ISSN: 2577-8455

Research Article

Archives of Infectious Diseases & Therapy

Barriers to Water, Sanitation and Hygiene Practices in Mutare District, 2022

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Submitted: 2024, May 07; **Accepted:** 2024, Jun 28; **Published:** 2024, Jul 24

Citation: Chokuona, K. F. V., Mukuzunga, M., Gombe, N. T., Chadambuka, A., Juru, T. P. (2024). Barriers to Water, Sanitation and Hygiene Practices in Mutare District, 2022. *Archives of Infect Diseases & Therapy, 8*(2), 01-07.

Abstract

Background: *Sanitation and hygiene are extremely important for survival, development and health. Inadequate sanitation expose people to water, sanitation and hygiene related diseases. Mutare district has been increasingly recording unsatisfactory bacteriological tests from the first quarter of 2019 to the first quarter of 2023 and water-borne infections have been increasing. We evaluated the WASH program in Mutare district.*

Methods: *We conducted a program evaluation using logical framework approach. Twenty-one health facilities were sampled and 63 participants recruited. An interviewer-administered questionnaire was used to assess healthcare worker (HCW) knowledge and review of environmental records was done. Resources required for the health facilities WASH programs were assessed using a checklist. Frequencies, means and proportions were generated.*

Results: *The median years of service of HCW was 9 years. The district lacked land and water pollution control strategies and consumables for water bacteriological testing. Aquatabs were in limited supply. Some of the visited health facilities (6/21) poorly segregated waste, although all the HCW were mentored on WASH activities.*

Conclusion: *Inadequate water test kits and other resources compromises the performance of the WASH program. Segregation of waste appropriately reduces the risk of infection and injuries among the waste handlers.*

Keywords: WASH, Resources, Waste, Mutare District

1. Introduction

Water, sanitation and hygiene are interdependent fields abbreviated as WASH [1]. WASH is important for a child's being and is at the center of child health and development. Clean and safe water supply allows children to attend school and increase the time for parents to generate family income, thereby improving their health and prosperity [2]. Sanitation and hygiene are extremely important for survival, development and health. Inadequate sanitation expose people to water, sanitation and hygiene related diseases such as acute respiratory infections, maternal and neonatal sepsis, malnutrition (through diarrhea and intestinal parasites infections), malaria, cholera, typhoid, polio, rotavirus (through the fecal-oral route) and neglected tropical diseases such as schistosomiasis and trachoma [3-5]. Basic sanitation is defined as acquiring safe disposal of human waste (feces and urine) facilities and being able to maintain good hygiene through collection of garbage, management of hazardous waste and in treatment and disposal of wastewater [3].

Globally, a third of the population lack access to basic hygiene at home such as a hand washing station with soap and water [3]. By 2020, the United Nations' Sustainable Development goal (SDG) 6 was for every human being to have "adequate and equitable" sanitation and basic hygiene [3]. In 2016, globally, 1.9 million deaths and 123 million disability-adjusted life-years (DALYs) were reported linked to inadequate WASH facilities [5]. The burden of these WASH related diseases amounts to 4.6% of worldwide DALYs and 3.3% of global deaths [5]. This burden of deaths in children under 5 years was 13% [5]. According to United Nations Children's Fund (UNICEF), in 2015, over 300000 children under the age of five died from diarrheal diseases linked to poor WASH [6]. Proper practice of hand washing yields a healthy development of children and improves school attendance [6]. Worldwide; the fifth cause of death in children is diarrhea resulting from risk factors such as poor sanitation and unsafe drinking water.

In West and Central Africa, people practice unsafe hygiene of open defecation and an estimate of 40% of the population have inadequate sanitation. More than a third of people in this region lack access to safe water putting them at risk of water related diseases [7]. In Zimbabwe, according to the Multiple Indicator Cluster Survey (MICS) in 2019, 83.7% households had fecal contamination of drinking water sources and 36.8% households lacked a hand washing facility with soap and water increasing the risk of diseases linked to WASH [8].

The hygiene stations for the community should either consist of refillable buckets with taps equipped with liquid soap or alcohol based hand rub or should consist of piped tap water supply with sinks [9]. The use of ash can be considered when soap or alcohol-based hand rub are not available, as it has shown to be effective is some instances [9]. Ash may inactivate pathogens by raising the pH but in communities with poor sanitation soil can be fecally contaminated increasing the risk of diarrheas. Toilets and bathrooms should be cleaned at least once per day with household disinfectant of 0.1% sodium hypochlorite [9]. Each household should have a source of clean water for drinking and home use, a toilet, a waste pit and a hand washing facility with soap [8].

Countries are struggling to meet the SDG targets particularly on WASH, which is SDG 6 (ensure availability and sustainable management of water and sanitation for all) and on health which is SDG 3 (ensure healthy lives and promote well-being for all at all ages) [10]. Better WASH services strengthens health systems in allowing effective responses to emergencies (outbreaks and natural disasters), in preventing disease outbreaks and in bringing emergencies under control when they occur [10].

According to WHO, the activities of the WASH program include water sampling, water chemical tests, water bacteriological tests, water pH measurement, water turbidity measurement, disinfection of contaminated water sources, building of toilets to all households and community education on effects of open defecation [11]. The main goal of the WASH program in Zimbabwe is to save lives that could be lost due to WASH related diseases and illnesses through goals such as improvement of local authorities to in producing safe water for residents and communities, improvement in the management of sewage and solid waste with minimal sewage outflows in residential areas thereby reducing the posed environmental hazard and improvement in the accountability and management of local authorities, developing a supportive policy environment [12]. This is achieved through activities such as assessment of water and sewage infrastructure, capacity building on dump site management, transportation of solid waste, participatory health and hygiene education, hygiene promotion campaigns and support policy formulation processes [12].

Mutare district has been increasingly recording unsatisfactory bacteriological tests from the first quarter of 2019 to the first quarter of 2023 (District Environmental Records). The unsatisfactory bacteriological tests confirm fecal contamination (WHO cut off of >1 coliform/100mls of water) of the drinking water sources. The total sanitation coverage of Mutare District is 38% against a WHO target of 100% further weakening the WASH program by increasing the risk of contaminating drinking water sources and recreational water sources. The water-borne infections such as diarrhea, dysentery and cholera have been increasing in Mutare District which could be attributed to poor water and sanitation. It is against this background that we evaluated the WASH program in Mutare district 2023.

Research Question: Why is the WASH program underperforming in Mutare district?
Broad Objective: To evaluate the WASH program in Mutare district, 2023.
Specific Objectives:
• To evaluate the processes involved in the WASH program in Mutare district, 2023.
• To evaluate the inputs needed to run the WASH program in Mutare district, 2023
• To assess the outputs of the WASH program in Mutare district, 2023.
• To assess the knowledge levels of HCWs on WASH in Mutare district, 2023

2. Materials and Methods

2.1. Study Design

The study type was a program evaluation using logical framework approach in figure 1.

Logical framework process-outcome for the WASH program in Mutare district.

Inputs	Processes	Outputs	Outcomes	Impacts
WATER -Human Resources -Water monitoring and evaluation -Bacteriological kits for treating water -Chemical kits for treating water -Laboratory water culture media -Water pollution control policies and strategies -Aquatabs SANITATION -Hardware component (cement, ironsheets, timber, mashwire, bricks, riversand, pitsand, builders) -Manpower -Software component (toilets plan) HYGIENE -Buckets with taps -Liquid soap -Pot racks -Refuse pits	WATER -Planning -Conduction of water quality monitoring by EHTs -Training of HCWs on water quality monitoring -Conduction of water quality monitoring by laboratory -Training of household water quality monitoring. SANITATION -Planning -Community education on effects of open defecation -Sourcing of building materials -Building pit latrines HYGIENE -Planning -Sourcing the buckets and liquid soap -Digging of refuse pits -Building pot racks	WATER -HCWs trained in water quality monitoring -Number of water quality monitoring meetings conducted at facilities -number of lab staff trained in water quality monitoring SANITATION -Number of household with safely treated water -Number of households with pit latrines -Number of households with refuse pits HYGIENE -Number of households with pot racks -% coverage of hand washing buckets with liquid soap	-Quality water provision with low turbidity -Quality water provision with no fecal coliforms. -Improved infrastructure -Improved operation and management -Increased number of internal and external water safety meetings -Increased consumer water safety trainings -Increased knowledge and understanding of hazards -Increased drinking water quality standards -Increased sanitation coverage -Increased refuse pits	-Service continuity -Water coverage -Water quality -Reduction in morbidity and mortality of water related illnesses. -Open defecation free community

Figure 1: Logical Framework Process-Outcome Evaluation for the WASH Program in Mutare District, 2023 (Source-Multiple Sources of Literature Review)

2.2. Study Setting

The study was conducted in Mutare district, Manicaland Province. Mutare district has 46 health facilities. According to Census 2022, population projections, Mutare has a total population of 306760 with 41.6% constituting of children under 15 years of age.

2.3. Study Population

The study population was healthcare workers in Mutare district who included nurses, environmental health officers and field orderly members. Environmental Health Officers and sisters in charge participated as key informants.

2.4. Sample Size Calculation

Sample size was calculated using the Dobson formula $\mathbf{n= z^2p (1-p)/d^2}$. Using sensitivity analysis, with a power of 80% and 95% level of confidence we used staff shortage, provision of waste management services and lack of access to hand sanitizers as the risk factors [13-15]. The minimum sample size calculated was 63 **(table 1).**

Table 1: Sample size calculation using Dobson's formula

Variable	p / proportion of cases	Calculated minimum sample size
Staff shortage	0.957	63
Waste management services	0.972	42
Lack of hand sanitizers	0.958	62

2.5. Sampling

Systematic random sampling was used to select 21 out of 54 health facilities in Mutare district participating in WASH services. Simple random sampling was done to select the study participants.

2.6. Data Collection

Data was collected using pre-tested interviewer administered questionnaire for healthcare workers (HCWs). The questionnaire collected information on knowledge levels among HCWs on WASH program. Qualitative data was collected using a key informant interview guide. Review of community environmental records was done. Resources required for the health facilities WASH programs were assessed using a checklist. These included pit latrines, buckets with soap and water, refuse pits and water pollution control policies.

2.7. Data Capture and Analysis

Data was captured and analyzed using Epi Info 7 statistical package. Cleaning of data was done before analysis. The same software was used for univariate analysis to generate frequencies, means, medians and proportions.

2.8. Ethical Considerations

Permission to carry out the study was obtained from Mutare District Health Executive and Health Studies Office (HSO). To ensure confidentiality, names of participants were not required and unique identifier codes were used to maintain anonymity. Informed written consent was sought from all participants. Participants signed consent forms as part of enrolment. Records

of data collected were secured under lock and key. Only the researcher have access to the data and data will be shared with the field and academic supervisors only.

3. Results

A total of 63 participants were successfully recruited and they predominantly constituted of females 46 (73.0). The median years is service was 9 (Q1=4; Q3=15) and majority were registered general nurses 25 (39.7). Assessment of inputs for the WASH program in Mutare district in 2023 was done and the findings are presented in table 2.

Table 2: Inputs provided for the WASH program in Mutare district 2023

Input	Target	Available n (%)	Comment
Bacteriological kits: MLSB **Membrane pads** **Filter pads** **Methanol** **Methylated spirit**	100 100 100 100 100	0 0 0 0 0	Need at least 680g/year Need at least 500 pads/year Need at least 500 pads/year Need at least 2 litres/year Need at least 2 litres/year
Turbidity kits	100	100	Need turbidity metres
pH meter	100	100	Need batteries
Chemical kits: Flouride test kit **Ammonia test kit** **Nitrates test kit** **Nitrites test kit** **Cyanide testing tablets** **Arsenic test kit**	100 100 100 100 100 100	0 0 0 0 0 0	Need 500 tests per chemical/ year
Aquatabs	100	3000/300000 (10)	Need approximately 300000 tablets to supply the 79404 households in the district
Water pollution control policies and strategies	100	0	
Hand washing facilities	100	-	Reported to be few, actual data not available
Refuse pits	100	-	Reported to be many, actual data not available
Households with standard blair ventilated pit latrine (BVIP)/flush toilet	100	30174/79404 (38)	

*value of n varies from each input

Mutare district establishment of healthcare workers is 60% (Mutare district health information department records). The district is lacking water pollution control policies, consumables for bacteriological tests which include membrane lauryl sulphate broth, membrane pads, filter pads, methanol and methylated spirit and chemical kits to test for presence of fluoride, ammonia, nitrates, nitrites, cyanide and arsenic in the water sources. Aquatabs were in limited supply 3000 (10%) against the minimum stock expected. The households in Mutare district have a better refuse pit coverage but the hand washing facilities and sanitation coverage are very low.

All the study participants were trained and mentored on WASH activities and the EHTs trained the Mutare district community on accessing safe water sources for drinking and home use and to exclusively defecate in toilets. However, a few households were participating in sourcing building materials for toilets through health clubs to improve the 38% sanitation coverage.

Out of the 1694 community water points in Mutare district (RWIMS data) which were supposed to be bacteriologically tested every quarter of the year, only 555 water samples were collected and tested (10.9%) in the past three quarters **(figure 2).** A total of the 533 (96.0%) water samples were tested from the collected water samples and 142 (25.6%) of them were fecally contaminated.

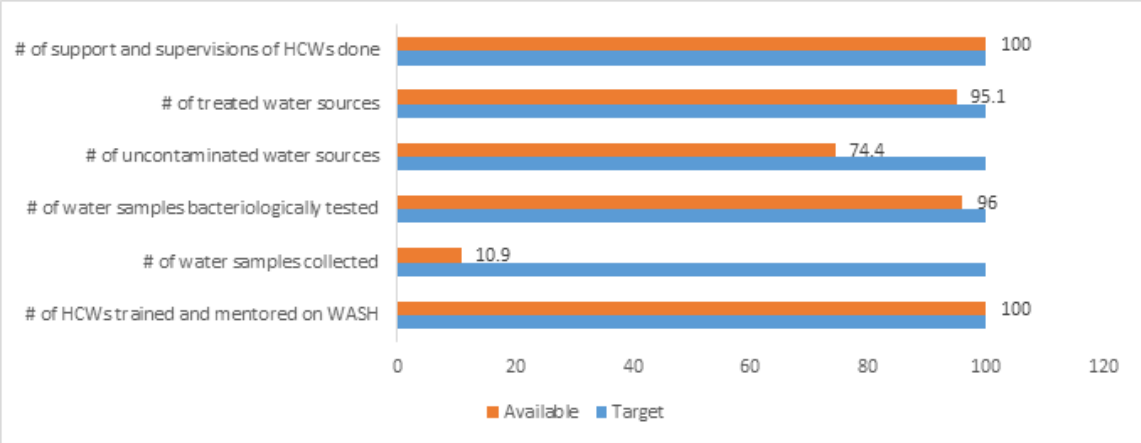

Figure 2: Outputs for the WASH program in Mutare district 2023

The knowledge levels of the study participants were assessed using a 3 point likert scale on 30 questions about the indicators of WASH, the groups at high risk of poor WASH facilities, how to prevent diarrhea, demonstration of proper hand washing and their roles in WASH. Majority knew the proper procedure for hand washing 39 (61.9%) and the knowledge levels towards the WASH program were predominantly fair 49 (77.8%).

The WASH program was predominantly perceived to be affected by lack of resources 40 (60.3%), **figure 3.** Some of the participants reported that there was lack of consumables for bacteriological testing, while some reported lack of resources to repair toilets and some lack of resources to service boreholes. The community was perceived to be reluctant towards the WASH activities such as using unsafe water sources and practicing open defecation. All the healthcare workers admitted that they rarely washed their hands when moving from one ward to the other and 37 (50.8%) of the participants perceived that poor performance of WASH was attributed to reluctance of HCW on hand washing.

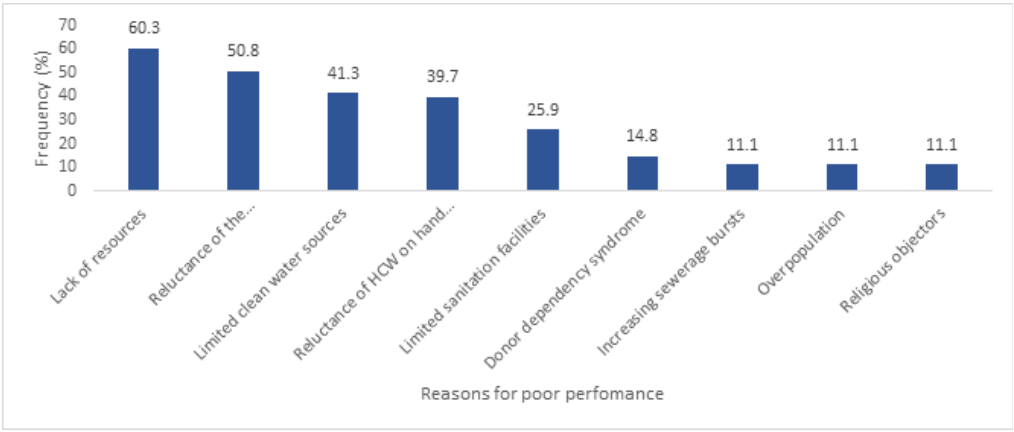

Figure 3: Perceived reasons for poor performance of WASH in Mutare district 2023

Majority of the facilities 20/21 had accessible improved water sources but 12/21 of them reported seasonal shortages of water. Only 5/21 facilities used one toilet for both patients and HCWs. Facilities predominantly 15/21 improperly segregated infectious and non-infectious waste.

4. Discussion

Mutare district had adequate EHTs but other health care workers were inadequate to assist in the implementation of the WASH program amongst other responsibilities. This could increase the workload on the staff members thereby affecting the implementation of some of the WASH activities in Mutare district. Moreover, HCWs in Mutare district were reluctant in routine hand washing as they rarely washed them on moving between wards and perceived they were safe with the use of gloves during their work. Similar findings were reported by Gedamu et al in an Ethiopian study where high workloads affected hand washing attitude of the HCWs as they thought washing hands was taking more time resulting in increased Healthcare Associated Infections (HAIs) [16]. Another study in South Africa by Shezi et al reported that a low ratio of healthcare workers against the population ratio was a barrier towards good performance of the WASH interventions [17].

The resources needed for the WASH program were inadequate and not available in some occasions. The resources included the bacteriological test kits and chemical test kits which is critical for running the WASH program. The participants mentioned that some of the boreholes were serviced to improve on the provision of safe water supply but they were not yet in use as they were

not yet sampled and tested for fecal contamination following the cholera outbreak. The limited water sources in some areas made the community to keep using the unsafe water sources such as water from the rivers and unprotected wells with the limited aquatabs to purify the water keeping exposing them to water related illnesses such as diarrheas. A study in Uganda also supports that limited resources and poor water supply resulted in increased risk of WASH related infections particularly in the immunocompromised groups [14].

Mutare district lacked water pollution control policies and strategies which could ensure clean and safe water to the community and healthcare workers. The high fecal contamination rate on a third of the tested water sources can be attributed to the lack of these water pollution control policies which could provide technical guidance in ensuring healthy and clean environment; although the EHTs continue to educate the community on effects of open defecation and water pollution. In a study by Odjegba et al, Nigeria had no existing policy in all the primary healthcare centres but used a technical guidance supported by UNICEF so as to improve the WASH facilities in the health sector [18]. Kayiwa et al also evidenced that open water sources did not meet the WHO standard of 0 CFU/100 ml of water and encouraged use of piped water sources [14].

Lack of a hand washing facility in majority of the Mutare district households exposed the population to the spread of water related illnesses and compromised the interventions applied in the infection prevention of control for diseases such as cholera, dysentery and other diarrhoeas. This could be due to limited funds which also affected the sanitation coverage in Mutare district. Although some of the community members are participating in the health clubs and financially supporting each other in improving the WASH program through establishing a blair ventilated pit latrine, some members still have the donor dependency syndrome where they keep waiting for donors to fund in the building of their toilets. This makes the sanitation coverage remain low and theeffects to control the spread of outbreaks such as cholera outbreak are compromised. In Uganda, Kayiwa et al reported that efforts to control the spread of Ebola and COVID-19 were compromised by lack of functional hand washing facilities [14].

Although all the selected facilities segregated used needles in the sharps tins, some of the facilities did not segregate the infectious and non-infectious waste in waste bins while some disposed waste directly into unlined bins. This exposed waste handlers on waste management and incineration. The study findings concur with an Ethiopian study by Tadesse and Kumie et al and a study in Uganda by Kayiwa et al, where improper waste management exposed HCWs to infection and injuries [14,19].

The trainings and mentorship received by HCWs on WASH activities improved their infection prevention and control skills and enhanced their knowledge in the management of WASH related infections. The WASH sensitization sessions done at health facilities and the community education done by EHTs also assisted in controlling the spread of WASH related diseases. The good infection control measures are directly linked to good knowledge on WASH as evidenced by Garba et al in a Nigerian study [20]. Another study in Ghana by Labi et al also indicted that, health education, proper hand hygiene and provision of essential supplies improve WASH services [21].

Limited sanitation facilities in some of the health facilities in Mutare district can increase the risk of spread of hospital infections to both the healthcare workers and the patients. This follows as the toilets are messed up easily by the increased patient and staff load. Supported findings were reported in India where the maternal and neonatal sepsis increased due to the limited sanitation facilties [22]. In a Nigerian study, Odjegba et al also evidenced that poor sanitation facilities expose patients and HCWs to healthcare associated infections [18].

5. Limitations

Some records were missing such as hand washing facilities coverage and refuse pits coverage from the environmental departmental records resulting in the inability to establish some of the outputs of the WASH program. The study also mainly assessed on health facilities WASH and not broadly on WASH in schools and WASH in the community lacking the true representation of the WASH program in Mutare district.

6. Conclusion

Segregation of waste appropriately reduces the risk of infection and injuries among the waste handlers. Proper hand washing among healthcare workers is encouraged to minimize the risk of contracting healthcare associated infections. Inadequate water test kits and other resources compromises the performance of the WASH program. Limited sanitation facilities exposes both the patients and healthcare workers to nosocomial infections. We recommended prioritization of increasing health facilities sanitation facilities, provision of water and land pollution strategies, engagement of public works for sewerage repairs and refreshing HCW on proper handwashing and proper waste disposal

7. Public Health Actions

The Public Health Officer sourced the water and land pollution control policies and strategies from Environmental Management Agency (EMA) and distributed them to Mutare district. All the healthcare workers who participated in the study were refreshed on proper hand washing, proper waste disposal and other WASH services.

8. Acknowledgements

The authors acknowledge the Manicaland Provincial Medical Directorate for their support in conducting this study. The authors are also thankful to the Zimbabwe MPH-FETP program and Centers for Disease Control and Prevention (CDC) Zimbabwe for technical assistance.

9. Authors' Contributions

KC: conception, design, acquisition, analysis and interpretation of data and drafting the manuscript. MM: conception, design, acquisition, analysis and interpretation of data and drafting the manuscript. NG: conception, design, data collection, analysis, interpretation and reviewing of several drafts of the manuscript

for important intellectual content. AC: conception, design, data collection, analysis, interpretation and reviewing of several drafts of the manuscript for important intellectual content. GS: conception, design, data collection, analysis, interpretation and reviewing of several drafts of the manuscript for important intellectual content. TJ: conception, design, data collection, analysis, interpretation and reviewing of several drafts of the manuscript for important intellectual content. MT: conception, design, data collection, analysis, interpretation and reviewing of several drafts of the manuscript for important intellectual content. All authors read and approved the final manuscript.

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