sanitation, and limited availability of hygiene products. Regular hygiene awareness programmes should therefore be conducted in coastal communities to promote safe hygiene practices before disasters occur. Disaster preparedness plans should include the distribution of hygiene kits containing soap, disinfectants, sanitary napkins, and other essential hygiene materials. Menstrual hygiene

management should be recognized as an essential component of emergency response, and women-friendly sanitation facilities should be established in relief camps (UNICEF, 2021).

5.3.4 Strengthening Gender-Responsive Disaster Management

The findings demonstrate that disasters disproportionately affect women because of their caregiving responsibilities and dependence on WASH services. Disaster management authorities should integrate WASH as a core component of disaster preparedness, response, and recovery programmes. Early warning systems should include information regarding safe drinking water sources, sanitation facilities, and emergency hygiene services. Emergency shelters should be equipped with adequate WASH facilities, and regular mock drills should incorporate WASH preparedness activities to improve community resilience (United Nations Office for Disaster Risk Reduction, 2015).

5.3.5 Enhancing Women's Participation and Community Resilience

The study showed that women adopted several coping strategies during disasters and played a significant role in maintaining household well-being. Therefore, women should be actively involved in disaster preparedness committees, local disaster management planning, and community-based WASH programmes. Capacity-building programmes should be organized to strengthen women's knowledge of disaster preparedness, emergency water management, hygiene promotion, and climate adaptation. Self-help groups and community-based organizations should also be encouraged to participate in disaster risk reduction activities, thereby strengthening household and community resilience (Enarson & Chakrabarti, 2009).

5.3.6 Policy and Future Research

The study highlights the need for stronger coordination between disaster management, public health, and WASH sectors. Government departments should integrate gender-sensitive WASH interventions into disaster management policies and allocate adequate financial resources for strengthening climate-resilient WASH infrastructure in coastal communities. Non-governmental organizations and local communities should collaborate in implementing sustainable WASH programmes that address the specific needs of women. Future research may include larger sample sizes from multiple coastal districts of Kerala and adopt mixed-method or qualitative approaches to gain a deeper understanding of women's lived experiences, coping mechanisms, and long-term resilience during disaster situations.

5.4 CONCLUSION

The present study examined the Water, Sanitation, and Hygiene (WASH) challenges faced by women in disaster-prone coastal communities of Karumkulam Grama Panchayath, Thiruvananthapuram district. The findings revealed that although women generally had better access to safe drinking water, sanitation facilities, and hygiene services under normal conditions, disaster situations significantly disrupted these essential services. Floods, heavy rainfall, coastal hazards, and damage to WASH infrastructure affected women's access to safe drinking water, sanitation facilities, and hygiene practices, thereby increasing their physical, social, and health-related vulnerabilities. The study also found that women experienced additional burdens due to their primary responsibilities for household water management, caregiving, and maintaining hygiene during and after disasters. Despite these challenges, women adopted various coping strategies such as storing water, using alternative water sources, and seeking support from community members and local authorities.

The findings highlight the importance of strengthening disaster-resilient WASH infrastructure, ensuring uninterrupted access to safe drinking water and sanitation services, promoting hygiene awareness, and integrating gender-responsive WASH interventions into disaster preparedness and response programmes. These findings are consistent with the Sendai Framework for Disaster Risk Reduction 2015–2030, which emphasizes strengthening resilience and reducing disaster risk through inclusive and people-centred approaches (United Nations Office for Disaster Risk Reduction, 2015). They also support the recommendations of the WHO/UNICEF Joint Monitoring Programme, which recognizes equitable access to safe water, sanitation, and hygiene as fundamental for improving health, reducing gender inequalities, and enhancing resilience in vulnerable communities (World Health Organization & United Nations Children's Fund, 2023). Furthermore, the findings align with the Intergovernmental Panel on Climate Change (IPCC), which identifies coastal communities as highly vulnerable to climate-related hazards and emphasizes the need for climate-resilient infrastructure and adaptation strategies (IPCC, 2023).The study contributes to a better understanding of the relationship between gender, disasters, and WASH in coastal communities. It provides evidence that can support policymakers, disaster management authorities, local self-government institutions, public health professionals, and social workers in designing effective, gender-sensitive, and disaster-resilient WASH interventions. The findings also provide a foundation for future research aimed at strengthening community resilience and improving the health and well-being of women living in disaster-prone coastal areas.

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ANNEXURE I: TOOL FOR DATA COLLECTION

STRUCTURED INTERVIEW GUIDE

Section A: Demographic Information

1. Name of the Respondent
2. Ag
3. . Marital Status
   - Single
   - Married
   - Widowed
   - Divorced / Separated

4. Education Level
   - No formal education
   - Primary (up to 5th standard)
   - Secondary (6th–10th standard)
   - Higher secondary (11th–12th standard)
   - Graduate and above

5. Occupation
   - Fishing vending
   - Fish processing / fish selling
   - Household work
   - Daily wage labour
   - Small business
   - Other

6. Monthly Household Income

7. Number of Family Members in the Household

8. Number of Female Members in the Household

9. Distance of Your House from the Sea
   - Less than 500 meters

- 500 meters – 1 km
- More than 1 km

10. Type of House
    - Own house
    - Rented house
    - Relative's house
    - Other

11. Duration of Stay in the Community
    - Less than 5 years
    - 5–10 years
    - 11–20 years
    - More than 20 years

12. Have you experienced any disaster in the last 5 years?
    - Yes
    - No

13. Type of Disaster Experienced
    - Coastal erosion
    - Flooding
    - Cyclone / storm
    - Saline water intrusion
    - Heavy rainfall
    - Other

14. During disasters, where do you usually stay?
    - Own house
    - Relative's house
    - Relief camp / Temporary shelter
    - Other

Section B: Access to WASH Facilities During Disaster Situations

15. What is the main source of drinking water for your household?
    - Public tap
    - Well
    - Borewell
    - Tanker water
    - Bottled water
    - Other

16. Is your main water source affected during disasters?
    - Yes
    - No
    - Sometimes

17. During disasters, how far is the nearest available water source?

18. How much time do you usually spend collecting water during disasters?
    - Less than 30 minutes
    - 30–60 minutes
    - More than 1 hour

19. Who usually collects water for the household during disasters?
    - Women
    - Men
    - Both men and women
    - Children

20. Does your household have a toilet facility?
    - Yes
    - No

21. If yes, is the toilet usable during disasters?

- Always usable
- Sometimes usable
- Not usable

22. During disasters, is water available in the toilet for use?
    - Always available
    - Sometimes available
    - Rarely available
    - Not available

23. How easy is it for women to access bathing facilities during disasters?
    - Very easy
    - Easy
    - Neutral
    - Difficult
    - Very difficult

24. Are community toilets available in your area?
    - Yes
    - No

25. If yes, how clean are the community toilets during disasters?
    - Very clean
    - Clean
    - Poor
    - Very poor

26. Do women feel safe using sanitation facilities during disasters?
    - Very safe
    - Safe
    - Unsafe
    - Very unsafe

27. How accessible are water and sanitation facilities for elderly women during disasters

- Very accessible
- Accessible
- Neutral
- Difficult to access
- Very difficult to access

28. How accessible are water and sanitation facilities for pregnant women during disasters?

- Very accessible
- Accessible
- Neutral
- Difficult to access
- Very difficult to access

29. How regularly is waste collected in your community during disasters?

- Very regularly
- Regularly
- Occasionally
- Rarely
- Not at all

30. Do authorities provide emergency water supply during disasters?

- Yes
- No
- Sometimes

Section C: WASH Challenges Faced by Women

31. Access to safe and sufficient drinking water becomes difficult during disasters.

- Strongly Agree
- Agree
- Neutral
- Disagree

- Strongly Disagree

32. Water sources become contaminated or unsuitable for drinking during disasters.
    - Strongly Agree
    - Agree
    - Neutral
    - Disagree
    - Strongly Disagree

33. Women have to travel longer distances and spend more time to collect water during disasters.
    - Strongly Agree
    - Agree
    - Neutral
    - Disagree
    - Strongly Disagree

34. Toilets become unusable or inaccessible during floods or heavy rainfall.
    - Strongly Agree
    - Agree
    - Neutral
    - Disagree
    - Strongly Disagree

35. Sanitation facilities create difficulties for women during disasters.
    - Strongly Agree
    - Agree
    - Neutral
    - Disagree
    - Strongly Disagree

36. Waste disposal and drainage problems worsen during disasters.
    - Strongly Agree
    - Agree

- Neutral
- Disagree
- Strongly Disagree

37. Lack of water affects personal hygiene during disasters.
    - Strongly Agree
    - Agree
    - Neutral
    - Disagree
    - Strongly Disagree

38. There is insufficient water available for bathing and washing during disasters.
    - Strongly Agree
    - Agree
    - Neutral
    - Disagree
    - Strongly Disagree

39. Access to menstrual hygiene management becomes difficult during disasters.
    - Strongly Agree
    - Agree
    - Neutral
    - Disagree
    - Strongly Disagree

40. Women face greater WASH-related challenges than men during disasters.
    - Strongly Agree
    - Agree
    - Neutral
    - Disagree
    - Strongly Disagree

41. Poor WASH conditions increase health risks during disasters.
    - Strongly Agree
    - Agree

- Neutral
- Disagree
- Strongly Disagree

Section D: Hygiene, Menstrual Hygiene, Privacy and Safety

42. Women face difficulties in maintaining personal and menstrual hygiene during disasters.
    - Strongly Agree
    - Agree
    - Neutral
    - Disagree
    - Strongly Disagree

43. Women feel uncomfortable using shared water and sanitation facilities during disasters.
    - Strongly Agree
    - Agree
    - Neutral
    - Disagree
    - Strongly Disagree

44. Women feel unsafe using sanitation facilities at night during disasters.
    - Strongly Agree
    - Agree
    - Neutral
    - Disagree
    - Strongly Disagree

45. Women avoid using toilets at night due to safety concerns during disasters.
    - Strongly Agree
    - Agree
    - Neutral
    - Disagree
    - Strongly Disagree

46. Hygiene management among adolescent girls is affected during disasters.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

47. Pregnant women face sanitation and hygiene difficulties during disasters.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

48. Elderly women face difficulties accessing sanitation facilities during disasters.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

49. Menstrual products are easily available during disasters.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

50. Women find it difficult to dispose of menstrual products during disasters.

- Strongly Agree
- Agree
- Neutral
- Disagree

- Strongly Disagree

51. Women have access to separate, safe, and private spaces for changing menstrual products during disasters.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Section E: Coping Strategies

52. Women store water in advance to prepare for disasters.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

53. Women collect water from multiple sources during disasters.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

54. Women reduce water usage during shortages.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

55. Women depend on neighbours or relatives for water.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

56. Women use temporary sanitation facilities during disasters.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

57. Women compromise personal hygiene due to limited water.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

58. Women reuse water for different household purposes.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

59. Women use rainwater as an alternative source.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

60. Community cooperation helps reduce WASH challenges.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Section F: Perceptions on Disaster Management

61. Government provides adequate drinking water during disasters.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

62. Government provides sufficient sanitation facilities during disasters.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

63. Relief camps provide adequate water and sanitation facilities for women.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

64. Authorities respond quickly to water shortages during disasters.

- Strongly Agree
- Agree

- Neutral
- Disagree
- Strongly Disagree

65. Women's needs are considered in disaster management planning.
    - Strongly Agree
    - Agree
    - Neutral
    - Disagree
    - Strongly Disagree

66. NGOs support communities in improving WASH facilities during disasters.
    - Strongly Agree
    - Agree
    - Neutral
    - Disagree
    - Strongly Disagree

67. Community participation improves WASH management.
    - Strongly Agree
    - Agree
    - Neutral
    - Disagree
    - Strongly Disagree

68. More gender-sensitive WASH programs are needed.
    - Strongly Agree
    - Agree
    - Neutral
    - Disagree
    - Strongly Disagree