

Assessing the Impact of Integrated Water, Sanitation, Hygiene and Health Interventions in Emergency Settings: Evidence from Ancuabe and Metuge Districts, Cabo Delgado, Mozambique.

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Abstract— There is increasing recognition that the integration of Water, Sanitation, and Hygiene (WASH) services with health interventions is essential for effective emergency response. This study examines the influence of integrated WASH and health interventions in emergency settings, with evidence drawn from the protracted conflict context of Northern Mozambique. A parallel mixed-methods approach was adopted, enabling the collection of both qualitative and quantitative data. The study focused on assessing the impact of integrated WASH and health interventions in Ancuabe and Metuge districts of Cabo Delgado Province. A case study research design was used to allow for an in-depth understanding of the key variables under investigation. A total of 100 participants were scientifically selected, including caregivers across four healthcare facilities. The findings indicate a high availability of sanitation infrastructure (98%) and strong user satisfaction with cleanliness (96%). However, significant service gaps persist. Only 75% of respondents reported access to functional water services, with one facility lacking water entirely. Additionally, 56% indicated the absence of soap and water at handwashing points. Inclusive and gender-sensitive infrastructure remains inadequate, with no disability-friendly facilities and 35% of sanitation facilities not gender-segregated. Although 92% of respondents reported exposure to hygiene promotion activities, knowledge of critical handwashing times was limited. Monitoring systems were also weak, with 94% reporting no external inspections. The study concludes that infrastructure provision alone is insufficient to ensure effective WASH–health integration. Strengthening system functionality, promoting inclusive design, reinforcing behavior change interventions, and improving monitoring and accountability mechanisms are essential to achieving better health outcomes in emergency settings.

Keywords— Integrated WASH, Health interventions, emergency response, health care facilities, internal displacement, hygiene promotion.

I. INTRODUCTION

The protracted armed conflict in Cabo Delgado Province, Mozambique, has generated complex humanitarian challenges, with large-scale internal displacement placing sustained pressure on already fragile

health systems and Water, Sanitation, and Hygiene (WASH) services. In such contexts, the integration of WASH interventions with health service delivery has become increasingly critical for effective emergency response, particularly in reducing disease transmission and strengthening infection prevention and control (IPC). Despite its recognized importance, there remains limited empirical evidence on how such integration performs in real-world, protracted emergency settings.

Since 2017, recurrent violence in Cabo Delgado has triggered repeated waves of displacement, overwhelming host communities, resettlement sites, and health care facilities (HCFs). As of early 2026, approximately 609,243 people remain internally displaced across northern Mozambique, with Cabo Delgado hosting around 70% of the national caseload (OCHA, 2025). Districts such as Ancuabe and Metuge have emerged as key reception areas, absorbing large numbers of internally displaced persons (IDPs) into environments where pre-existing WASH infrastructure and service capacity were already limited. This convergence of conflict, displacement, and infrastructural fragility has heightened the risk of waterborne diseases, healthcare-associated infections, and reduced access to safe and dignified care.

Globally, WASH services in health care facilities continue to fall below minimum standards, particularly in fragile and conflict-affected contexts. Evidence from the WHO/UNICEF Joint Monitoring Programme indicates persistent gaps in basic water supply, sanitation, hygiene, environmental cleaning, and healthcare waste management, with the most severe deficiencies observed in low-resource and emergency settings (WHO & UNICEF, 2024). In northern Mozambique, these systemic challenges are compounded by insecurity, climate-related shocks, and population mobility, leaving many facilities non-functional or operating at reduced capacity, and increasing the likelihood of outbreaks such as cholera and acute watery diarrhea (OCHA, 2025).



Although WASH components are commonly included in humanitarian responses, their integration with health interventions remains inconsistent. In districts such as Ancuabe and Metuge, health care facilities frequently operate with unreliable water supply, inadequate sanitation infrastructure, limited hand hygiene facilities, and weak waste management systems. Furthermore, gaps in coordination, monitoring, and behaviour change programming constrain the effective alignment of WASH and health interventions, thereby undermining IPC outcomes and overall service quality (IOM, 2025).

Existing studies demonstrate the effectiveness of WASH interventions in reducing disease transmission in emergency settings (e.g., Yimenu et al., 2026; Ezenwaka et al., 2026). However, there is a notable lack of district-level, user-centred empirical evidence on how integrated WASH and health interventions function within health care facilities in protracted conflict contexts. In Cabo Delgado, available data predominantly focus on infrastructure coverage, displacement dynamics, and humanitarian needs, with limited attention to patient and caregiver experiences, service functionality, and perceived quality of care at the facility level.

This study addresses this gap by advancing a novel, user-centred assessment of the synergy between WASH and health service delivery in a protracted emergency context. Drawing on primary data from patients and caregivers in selected health care facilities in Ancuabe and Metuge districts, it systematically examines the availability, functionality, user perceptions, and gaps across key WASH components including water supply, sanitation, hygiene facilities, hygiene promotion, and waste management and analyses how their integration influences IPC, service utilisation, user dignity, and overall health outcomes. By moving beyond infrastructure-focused assessments to capture lived experiences and functional performance, the study provides context-specific, operational insights into how integrated WASH–health interventions work in practice.

In doing so, the paper contributes to both scholarship and policy by generating empirical evidence on the operational synergy of WASH and health systems in fragile settings, identifying critical gaps in implementation, and highlighting actionable pathways for strengthening integrated service delivery. These findings have direct implications for improving humanitarian programming and for advancing progress towards Sustainable Development Goals 3 and 6 in conflict-affected environments in Mozambique.

Research Objectives

The overall aim of this study is to evaluate the impact of integrated WASH and health interventions in emergency response, drawing on primary evidence from health care facilities in Ancuabe and Metuge districts, Cabo Delgado Province, Mozambique.

Specific objectives

1. To assess the availability, functionality, and user satisfaction with WASH services (water supply, sanitation infrastructure, handwashing facilities, hygiene promotion, and waste management) in the health care facilities.
2. To examine the prevalence of hygiene promotion messages and the level of user knowledge of critical hygiene practices.
3. To identify gaps in WASH integration, including accessibility, cleanliness, and oversight, and their implications for infection prevention, service delivery, and user dignity.
4. To highlight operational challenges and opportunities for improving integrated WASH and health interventions in this emergency setting.

II. LITERATURE REVIEW

This study is grounded in two complementary theoretical perspectives. Resilience Theory and the Health Systems Framework which together provide a structured lens for analysing how integrated Water, Sanitation, and Hygiene and health interventions function in protracted emergency settings such as Cabo Delgado Province.

Resilience Theory conceptualises resilience as the capacity of systems, communities, and institutions to absorb shocks, adapt to changing conditions, and transform in response to crises while maintaining essential functions (Kruk et al., 2019; Blanchet et al., 2020). This capacity is commonly understood through three interrelated dimensions: absorptive, adaptive, and transformative capacities. Within the context of WASH–health integration, the availability of reliable water supply, adequate sanitation, functional hygiene systems, and effective waste management enhances the ability of health care facilities to withstand disruptions associated with displacement, disease outbreaks, and infrastructural damage. These elements are central to sustaining infection prevention and control (IPC) and ensuring continuity of care (WHO & UNICEF, 2022).



Importantly, resilience extends beyond physical infrastructure to encompass behavioural and institutional dimensions. Hygiene knowledge, adherence to handwashing practices, and the effectiveness of communication strategies such as information, education, and communication (IEC) materials play a critical role in shaping system adaptability (Barasa et al., 2021). From this perspective, variations in WASH service performance across facilities reflect differing levels of resilience capacity, where gaps in access, inclusivity, monitoring, and hygiene communication indicate systemic weaknesses, while ongoing hygiene promotion efforts signal opportunities for strengthening resilience pathways.

The Health Systems Framework, particularly the World Health Organization's health system "building blocks" model, offers a complementary analytical structure for understanding how different system components interact to produce health outcomes. The framework encompasses service delivery, health workforce, health information systems, access to essential medicines, financing, and governance (World Health Organization, 2010; Bogale et al., 2024; Truppa et al., 2024). WASH services intersect directly with several of these building blocks most notably service delivery, workforce, and governance by enabling safe clinical practices, maintaining environmental hygiene, and supporting effective IPC.

Inadequate WASH infrastructure undermines the capacity of health systems to deliver quality care, contributing to healthcare-associated infections, reduced patient trust, and lower service utilisation (World Health Organization & United Nations Children's Fund, 2024; Bose, 2024). The framework further underscores that WASH should be treated as an integral component of health system strengthening rather than a peripheral service, particularly in fragile and emergency contexts. It also highlights the critical role of governance and health information systems in ensuring continuous monitoring, maintenance, and effective utilisation of WASH services. Weak coordination and oversight frequently result in fragmented interventions with limited impact (Yimenu et al., 2026; Truppa et al., 2024). Taken together, these frameworks emphasise that integrated WASH-health interventions generate system-level synergies, enhancing efficiency, service quality, and resilience. By combining infrastructure, IPC measures, behaviour change communication, and coordinated monitoring, such integration strengthens both immediate emergency response and longer-term health system functionality in conflict-affected settings.

Empirical Literature Review

Empirical evidence consistently demonstrates that the integration of WASH interventions with health services is critical for improving health outcomes, reducing disease transmission, and enhancing service utilisation in humanitarian contexts (Alareqi et al., 2024; Bose, 2024). However, the effectiveness of such integration is highly context-dependent, shaped by implementation quality, inter-sectoral coordination, and sustained oversight factors that are often constrained in fragile and conflict-affected environments (Truppa et al., 2024; Yimenu et al., 2026).

Global Status of WASH in Health Care Facilities

Globally, access to WASH services in health care facilities remains inadequate, particularly in low-income and fragile settings. Evidence from the WHO/UNICEF Joint Monitoring Programme indicates persistent deficiencies in basic water, sanitation, hygiene, environmental cleaning, and healthcare waste management services, with the most severe gaps observed in conflict-affected contexts (World Health Organization & United Nations Children's Fund, 2024). These deficiencies directly compromise IPC, increase the risk of healthcare-associated infections, and undermine service quality and patient trust (Bose, 2024).

Effectiveness of WASH Interventions in Humanitarian Settings

In humanitarian emergencies, well-implemented WASH interventions have been shown to reduce disease transmission and improve public health outcomes. Systematic reviews and meta-analyses report consistent reductions in diarrhoeal diseases and improvements in hygiene behaviours, although the strength and sustainability of outcomes vary across contexts (Alareqi et al., 2024). Evidence further suggests that integrated WASH-health approaches, which combine infrastructure provision with IPC measures, clinical services, and behaviour change communication, are more effective than standalone interventions (Als et al., 2020; Truppa et al., 2024). Such integration enhances alignment with health service delivery, reinforces hygiene practices, and supports health workforce performance. However, behavioural outcomes often lag behind infrastructure improvements, particularly where hygiene promotion is inconsistent or lacks appropriate communication tools (Alareqi et al., 2024).



WASH, Service Utilisation, and Patient Trust

A growing body of literature highlights the relationship between WASH conditions in health care facilities and patient perceptions of care quality. Clean environments, functional sanitation, and reliable water supply are associated with increased trust and higher utilisation of services. Conversely, poor WASH conditions deter care-seeking behaviour and undermine patient dignity, particularly among vulnerable groups such as women, children, and persons with disabilities (World Health Organization & United Nations Children's Fund, 2024; Bose, 2024). However, perceived cleanliness does not always correspond to compliance with IPC standards. Facilities may appear acceptable to users while lacking essential components such as routine inspections, adequate waste management, or consistent hand hygiene infrastructure (Bose, 2024).

Water Supply and Health System Performance

Reliable access to safe water is foundational to effective WASH integration in health care facilities. Inadequate water supply constrains hygiene practices, clinical procedures, and sanitation maintenance, thereby undermining overall health system performance (World Health Organization & United Nations Children's Fund, 2024). In sub-Saharan Africa, water challenges are often characterised by intermittent supply, inconsistent quality, and reliance on point-of-use treatment methods, which are frequently unsustainable in emergency contexts (Bose, 2024).

Sanitation, Inclusivity, and Dignity

Sanitation infrastructure is critical not only for disease prevention but also for ensuring dignity and equitable access to care. Empirical studies identify persistent gaps in the provision of clean, gender-segregated, and disability-inclusive sanitation facilities in fragile and emergency settings (Als et al., 2020; Truppa et al., 2024). These shortcomings disproportionately affect vulnerable populations and limit equitable access to health services in displacement contexts.

Hygiene Promotion and Behavioural Change

Behavioural change remains one of the most challenging aspects of WASH interventions. While hygiene promotion activities are widely implemented, their effectiveness depends on consistent messaging, reinforcement, and the availability of appropriate tools such as IEC materials (Alareqi et al., 2024).

Evidence indicates that knowledge of critical hygiene practices—such as key handwashing moments—is often limited in emergency settings, even where infrastructure exists. The absence of visual aids and structured communication strategies further weakens outcomes, highlighting the need for stronger integration between infrastructure provision and behaviour change interventions.

Integration versus Fragmentation of Interventions

A central theme in the literature is the superiority of integrated over fragmented WASH–health approaches. Fragmented interventions often result in inefficiencies, duplication of efforts, and limited impact. In contrast, integrated models characterised by coordinated planning, joint monitoring, and unified behaviour change strategies enhance IPC, improve service delivery, and strengthen overall system resilience (Yimenu et al., 2026; Hamza et al., 2025). Despite these advantages, achieving effective integration remains a significant challenge in protracted emergency contexts. Key barriers include weak coordination mechanisms, limited data sharing across sectors, inadequate governance and oversight, insecurity, logistical constraints, and insufficient community engagement. As a result, WASH and health interventions frequently operate in parallel rather than in true synergy, thereby reducing their overall effectiveness and sustainability in conflict-affected settings.

III. METHODOLOGY

The study adopted a mixed methodology that enabled collection of both qualitative and quantitative data. The study also used a research paradigm that posted into pragmatism philosophy that facilitated the study conducted in Ancuabe and Metuge districts, located in Cabo Delgado Province in northern Mozambique. These districts have emerged as critical humanitarian settings due to their role as major reception areas for internally displaced persons (IDPs) fleeing protracted armed conflict in the province. The insurgency, which escalated significantly from 2017 onwards, has resulted in widespread displacement, destruction of infrastructure, and disruption of essential services, including healthcare and WASH systems (OCHA, 2025; UNHCR, 2026). Both districts host a combination of resettlement sites and host communities, placing significant pressure on existing health care facilities (HCFs), many of which were already operating with limited WASH infrastructure prior to the crisis.

The rapid population influx has exacerbated challenges related to water supply, sanitation, hygiene, and healthcare waste management, making these districts particularly suitable for examining the performance of integrated WASH and health interventions in a protracted emergency context.

Research Design

The study employed a cross-sectional descriptive research design, integrating both quantitative and qualitative approaches to provide a comprehensive assessment of WASH–health integration within health care facilities. This design was appropriate for capturing conditions at a specific point in time while allowing for the triangulation of user experiences, service functionality, and system performance. The approach emphasised a user-centred perspective, focusing on the experiences and perceptions of patients and caregivers as key indicators of service effectiveness, utilisation, and dignity. By combining structured data collection with experiential insights, the study was able to assess not only the availability of WASH services but also their functionality and perceived quality within real-world emergency settings.

Study Population

The study population comprised patients and caregivers accessing selected health care facilities in Ancuabe and Metuge districts during the study period. These groups were purposively targeted because they are the primary users of WASH and health services within facilities and are therefore well positioned to provide insights into service availability, functionality, and quality. In addition, health care facility staff (where applicable) were included to provide contextual information on WASH service provision, operational challenges, and infection prevention and control (IPC) practices. The inclusion of both service users and providers enabled a more holistic understanding of how integrated WASH–health interventions function in practice.



Source: Google Maps, Cabo Delgado Province, Mozambique, accessed April 2, 2025.

Figure 1: Map Of Cabo Delgado Province Showing The Districts Of Study

Cabo Delgado Province remains the epicenter of Mozambique’s protracted humanitarian crisis, hosting approximately 70% of the country’s internally displaced population. As of mid-2025, an estimated 541,400–609,243 internally displaced persons (IDPs) were recorded across northern Mozambique, with the majority residing in Cabo Delgado (IOM, 2025; UNHCR, 2026). Within the province, Ancuabe and Metuge districts have emerged as key reception areas, hosting substantial displaced populations. Recent assessments estimate that Metuge hosts approximately 60,466–79,906 IDPs, while Ancuabe accommodates between 40,848 and 48,871, placing considerable strain on already limited local resources and services (IOM, 2025).

This population influx has significantly overstretched health care facilities (HCFs), many of which were operating with limited capacity even prior to the escalation of violence.



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The study area is further characterised by severe infrastructural and service deficits. Conflict-related disruptions, compounded by recurrent climate shocks, have resulted in reduced access to safe water and sanitation for large segments of the population. It is estimated that approximately 35–45% of health facilities in Cabo Delgado lack reliable access to water, increasing the risk of waterborne diseases such as cholera and acute watery diarrhoea, particularly in overcrowded resettlement sites and host communities (Mentor Initiative, 2025; WHO & UNICEF, 2024).

These conditions disproportionately affect vulnerable groups, including women, children, and persons with disabilities. In addition, the study context is linguistically and culturally diverse. While Portuguese serves as the official language in health facilities, many IDPs primarily speak Makonde, whereas host communities in Ancuabe and Metuge commonly use Macua and Mwani. This linguistic diversity has important implications for effective communication, particularly in relation to hygiene promotion, health education, and informed consent during data collection. Given the convergence of high displacement, weakened infrastructure, recurrent disease risks, and strained health systems, Ancuabe and Metuge districts provide a highly relevant setting for assessing the effectiveness of integrated WASH and health interventions in protracted emergency contexts. Data were collected from four purposively selected facilities: Meza Health Centre and Ancuabe General Hospital in Ancuabe district, and Nacuta Health Centre and Metuge General Hospital in Metuge district. These facilities serve both IDP and host populations and thus provide critical insights into user experiences across diverse population groups.

Research Design and Data Collection

The study employed a cross-sectional quantitative research design to capture real-time experiences of patients and caregivers regarding WASH service delivery and its integration with health services in an emergency context (Adu & Miles, 2023). This design was appropriate for generating a snapshot of service availability, functionality, and user perceptions within selected health care facilities. The target population comprised adult patients and caregivers (aged 18 years and above) from both IDP and host communities who accessed health services during the data collection period, either for their own care or on behalf of dependents. A one-stage cluster sampling approach was adopted, with the four selected health facilities serving as clusters (Silvia, 2020).

Within each facility, respondents were randomly selected across key service delivery units, including outpatient, reproductive health, paediatric, and emergency departments, to ensure broad representation of service users.

A sample size of 100 research respondents was determined at a 95% confidence level and a 5% margin of error. Although questionnaires were initially administered using the Kobo Collect platform, data cleaning resulted in 100 valid responses for analysis. Data were collected using a structured, interviewer-administered questionnaire designed to capture socio-demographic characteristics, WASH service availability and functionality, hygiene promotion activities, waste management practices, accessibility, and user perceptions of service quality and dignity (Board, 2023). The questionnaire was developed in English and adapted with local language support where necessary to enhance comprehension among respondents.

A pilot test involving 10 respondents at Metoro Health Facility informed minor revisions to improve clarity and cultural appropriateness. Data collection was conducted over a two-month period (October–November 2025) by four trained enumerators using the Open Data Kit (ODK) Kobo Collect mobile application. This approach enabled real-time data capture, built-in validation checks, and improved data quality. Daily supervision and routine data reviews were conducted to ensure completeness, accuracy, and consistency.

Data Analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS), version 21, with technical support from a Monitoring and Evaluation specialist. Given the descriptive nature of the study, analysis focused primarily on descriptive statistics, which were appropriate for summarising patterns and user-reported conditions related to WASH–health integration in emergency-affected health care facilities (Pallant, 2020). The dataset was cleaned, coded, and organised into variables aligned with the study objectives and research questions. Analytical techniques included frequencies and percentages to describe response distributions, as well as tables, bar charts, and pie charts for visual representation of key findings. Limited comparative analysis was conducted across facilities and respondent groups where meaningful patterns emerged. The analysis focused on the following key domains:

- Availability and functionality of WASH services, including water supply sources and reliability, sanitation facilities and cleanliness, and hand washing infrastructure with soap and water;



- Hygiene promotion and knowledge, including the presence and reach of hygiene education activities and user awareness of critical hygiene practices;
- Waste management systems, including availability of waste bins, disposal frequency, solid waste management sites, and incineration of infectious waste;
- User perceptions, including perceived cleanliness, accessibility (particularly for persons with disabilities), service quality, and dignity.

Findings were interpreted in relation to the study's theoretical and conceptual frameworks, linking observed patterns to health system performance, user experience, and the effectiveness of integrated WASH and health interventions in protracted emergency setting (Badr & Lhoussaine, 2024). The analysis remained purely descriptive, with no inferential statistical testing, consistent with the study's objective of providing a grounded, context-specific assessment of WASH conditions and integration within selected facilities.

Ethical Considerations

The study adhered to established ethical standards, including informed consent, voluntary participation, confidentiality, and anonymity (Brivot & Cho, 2023). Respondents were fully informed about the purpose of the study and their right to withdraw at any time without consequence. No personally identifiable information was collected, and all data were used strictly for research purposes. Special consideration was given to the humanitarian context to ensure that participation did not disrupt health service delivery or place additional burden on vulnerable population.

IV. RESULTS

This section presents the key findings from 100 research participants and caregivers across four health care facilities (two in Ancuabe district and two in Metuge district) and discusses them in relation to the study objectives. The broader literature on WASH in health care facilities (HCFs), and the context of integrated WASH and health interventions in emergency settings. The results are organized by socio-demographic characteristics followed by WASH-related findings.

Socio-Demographic Characteristics of Respondents

Participants and caregivers constituted the primary respondents in this study, with a clear predominance of female participants (66%) compared to males (34%). In terms of displacement status, the majority of respondents were from host communities (74%), while 24% were internally displaced persons (IDPs) and 2% were returnees. The age distribution showed a youthful population, with most respondents falling within the 18–26 years (35%) and 26–35 years (33%) categories, followed by 36–45 years (22%). Only a small proportion (10%) fell outside these ranges, including those below 18 years, between 46–55 years, and above 56 years.

Livelihood patterns revealed significant economic vulnerability, as nearly half of the respondents (48%) reported having no source of income and relying entirely on humanitarian assistance. Among those with livelihoods, 33% were engaged in farming, 14% in trading, and a smaller proportion (5%) in other occupations such as fishing and government work. In terms of health facility utilization, most respondents accessed services through outpatient departments (46%), followed by paediatric units (31%) and reproductive health services (18%), while only a few used accident and emergency units or inpatient wards (5%). Health-seeking behavior was notably frequent, with 85% of respondents having visited the facility more than twice, compared to 11% who visited twice and 4% who visited only once. More than half (56%) sought care for their own health conditions, while others primarily accompanied children (40%), spouses (3%), or parents (1%).

These patterns highlight the central role of women and caregivers in accessing health services within emergency-affected settings and reflect broader socio-economic and displacement realities in Cabo Delgado. The high dependence on humanitarian assistance and frequent facility visits underscore both vulnerability and reliance on public health systems in crisis contexts (International Organization for Migration [IOM], 2025; United Nations High Commissioner for Refugees [UNHCR], 2026). Furthermore, the dominance of women and young adults in facility utilization aligns with established evidence that caregivers, particularly mothers, are the primary users of health services in displacement settings, especially for child health and reproductive care (Als et al., 2020).

WASH in Health Care Facilities: Cleanliness, Health Promotion, and Organizational Support

Hygiene Promotion, Waste Management, and Critical Knowledge Gaps

**TABLE 1
CLEANLINESS, HEALTH PROMOTION, AND ORGANIZATIONAL SUPPORT**

Aspect	Response/Category	Percentage (%)
Cleanliness Satisfaction	Satisfied	96
	Not satisfied (issues: dirt in the courtyard, urine smell near children's consultation)	4
Awareness of Organizational Support	Aware of support from organizations	6
	Not aware	94
Health Promotion Messages Provided	Acknowledged presence of health promotion messages	94
	Did not know/never heard of health promotion messages	6
Topics of Health Promotion Messages	Malaria prevention	✓
	Diarrhea (AWD)/Cholera prevention	✓
	COVID-19 prevention	✓
	Reproductive health	✓
	Non-communicable diseases	✓
	Importance of immunization	✓

Source: Field Survey, (2025).

Ninety-six percent of respondents reported satisfaction with the overall cleanliness of the health facilities, though a small minority (4%) noted issues such as dirt in courtyards and urine odour near consultation areas. Awareness of external organizational support was very low (only 6%), with 94% unsure or unaware of any partner involvement. Similarly, 94% acknowledged that health promotion messages were provided on topics including malaria prevention, acute watery diarrhea/cholera, COVID-19, reproductive health, non-communicable diseases, and immunization.

These high satisfaction rates with cleanliness contrast with low awareness of supporting organizations and limited partner oversight (discussed later). The findings echo global patterns where user perceptions of cleanliness may not fully reflect underlying system weaknesses in fragile settings (WHO & UNICEF, 2024). In conflict-affected areas of sub-Saharan Africa, similar discrepancies between reported satisfaction and actual service quality have been documented, often linked to low expectations or normalization of suboptimal conditions (Alareqi et al., 2024).

**TABLE 2
HYGIENE PROMOTION, WASTE MANAGEMENT, AND KNOWLEDGE GAPS**

Aspect	Response/Category	Percentage (%)
Hygiene Promotion Availability	Confirmed presence of hygiene promotion	92
	No hygiene promotion	8
Key Hygiene Promotion Messages	Menstrual hygiene	40
	Critical times for handwashing	22
	Personal hygiene	12
	Proper water storage and usage	10
	Use of latrine	5
	Food hygiene	3
Waste Collection Bins	Present	94
	Absent	4
	Don't know	2
Waste Disposal Timeliness	Regular disposal	76
	Not timely	19
	Don't know	5
Solid Waste Disposal Site	Available	89
	Not available	6
	Don't know	5
Incinerator Availability	Present	88
	Absent	12
Inspection of Cleanliness	No inspection	94
	Inspected by supporting organizations	6
Knowledge of Critical Handwashing Times	Could mention at least three critical times	2
	Only mentioned one (after toilet use)	98
Handwashing Stations	Available and used	92
	Not available/not used	8
Soap and Water Availability	Provided	95
	Not provided	5
IEC Posters on Hygiene Promotion	None observed	0

Source: Field Survey, (2025).

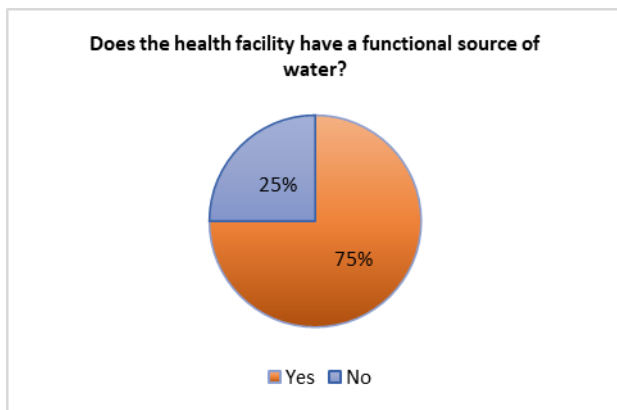
Ninety-two percent of respondents confirmed the presence of hygiene promotion at the facilities. The most commonly recalled messages were menstrual hygiene (40%) and critical times for handwashing (22%), followed by personal hygiene (12%), proper water storage (10%), latrine use (5%), and food hygiene (3%). However, only 8% reported no hygiene promotion.

Waste management showed relatively strong infrastructure coverage: 94% noted waste collection bins, 89% reported designated solid waste disposal sites, and 88% confirmed incinerators for infectious waste. Yet, timeliness of waste disposal was inconsistent (76% reported regular disposal, 19% irregular, 5% unsure), and 94% indicated no routine inspection of facility cleanliness by supporting partners.

Knowledge of critical handwashing times was notably poor: 98% mentioned only one time (after using the toilet), while just 2% could identify at least three critical times. Handwashing stations were reported as available and used by 92% of respondents, with soap and water available according to 95%. However, no Information, Education, and Communication (IEC) posters on hygiene promotion were observed in any facility.

These results reveal a common pattern in emergency settings: reasonable infrastructure coverage coupled with weak behavior change outcomes and limited oversight. Systematic reviews confirm that hygiene knowledge often remains low despite promotion activities, particularly when visual aids and repeated reinforcement are absent (Alareqi et al., 2024; Als et al., 2020). The near-total absence of IEC materials and partner inspections aligns with documented barriers to effective WASH cluster coordination in sub-Saharan African emergencies, including poor inter-sectoral collaboration and insufficient monitoring (Yimenu et al., 2026).

Water Supply



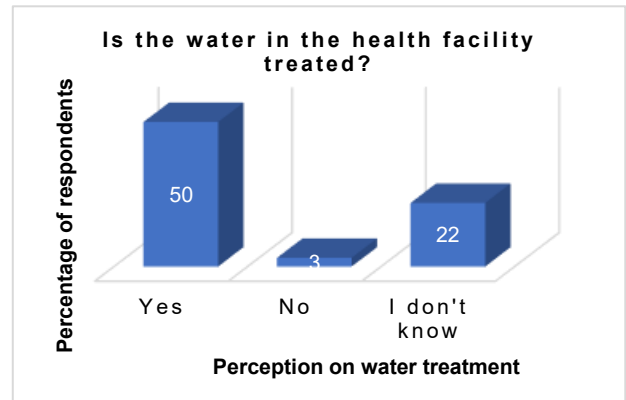
Source: Field Survey, (2025).

FIGURE II KNOWLEDGE OF RESPONDENTS ON THE AVAILABILITY OF FUNCTIONAL WATER SOURCE AT THE HEALTH FACILITY



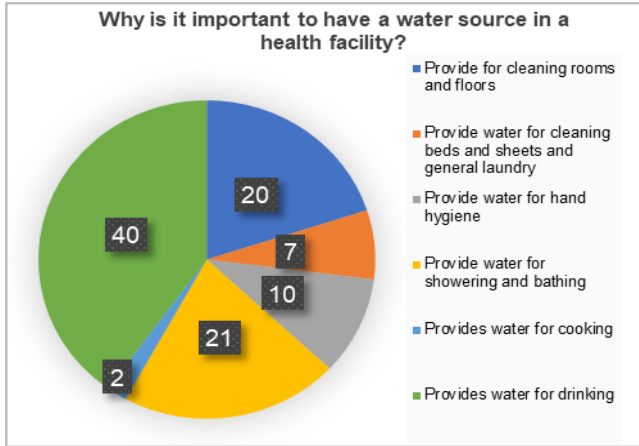
Source: Field Survey, (2025).

FIGURE III PERCEPTION OF THE 75% RESPONDENTS ON THE TASTE OF WATER FOR THE AVAILABE FUNCTIONAL WATER SOURCE



Source: Field Survey, (2025).

FIGURE IV PERCEPTION OF THE 75% RESPONDENTS ON WATER TREATMENT AT THE HEALTH FACILITY



Source: Field Survey, (2025).

FIGURE V PROPORTION OF RESPONDENTS ON THE IMPORTANCE OF WATER SOURCE IN THE HEALTH FACILITY

Seventy-five per cent of respondents reported a functional water source at the visited facilities, with daily accessibility confirmed by those with sources (except at Meza Health Centre, which had none). Main sources included hand pump boreholes (in Metoro General Hospital and Nacuta) and tap water (in Metuge General Hospital). Water quality perceptions were modest: among those with access, 48% rated it acceptable, 26% good, and 1% excellent. Fifty percent reported treatment with Certeza (a point-of-use chlorination product). Perceived uses of facility water included drinking (40%), showering/bathing (21%), cleaning rooms/floors (20%), hand hygiene (10%), laundry (7%), and cooking (2%).

The 25% of respondents who reported the lack of a functional water source (notably at Meza Health Centre) and the variable quality perceptions highlight critical gaps in reliability. These findings are consistent with global evidence showing that fragile and conflict-affected contexts in sub-Saharan Africa continue to have the lowest basic water coverage in health care facilities (World Health Organization & United Nations Children’s Fund, 2024). A recent systematic review and meta-analysis further emphasises that while point-of-use treatment methods are frequently used in healthcare settings, they often fail to provide sustainable and reliable solutions, particularly in low-resource and emergency contexts where infrastructure gaps persist (Gnanasekaran et al., 2024). These patterns align with reports from Cabo Delgado, where repeated conflict-related disruptions have severely affected water access and heightened the risk of disease outbreaks (Mentor Initiative, 2025).

Among respondents who reported functional water sources (n = 75), perceptions of water taste varied across facilities. At Metoro General Hospital in Ancuabe district, 21% of respondents described the water as acceptable, 4% as good, and 1% as excellent. In Metuge General Hospital, 10% rated the water taste as acceptable while 14% considered it good, with no respondents indicating excellent. Similarly, at Nacuta Health Centre in Metuge district, 17% reported the water as acceptable and 8% as good, with no ratings of excellent. Overall, across the three facilities, 48% of respondents perceived the water taste as acceptable, 26% as good, and only 1% as excellent.

Sanitation Infrastructure

**TABLE 3
SANITATION INFRASTRUCTURE**

Aspect	Response/Category	Percentage (%)
Presence of Sanitation Infrastructure	Confirmed presence of sanitation infrastructure	98
	No sanitation infrastructure	2
Types of Toilet Facilities	Simple pit latrine with concrete slab	✓
	VIP latrine with concrete slab	✓
Cleanliness of Facilities	Always kept neat	71
	Not always clean	27
Gender Segregation	Segregated for males and females	63
	Not segregated	35
Accessibility for Disabled Persons	No ramps, slides, or adapted entrances	100 (of those with facilities)
Importance of Sanitation Infrastructure	Improves health, well-being, and dignity of patients/staff	68
	Proper disposal of human waste	28
	Supports menstrual hygiene management	4
Soap & Water Availability at Sanitation Points	Available for handwashing	42
	Not available	56

Source: Field Survey, (2025).

Ninety-eight percent of respondents confirmed the presence of sanitation infrastructure, primarily simple pit latrines or ventilated improved pit (VIP) latrines with concrete slabs. Cleanliness was rated as consistently good by 71%, while 27% reported it was not always maintained. Gender segregation existed in 63% of cases, but 35% reported no separation. Critically, none of the respondents indicated that facilities considered accessibility for persons with disabilities (no ramps, slides, or adapted entrances). Regarding importance, 68% viewed sanitation as improving health, well-being, and dignity of patients and staff, 28% emphasized proper waste disposal, and 4% noted support for menstrual hygiene management. However, only 42% reported soap and water available at sanitation points for handwashing, with 56% indicating absence.

The high presence of basic sanitation but near-total lack of disability-inclusive features and inconsistent handwashing provisions mirrors regional challenges in emergency WASH. Global JMP data and reviews emphasize that inclusivity gaps disproportionately affect vulnerable groups in displacement settings and undermine dignity and equity (WHO & UNICEF, 2024; Als et al., 2020). The low availability of soap at latrines further limits effective IPC, a pattern frequently reported in fragile contexts (Yimenu et al., 2026).

District-Specific Evidence

The study revealed notable differences in WASH conditions between Ancuabe and Metuge districts. The table below summarizes the key findings for each health facility across the main WASH components examined.

TABLE 4
DISTRICT-SPECIFIC WATER SUPPLY AND SANITATION
INFRASTRUCTURE FINDINGS BY HEALTH FACILITY

District	Health Facility	Water Supply	Sanitation Infrastructure	Handwashing Facilities
Ancuabe	Metoro General Hospital	Functional borehole; daily access; mixed quality (mostly acceptable)	Present; mostly clean; limited gender separation	Available with soap & water
Ancuabe	Meza Health Centre	No functional water source	Present; cleanliness inconsistent	Limited
Metuge	Metuge General Hospital	Tap water; daily access; mixed taste perceptions	Present; cleanliness inconsistent; partial gender	Available with soap & water

			separation	
Metuge	Nacuta Health Centre	Handpump borehole; daily access; mostly acceptable quality	Present; cleanliness inconsistent	Available with soap & water

Source: Field Survey, (2025).

TABLE 5
DISTRICT-SPECIFIC HYGIENE PROMOTION FINDINGS BY
HEALTH FACILITY

District	Health Facility	Hygiene Promotion & Knowledge	Waste Management & Oversight	Key Implications
Ancuabe	Metoro General Hospital	Promotion reported; poor knowledge of critical times	Bins & incinerator present; no routine inspection	There is little hygiene promotion
Ancuabe	Meza Health Centre	Promotion reported; poor knowledge	Bins present; no routine inspection	There is little hygiene promotion
Metuge	Metuge General Hospital	Promotion reported; poor knowledge	Bins & incinerator present; no routine inspection	There is little hygiene promotion
Metuge	Nacuta Health Centre	Promotion reported; poor knowledge	Bins present; no routine inspection	There is little hygiene promotion

Source: Field Survey, (2025).

The findings clearly indicate that, in Ancuabe District has relatively better water infrastructure at Metoro General Hospital, but Meza Health Centre stood out with a complete lack of functional water. Sanitation was generally present across facilities, but disability access and consistent cleanliness remained major concerns. And in Metuge District, both facilities had functional water sources, but taste/quality perceptions were lower. High paediatric attendance reflected the heavy burden on caregivers and children. Overall, oversight and inclusivity gaps were evident in both districts. These district-specific findings illustrate that while basic WASH infrastructure exists in many facilities, functionality, inclusivity, hygiene knowledge, and monitoring remain weak. Such variations highlight the uneven impact of integrated WASH and health interventions in emergency-affected areas of Cabo Delgado



Contribution of the Study

This study contributes distinct, user-centered evidence to the literature on integrated WASH and health interventions in protracted emergency settings. Unlike most existing assessments that rely on facility audits or provider reports, this research directly captures the perspectives of 100 patients and caregivers in Ancuabe and Metuge districts, revealing how WASH conditions are actually experienced in conflict-affected health care facilities.

First, the study provides clear district-specific insights into infrastructure functionality. While 75% of respondents reported functional water sources overall, complete absence was documented at Meza Health Centre in Ancuabe, and water quality perceptions remained modest (only 27% rated it good or excellent). These findings corroborate WHO & UNICEF (2024), who report that fragile contexts in sub-Saharan Africa consistently show the lowest basic water coverage in health care facilities. A recent systematic review and meta-analysis further highlights that reliance on point-of-use treatment methods is widespread in healthcare settings, yet such approaches often prove unsustainable due to persistent infrastructure gaps and inconsistent reliability, especially in low-resource and emergency contexts (Gnanasekaran et al., 2024).

Second, the study highlights a critical disconnect between infrastructure availability and behavioral outcomes. Although 92% of respondents confirmed hygiene promotion activities, knowledge was extremely limited: 98% could mention only one critical handwashing time (after toilet use), and no IEC posters were present in any facility. This specific gap directly supports Alareqi et al. (2024) and Als et al. (2020), who demonstrate through systematic reviews that hygiene promotion in humanitarian crises often fails to produce knowledge or practice change when visual aids and repeated reinforcement are absent.

Third, the study exposes pronounced inclusivity gaps. Zero percent of respondents reported disability-inclusive sanitation features (no ramps, slides, or adapted entrances), despite 98% confirming the presence of basic sanitation infrastructure. This finding strengthens Als et al. (2020), who emphasize that women, children, and persons with disabilities are disproportionately affected when humanitarian WASH interventions overlook equity and accessibility.

Fourth, the research reveals systemic oversight weaknesses. Only 6% of respondents were aware of organizational support for the facilities, and 94% reported no inspection of cleanliness by supporting partners.

These results corroborate Yimenu et al. (2026), who identify poor inter-sectoral collaboration, limited data sharing, and inadequate monitoring as major barriers to effective WASH cluster coordination in sub-Saharan African emergencies. By foregrounding patient and caregiver voices in two key IDP-receiving districts of Cabo Delgado, this study adds granular, primary quantitative evidence that bridges the gap between official reports and lived realities. The findings collectively demonstrate that infrastructure presence alone is insufficient for effective integrated WASH-health interventions; functional reliability, inclusive design, sustained behavior change, and strong governance are essential for meaningful impact in protracted conflict settings.

V. CONCLUSION

This study evaluated the impact of integrated WASH and health interventions in emergency response using primary evidence from patients and caregivers in four health care facilities in Ancuabe and Metuge districts, Cabo Delgado Province, Mozambique. The findings reveal a mixed picture: relatively high availability of basic infrastructure coexists with critical functional, inclusivity, behavioral, and oversight gaps. While 96% of respondents expressed satisfaction with facility cleanliness and 98% confirmed the presence of sanitation infrastructure, significant weaknesses persisted. Only 75% reported functional water sources, with complete absence at Meza Health Centre. Handwashing stations were available to 92%, yet soap and water at sanitation points were missing in 56% of cases. Disability-inclusive features were entirely absent (0%), and gender segregation was inconsistent (35% not separated). Hygiene promotion was reported by 92%, but knowledge remained extremely limited, 98% of respondents could mention only one critical handwashing time. Oversight was notably weak, with 94% reporting no partner inspection of cleanliness and only 6% aware of organizational support.

These results demonstrate that infrastructure presence alone does not guarantee effective integration of WASH and health interventions. The study highlights a clear disconnect between availability and functionality, between promotion and actual behavior change, and between service provision and equity/inclusivity. In the context of protracted conflict and large-scale displacement in Cabo Delgado, such gaps increase risks of healthcare-associated infections, reduce trust in services, and undermine dignity particularly for women, children, IDPs, and persons with disabilities.

Overall, the findings reinforce that sustainable improvements in emergency health outcomes require more than standalone WASH inputs. True integration, combining reliable infrastructure, inclusive design, sustained behavior change, and strong monitoring, is essential for building resilient health systems in fragile settings. This user-centered study from Ancuabe and Metuge provides actionable, ground-level evidence to inform more effective humanitarian programming in similar protracted emergency contexts.

VI. RECOMMENDATIONS

To enhance the effectiveness, sustainability, and impact of integrated WASH and health interventions in emergency settings such as Cabo Delgado, the following targeted recommendations are proposed for humanitarian actors and donors:

1. Ensure functionality, reliability, and maintenance of WASH services. Humanitarian actors should prioritize not only the provision but the continuous functionality of WASH infrastructure in health facilities. This includes rehabilitating non-functional systems (e.g., water supply gaps observed at Meza Health Centre), implementing preventive maintenance schedules, and ensuring consistent availability of water, soap, and sanitation supplies. Routine water quality testing and clear maintenance responsibilities at facility level are essential to sustain service delivery.
2. Strengthen integrated WASH–Health programming and coordination. WASH interventions should be fully embedded within health service delivery systems, particularly infection prevention and control (IPC). This requires structured collaboration between WASH and health teams at facility and district levels, joint planning, and shared indicators. Integrated approaches should replace parallel programming to improve efficiency, service quality, and health outcomes.
3. Enhance hygiene promotion through sustained behavior change strategies. Hygiene promotion should move beyond awareness creation to focus on measurable behavior change. Humanitarian actors should implement continuous, culturally appropriate, and language-sensitive engagement using multiple channels, including visual IEC materials, demonstrations, and interpersonal communication. Emphasis should be placed on improving knowledge of critical hygiene practices, particularly handwashing at key times.
4. Mainstream inclusivity, gender sensitivity, and protection in WASH services. All WASH interventions must ensure equitable access and dignity for all users. Facilities should be designed or retrofitted to include disability-friendly features (ramps, adapted latrines), gender-segregated sanitation, and safe, private spaces for women and girls. Special attention should be given to vulnerable groups, including persons with disabilities, internally displaced persons, and caregivers.
5. Strengthen monitoring, accountability, and community engagement. Humanitarian actors should institutionalize routine monitoring systems, including regular facility inspections, functionality assessments, and cleanliness checks. These should be complemented by user feedback mechanisms that capture patient and caregiver experiences. Community engagement in hygiene promotion, facility upkeep, and accountability processes should be promoted to enhance ownership and sustainability.
6. Prioritize funding for functionality, sustainability, and system strengthening. Donors should shift from short-term infrastructure outputs to long-term service functionality and resilience. Funding should include dedicated allocations for operation and maintenance (O&M), system rehabilitation, and continuous service delivery, ensuring that WASH infrastructure remains functional over time.
7. Incentivize and require integrated WASH–Health programming. Funding frameworks should promote integrated, multi-sectoral approaches by requiring proposals that demonstrate strong linkage between WASH and health interventions, including IPC. Donors should encourage joint outcomes, shared indicators, and coordinated implementation to reduce fragmentation and maximize impact.
8. Invest in sustained behavior change and communication interventions. Donors should allocate specific resources for comprehensive hygiene promotion strategies that go beyond one-off campaigns. This includes funding for IEC materials, community engagement, and behavior change expertise to ensure that infrastructure investments translate into improved practices and health outcomes.
9. Enforce inclusivity, protection, and quality standards. All funded interventions should adhere to minimum standards for disability inclusion, gender sensitivity, and user safety. Donors should require implementing partners to demonstrate how these standards are integrated into design, implementation, and monitoring, with clear accountability mechanisms.

10. Lastly the study recommends for strengthening of monitoring, coordination, and flexible long-term financing. Donors should support robust monitoring, evaluation, and learning systems, including joint assessments and real-time data tracking. Investment in coordination platforms and information systems is essential to improve alignment across actors. Additionally, flexible and multi-year funding should be prioritized to address the realities of protracted crises and enable a transition from emergency response to sustainable system strengthening.

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