Water, Sanitation, and Hygiene Service Status and Its Barriers at Public Healthcare Facility in the City of Addis Ababa: It's Implication for COVID-19 pandemic and Healthcare Acquired Infection Prevention.

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November, 2022

Addis Ababa, Ethiopia

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This Thesis Submitted to Addis Ababa University Ethiopian Institute of Water Resource, in Partial Fulfillment of the Requirements for the Master Degree in Water and Public Health.

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Addis Ababa, Ethiopia

Thesis Declaration Form

I undersigned, agreed to accept all responsibilities for the scientific and ethical conduct of the research project and for the provision of required thesis report as per the terms and conditions of the requirements of the department. I was providing timely progress report to my advisors and seek the necessary advice. Finally this thesis report has been approved by my advisors, examiner and institute director in the course of the thesis research work.

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1. External examiner name _____Signature: _____ Date: _____

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3. Chairperson name_____ Signature: _____ date_____

Name and Signature of institute director

Name_____ Signature: _____ Date: _____

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Acronyms and Abbreviation

AMR	Antimicrobials Resistance
COVID-19	Coronavirus Disease
DALYs	Disability Adjusted Life Years
HAI	Hospital Acquired Infection
HCAI	Health Care Acquired Infection
HCF	Health Care Facility
IPC	Infection Prevention and Control
JMP	Joint Monitoring Program
LMICS	Low and Middle Income Countries
SARS	Severe Acute Respiratory Syndrome
SDGs	Sustainable Development Goals
UN	United Nation
WASH	Water Sanitation and Hygiene
WHO	World Health Organization

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Abstract

Background: The public health significance of healthcare Water, Sanitation, and Hygiene (WASH) service in reduction of nosocomial infection and improving quality of care is paramount. However, little is known on the status of WASH service in a health care facility at the time of pandemic and the barriers that hinder the service in the health care setting in Ethiopia.

Objective: The aim of this study was to assess status of basic water, sanitation, hand hygiene, healthcare waste management, and environmental cleanliness service and its barriers at public health care facilities in the city of Addis Ababa, Ethiopia 2022.

Methods: Institutional-based survey convergent parallel mixed design was conducted among 86 public health care facilities (11 hospitals and 75 health centers located in Addis Ababa city). Stratified sampling technique was used to select health care facilities. A semi-structured observational checklist tool was used to measure the availability of services. For the qualitative study, purposively 16 key informants were selected for the interview. Semi-structured interview guide was used to identify the barriers and thematic data analysis was done.

Finding: This study found that no one healthcare facility had basic access to overall WASH services. The independent WASH domain analysis showed that, about 86% healthcare facilities had basic water access, 100% had limited sanitation access, 88.4 % had limited hand hygiene service, 69.8% had limited healthcare waste management service, and 97.7% had limited environmental cleaning service. Built environments of WASH infrastructure; Resource availability and allocation; leadership and stakeholder participation; inadequate training and poor behavior; and legal issues were identified barriers to provision of basic healthcare WASH services.

Conclusion and recommendation: The availability of healthcare WASH services in Addis Ababa city remains far from the pace to achieve the sustainable goal target by 2025. The overall availability of healthcare WASH services in Addis Ababa was limited that attributed to inadequate WASH infrastructure, inadequate resource, poor government commitment, and absence of framework and guideline. Limited access to WASH services and multiple existing challenges at healthcare facilities makes worsening the prevention and control of COVID-19 pandemics, healthcare acquired infection which indicating that the country need to act now on more financial investment, capacity building, facilitating committed leadership, and participation of stakeholders to ensuring basic WASH services at healthcare setting.

1. Introduction

1.1. Background of study

The collective provision of adequate WASH(Water Sanitation and Hygiene) service is target of sustainable developmental goal (SDG) for universal access to WASH services for all by 2030, and this is an essential for human health and well-being as a part of strategies to break the cycle of poverty and to prevent emerging and reemerging infectious disease including Ebola and COVID-19 in the developing countries (1). WASH services in health care facilities refer to the provision of water, sanitation, hygiene, health care waste management, and environmental cleaning infrastructure, and services across all health care facilities which includes all formally authorized health care facilities to provide health care service in the public and private sector (2).

Availability of sustainable WASH in a health care facility is critical for quality care to meet individual preferences, needs, and values; without minimum standards of WASH service in all health care facilities cannot meet the demand for good quality of care and human right to health (3). Provision of basic WASH service is a prerequisite for infection prevention and control(IPC) which can protect front-line health care workers, patients, visitors from infectious disease transmission in a health care setting(Ebola, pandemic influenza, hemorrhagic fevers, SARS, COVID-19 and other); and it is human rights, dignity, social justice and gender issue for care seekers, health care workers and other staffs at any health care setting (3,4).

Inadequate WASH remains one of the determinants of the global burden of disease; as pointed out by Pruss-Ustun et.al (5), globally, WASH is attributable to 2.8%(1.6 million) of all death and 104.6 million DALYs and an estimated 829,000 WASH attributable death and 49.8 million DALYs occurred from diarrheal disease in 2016; in the under 5 children 297,000 WASH-attributable diarrheal death occurred, which accounts 5.3% of all death among under 5 children.

Health care WASH is more important than ever in the role of prevention of COVID-19 and AMR among patients, staff, or community (6,7), and barriers that contributed to poor health care WASH provision result from a complex interaction of factors. Assessing the availability of WASH service in HCF (health care facility) based on new service ladder, exploring the underline barriers that contributed to poor health care WASH provision, and implication of poor WASH service to COVD-19 pandemic are the focus area of the study.

1.2. Statement of the problem

Lack of basic healthcare WASH services is a major public health problem, and it continues a challenge to international communities. Emerging and reemerging diseases like Antimicrobials Resistance (AMR), Ebola, and COVID-19 pandemic place WASH as a center of disease prevention. However, worldwide 11% of healthcare facilities had no water service, 10% of health care facilities had no sanitation service, and only 51% of health care facilities had basic hand hygiene service at the point of care and nearby toilet by 2022, which makes hundreds of millions of people are face risk of infection; since more than 681 million people lacked basic waste management service in health care facilities in Sub-Sahara African countries, and 3.85 billion people worldwide lacked basic hand hygiene service at their healthcare facilities (8).

The Lancet review reveals that healthcare-associated infection burden is much higher in developing than developed countries, which is more than 15% of patients developed an infection when they are staying in hospitals; and the risk of patients admitted to health care facility acquire one or more infection is two to twenty times higher developing than developed countries (9,10). Systematic review findings in Africa reveal that poor WASH services provision in HCF causes women to choose home delivery and increase patient dissatisfaction in low and middle-income countries (11).

We argue that health care professionals are at the front line of protecting clients from infection and covid-19 pandemic response, and they are exposed to infection when they are working in a high-risk environment. As reported by Desta et.al (12), the availability of supplies and infrastructure of WASH service is critical to safeguard health care professionals and to enhance the practice of IPC. The lesson gain from Ebola outbreak and Severe Acute Respiratory Syndrome (SARS) implies poor WASH service in the health system ready-made to expose clients and frontline workers to infection and expand the COVID-19 pandemic. Worldwide the proportion of health care workers infected with SARS was from 20% to 60% (13); and Cooper et.al reported, there was challenging to expand the outbreak of Ebola in Liberian healthcare facilities with poor WASH services for IPC (14).

Ethiopia launched WASH initiatives, clean and safe health facility (CASH), and sector-wide One-WASH national program (OWNP) (15), to improve WASH service in a health care facility,

which has public health significance in the reduction of nosocomial infection, improving quality of care, increasing healthcare-seeking behavior, and averting cost expend for infection. However, there is a dearth of evidence on the status of basic health care WASH service and the barriers that setback the provision of WASH services in a health care setting in Ethiopia. Therefore the aim of this study was to assess the status of basic WASH services availability and explore the barriers to providing adequate WASH services in public health care setting through mixed research design in the city of Addis Ababa, Ethiopia.

1.3. Significance of the study

By blending quantitative and qualitative data this research will provide strong evidence to literatures on the status of health care WASH service availability and its barriers which could contribute to Ministry of Health, Addis Ababa City Regional Health Bureau, and health care facility director for decision making, to allocate resources, to set healthcare WASH standard, develop an intervention to meet the barriers and audit tools that able to track improvement and progress of healthcare WASH SDG targets; the finding also contribute to understand the implication of existing WASH services in health care setting related to infection prevention and capacity to face challenges of AMR and COVID-19 pandemic; the finding of this study will be used in the advocacy and recommend actions related to the need of women, girls and disable person in the health care facility; It will help to established safe environments for patients and staffs; It also gives an insight for researchers to conduct nationwide further research.

1.4. Research questions

- What is the status of WASH service availability based on the JMP service ladder in public health care facility in the city of Addis Ababa?
- What are the barriers to the provision of healthcare WASH services in public health care facility in the city of Addis Ababa?
- What will the implication of current status of health care WASH service to the prevention of COVID-19 pandemic?

2. Literature Review

2.1. Availability of WASH service at the health care facility

History in WASH has an important role in prevention and fundamental for health security; at time foundation for preparedness and response of pandemic, as such COVID-19 disease has amplified the importance of WASH at the healthcare facility, households, schools, and any workplace and public area. However, in a large number of countries in the world, the existing WASH service is not good enough to face the current pandemic (4,16,17).

Sustained availability and continued use of WASH services must be in place whenever at any health care facility. Recent systematic review analysis reveals that hygiene interventions focusing on hand hygiene education, hand washing infrastructure, equipment disinfection, patient hygiene, aseptic technique, and environmental cleaning, were consistently protective against HCAIS in IMLCs (18).

There is a global call by 2018 "decade for action on health care WASH" to improve WASH in all levels of health care facilities and recognize WASH plays a role in preventing infection, saving lives, and improving quality of care (2). However, the status of health care WASH in the least developed countries are very poor, 50% of health care facility had not basic water service, 63% of health care facility had no sanitation service, and 70% of health care facility had not basic health care waste management service by 2019 (4). Worldwide survey indicated that 10% and 9% of healthcare facilities had not sanitation service and hand hygiene service worldwide respectively. In sub Saharan Africa countries 22% of healthcare facilities had not sanitation service by 2021 (8).

Descriptive report on WASH service availability for childbirth and newborn care in 7 countries hospital in East Asia and Pacific regions showed that 77% of 157 hospitals had sink with water and soap or alcohol hand rub in delivery rooms, 78% in neonatal care rooms, and 43% in postnatal care rooms. Flush toilets were available in or next to delivery rooms and neonatal care units among 53% of hospitals. The report found that a high proportion of hospitals with water and hand hygiene services were associated with having the country's WASH policy and standard on WASH service requirements in health facilities (19).

A cross-sectional survey in six sub-Saharan Africa finds out that there was a gap in the access of basic WASH services in rural HCFS, which cause a threat to the health of patients and health care workers in the facility. The authors found that HCFs had access to basic WASH service in Ethiopia was only 7%, Zambia(21%), Kenya(30%), Mozambique(29%), Uganda(30%), and Ruanda(50%). Although hand hygiene can reduce disease transmission, the availability of a combination of water, soap, and hand drying material was less than 25% in each country (20).

While the number of peoples accessing and using service in public health care facility increase with the improvement of national health insurance, the availability of basic WASH services in the health care facility nationally remains poor, which has a challenge too many people in Ethiopia served by health care facilities without WASH services. National level estimation by 2021 revealed that, 8% and 22% of healthcare facilities had not hand hygiene, and sanitization service respectively; 64% of facilities had basic health care waste management service; around 78% health care facilities had improved and usable sanitation service; 70% of had hand hygiene service at the point of care (8).

A cross-sectional study in Zimbabwe on WASH service in COVID-19 isolation health facilities showed that one in four health facilities did not have adequate service across the water, sanitation, waste management, hand hygiene, and environmental cleanliness. The assessment also added that the proportion of health facilities with poor sanitation coverage was 42% (21).

A finding on assessment of WASH service in a health care facility from Uganda reveals that only 12.12% of health care facilities had basic WASH service. The majority of health care facilities (84.5%) had limited WASH service. The WASH domain analysis also showed that about 48.3% had limited water service, 84.5% had limited sanitation service, 50% had limited environmental cleanliness service, 56.9% had limited hand hygiene service and 51.7% had limited waste management (22).

2.2. Water and Sanitation service

The component of the WASH service must work synergistically to get a satisfactory result. Having only water or hand hygiene facility or toilet is not enough; it may have water but may not have sanitation and hygiene facility; or do may have the toilet service but it might be not clean and patients and visitors may want to use it and want to wash their hand; waste may not properly

be segregated and treated. In such cases, clients are exposed to infection and injury, which has led to developing negative experiences and frustration that will deny them from seeking care and loss of trust in the future (11). Effective functioning of the health care facility and the ability to prevent health care infection relies on safe, sufficient, reliable water supply on health care premises (23).

Poor health care excreta and wastewater management are highly responsible for increasing the burden of healthcare-acquired infection and the spread of AMR. It estimated that the risk of transmission hospital-acquired infection (HAI) by contaminated environment contributed 30-50% (24), and release of untreated excreta and wastewater into the health care compound and community contribute the rise of AMR through creating favorable conditions for the emergence of resistant pathogens and by increasing demand of antibiotics (25).

Sanitation service in a health care facility is lagging further behind; particularly the provision of service for menstruating women and girls, and people with limited mobility is less prevalent relative to water services (26). In addition to the special need of women, inadequate infrastructure and lack of proper wastewater management cause adverse health and environmental impact. A recent finding shows that COVID-19 RNA was detected in raw wastewater, primary sludge, and a water body, which is poor sanitation system, could be a possible route of virus outbreak that provides early warning on the need for effective health care wastewater management to prevent the future outbreak and AMR (27).

2.3. Health care waste management

According to WHO, about 15% of waste generated in the health care facility is hazardous waste (28), which is hazardous infectious (10%) and radioactive waste (5%) . Unless these types of waste are managed properly healthcare workers, patients, visitors, waste handlers, and the community at large are exposed to infection and injury. Used needles and sharp materials are among the most infectious hazardous healthcare waste that easily causes injury and infection. In sub-Saharan African countries, 66 million people lacked access to segregation bin and safe disposal of waste at point of care (8). Analysis of studies shows a significant association of health care facility acquired disease (HCAI) and lack of basic WASH service in a health care

facility; adequate and timely supply of infection prevention materials is significant to prevent needle stick injury in a health care setting (29).

A recent study by Yazzie et.al find out the proportion of hazardous waste generated in Ethiopia health care facilities was high ranged from 21% to 70%, but the management is poor which is owing to the absence of proper waste segregation at the source of waste generation; and low combustion incinerator, open burning and open disposal of incinerator ash were the common waste treatment at the health care facility. The author concludes that the management practice of health care waste in Ethiopia was unsatisfactory. The factors that contributed to poor management at health care facilities were lack of enforcement from regulatory bodies, lack of awareness from health care staff, lack of training, and lack of appropriate management utilities (30).

Health center cross sectional study in Addis Ababa find out that rate of healthcare waste generation was 6.33-12.89 kg/day of which 62% accounts hazardous waste (31); other hospital survey in Addis Ababa also indicated that 41.31% of generated healthcare waste was hazardous waste (32). However, as per these studies, the waste collection and treatment practice in these health centers and hospitals were very poor which has risk of injury and infection for waste handlers, patients and staffs. According to cross sectional study conducted in Dilla University Referral Hospital Ethiopia, the fraction of hazardous waste accounts 48% from the total waste generated in the hospital; despite this amount of hazardous waste there was no appropriate segregation of waste at point of generation and disposal practice in the hospital (33).

A case-control study on risk factors to HAI in teaching hospitals found the chance of developing hospital-acquired infection was less by 82% among patients admitted in the wards with the presence of medical waste collection container or bines in the ward (34),

2.4. Hand hygiene service

WASH service in a health care facility is not about absolutely business service or aesthetic issues for clients, rather it is about saving a life, saving cost, and preparing for a future pandemic. With a long history of hand hygiene on reducing HAI and cross-infection between patients and health care providers, effectively applied hand hygiene is a vital intervention to prevent the spread of emerging disease, COVID-19 pandemic, and antimicrobial resistance (35). In the absence of

hand hygiene, contaminated hands of health care workers are also like vectors or the vehicle in the transmission of disease from one patient to others in the health care setting. It is estimated that the risk of transmission of hospital-acquired infection by contaminated hand is 50-70% (17,24), and up to 15.2% of admitted COVID-19 patients were infected at healthcare setting (36).

To ensure quality health care available to everyone, infection prevention and control(IPC) with WASH services are the most effective and practical measures that have proven impact on quality of care and patient safety across all levels of health care systems (37). A cross-sectional survey in North West Ethiopia by Engdaw et.al (38) find out that, the availability of adequate soap and water for hand hygiene and alcohol-based hand rub in the working area was significantly increased the proportion of hand hygiene compliance among health care providers in hospital. Another study find out even though currently blood, urine, personal protective equipment are thought to play a negligible role in the transmission; hand washing and hand disinfection are among preventive measures for the COVID-19 pandemic in the health care setting, and public area (39).

2.5. Environmental cleaning service in a health care facility

Environmental cleaning service in health care facilities is far more complex than ordinary types of cleaning in like public space since it is depended on the contaminate or pathogen present, the product used to remove it, tool and materials, and the process undergo in a range of environments with a range of services in health care facility requires a specific approach to clean it. As peters et.al reported it is a challenging but also worthy issue to services in health care facilities that need the integration of current and new technologies with human elements that must work together synergistically to achieve optimal results and better protection of patients (24).

Although an effective environmental cleaning has been shown to significantly reduce the transmission of HCAI, many health care facilities do not give value and look at environmental cleaning as an opportunity to save cost and increase patient satisfaction; and credit is not given to the importance of environmental cleaning service and health care hygiene, and for the staffs working in environmental cleaning unit rather they invest on new technology, specialized staff and fancy equipment (24).

Quality health care service is not only about technology, specialized staff, and expensive medical equipment, but human and organizational change also has an important opportunity for quality improvements (10,40). Unless we give sufficient training and credit to them they don't fail to make a change in quality service and patient safety. Health care workers and staff working in the cleaning unit should be trained and aware of environmental cleaning policy and protocol, which is about required types and frequency of cleaning, stepwise process, cleaning materials and preparation of it, management of supplies, and how to use Personal protective equipment, and also trained on the significance of their work to service of the facility (24,41).

2.6. Barriers of Health Care WASH Services availability

Countries with limited resources had faced challenges in infection prevention and control strategies, and the challenges will also be twofold during the COVID-19 pandemic. Availability of basic and functional hand hygiene infrastructure and practice, environmental cleaning, and disinfection, infection prevention protocol, presence of trained personnel should be in place in health care setting on the normal circumstance, then strengthened and sustained all the WASH services across developing countries will prevent HCAIs and covid-19 (42).

The barriers to the provision of proper WASH services in health care are in many ways. Yet many countries have a policy on health care WASH or IPC but is underfunded and disconnected from other key health programs and many of them lack compressive WASH standards in health care facilities and even the standard exists the implementation is stuck by either lack of budget or interest. Lack of timely and ongoing monitoring system on implementation and maintenance, cleaning and waste management system; focusing disease-specific budget rather than cross-cutting WASH; lack of fully functioning WASH infrastructure; and lack of effective stakeholder collaboration are prevalent barriers in the health care setting. Disempowered and lack of pre-service and in-service training to health care workers and cleaners are also barrios to improving and managing WASH service in the facility (2,24).

Hospital WASH service availability assessment report in East Asia and Pacific regions found that the availability of high proportion hospitals with water and hand hygiene services were associated with having the country's WASH policy and standard on WASH service requirements in health facilities (19). An assessment of Health care WASH in Ethiopia founds that lack of

integration in between national WASH and quality strategies; limited budget and infrastructure; absence of the best tool to monitor WASH; inadequate training on standards of WASH and IPC; and lack of behavioral change were among the bottleneck to improve health care WASH in Ethiopia (15).

As Mania et.al found on the assessment of hospital WASH availability in Kenya, there was a significant difference in availability of WASH service in between hospitals and specific wards, and the claims for differences were explained by challenges on the built environment, resource availability, leadership and the degree to the responsible body used innovative approaches to cope with shortages (43).

A qualitative study in Ethiopia by Marsha et.al (44) concludes, there was a gap in preventive measure practices for covid-19 in a public health care facility. The author explores shortage of PPE and hands hygiene solutions, lack of infrastructure including WASH services, lack of training, negligence and ignorance, and lack of attention and recognition for staff on the practice of prevention measures were among perceived barriers. A similar study conducted in Hawasa city hospital find out lack of supervision, low awareness of janitors and health workers, and inattention of patients and visitors were the challenges in the management practice of health care waste management (45).

Assessment of WASH service in the health care facility from Uganda reveals, more than 85% of the health care facility had not had basic WASH services, structural and performance limitations were the dominant barrios to the provision of WASH service in the health care facility (22). Government must set its standards for WASH services in health care facilities and put programs in place to improve these services along with health system service. Weak and invisible leadership and stewardship, monitoring by the government, health authorities, professionals, and minimizing complacency also challenge (10).

2.7. Conceptual framework

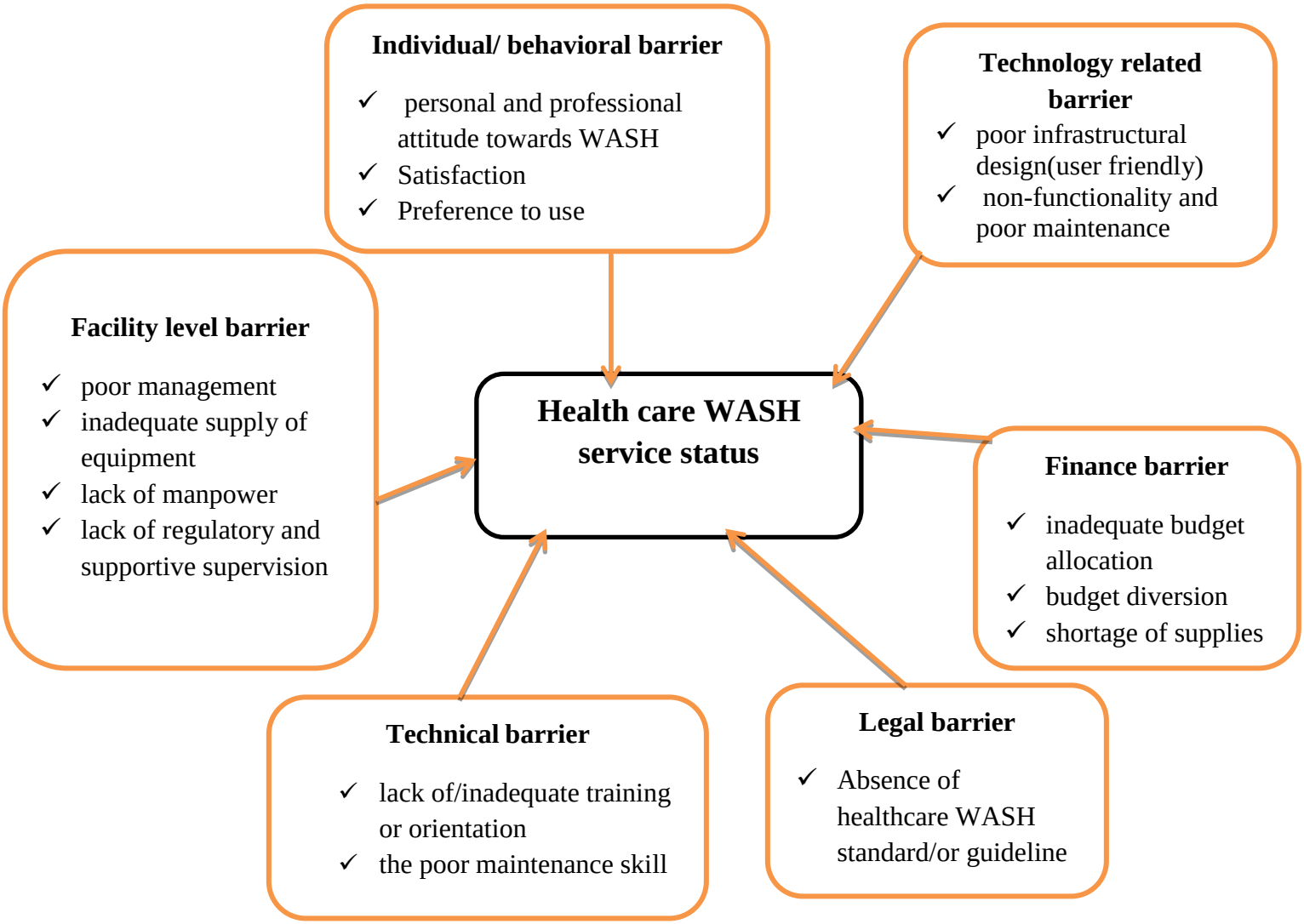

Figure 1: Conceptual framework of the study (19,40,42–45)

3. Objective

3.1. General objective

- The general objective of the study was to assess the status of basic WASH services and its barriers at public healthcare facility in the city of Addis Ababa, Ethiopia 2022.

3.2. Specific objectives

- To assess the status of basic WASH services in public healthcare facility in the city of Addis Ababa, Ethiopia 2022.
- To explore the barriers to the provision of basic WASH services in public healthcare facility in the city of Addis Ababa, Ethiopia, 2022.

4. Materials and Methods

4.1. Study Area

The study was conduct in Addis Ababa city. There are 14 public hospitals including specialty centers and COVID-19 treatment centers, and 100 health centers located in the city of Addis Ababa. With the efforts of private health care facility these public health care facilities are serving in a range of health care services for Addis Ababa city population and part of Ethiopia, which is estimated to be around 5,228,000 by 2022 (https://population.un.org/wpp/). Health care facilities are administered by the Ministry of Health and Addis Ababa regional health bureau. During pandemic, Addis Ababa city is the city where the highest number of COVID-19 cases located which accounting 54.2% (254,447) of people tested positive were located in Addis Ababa city from the total of 469,581 positive cases. (https://ethiopianhealthdata.org/dashboard/covid19-ethiopia).

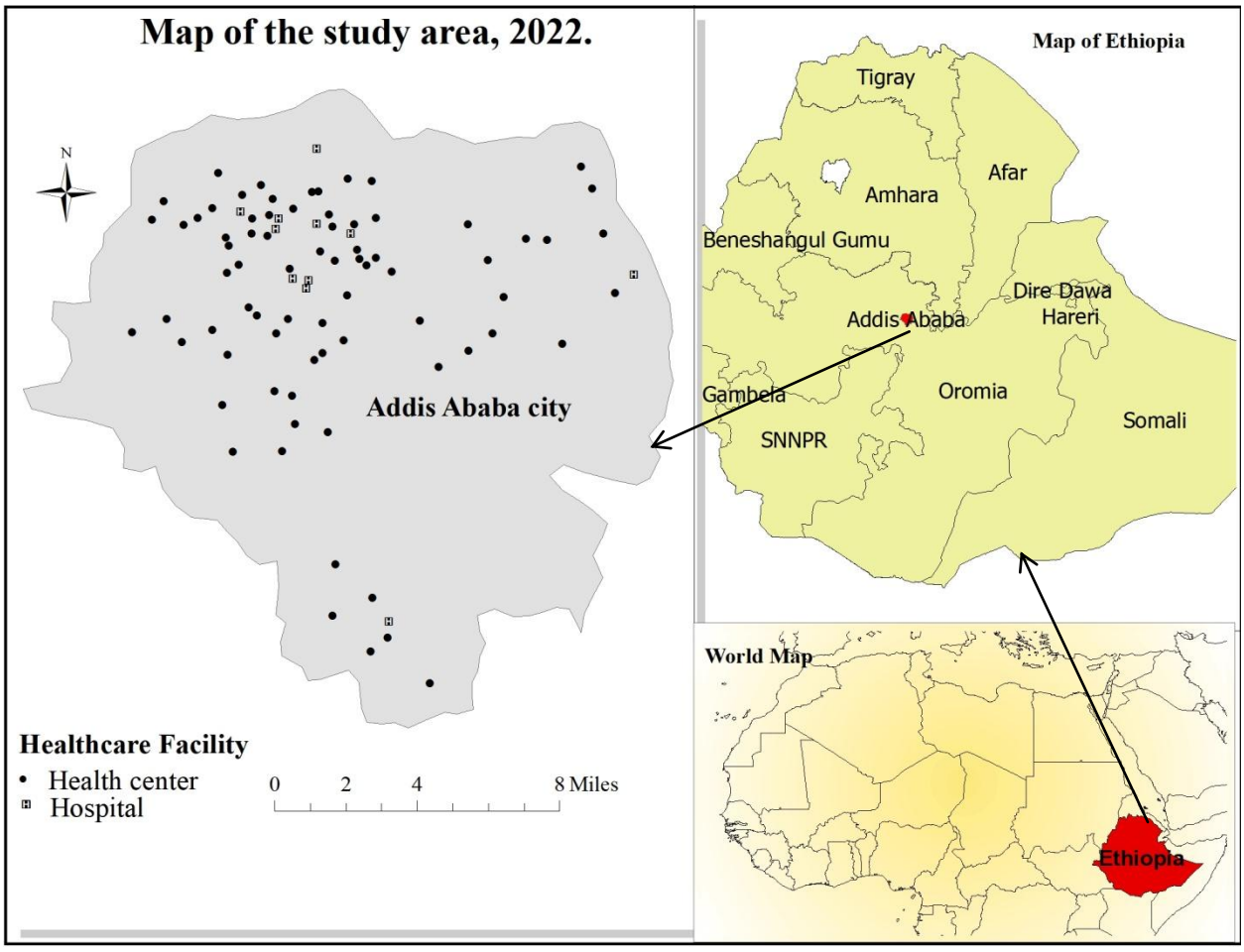

Figure 2: Spatial location of sampled healthcare facility.

4.2. Study Design/Approach and period

Facility-based mixed method design (Convergent parallel mixed design) was conducted. We intend to use convergent parallel mixed design to collect both quantitative and qualitative forms of data independently at the same time farm on the same concepts of WASH services and analyze and integrate the information to final interpretation of results to have a complete understanding of the research questions(46). Convergent parallel mixed design means conducting qualitative and quantitative study design and collecting qualitative and quantitative data at the same time through different data collection techniques to address the research question, analyzing both forms of data independently and integrating to the final interpretation(47). The reason to emphasize equality and collect quantitative and qualitative data is that the intent to seek different types of information and to have a complete understanding of our research questions; the quantitative data are answer or descriptive the status of WASH services in a current working public health center and hospitals in Addis Ababa city, and qualitative data form detailed views and experience of participants also able to explore barriers to the provision of basic WASH services in a health care facility. The study was conducted from March, 2022 to June, 2022.

4.3. Study population

The study population of this study was all public health care facilities, health center, specialty centers, and referral and teaching hospitals located in the city of Addis Ababa.

4.4. Inclusion and Exclusion criteria

Inclusion criteria: public healthcare facilities in Addis Ababa which provide service for the communities during the study were included.

Exclusion criteria: public healthcare facility in the city which is exclusively serving for a COVID-19 treatment center was excluded.

4.5. Study Variables

Dependent variable: WASH services status [basic, limited, no service**]**

Independent variables: WASH service barriers

- absence of healthcare WASH standard/or guideline,

- inadequate budget allocation by higher officials and/or health care managers,
- poor WASH infrastructure management at facility level,
- poor infrastructural design,
- non-functionality and poor maintenance of WASH infrastructure
- inadequate supply of WASH service equipment,
- inadequate manpower related to WASH infrastructure maintenance,
- absence of WASH focal person,
- lack of/inadequate training/orientation on WASH or general cleanliness,
- lack of regulatory and supportive supervision,
- poor personal and professional attitude towards WASH,
- absence of linkage from external partnership/stakeholders that provide training, capacity building, supplies, or develop a guideline

4.6. Operational Definition

WASH services in a health care facility: the provision of water, sanitation, hygiene, health care waste management, and environmental cleaning infrastructure and services across the facility. The status of WASH services in the health care facility will be measured by JMP health care facility WASH standard, and the five indicators of WASH service has been classified into separate three-level service ladder (basic, limited, and no service) as guided by GMP standard (48).

Basic Water Service: health care facility where the main source of water is an improved source and located on the premises, and from which water is available at the time of the survey (48).

Limited Water Service: health care facility they access to an improved water source that is either located off the premises (within 500 meter) or do not have water available at the time of the survey.

No Water Service: health care facility where access water from either unimproved water source or improved water source that is more than 500 meters or no water source at all.

Basic Sanitation Service: health care facility with improved and usable sanitation facilities, and with at least one toilet dedicated for staff, and one sex separated toilet with menstrual hygiene facilities and one toilet accessible for users with limited mobility (48).

Limited Sanitation Service: health care facilities with improved sanitation facilities, and usable sanitation facilities or with dedicated for staff or with sex-separated toilet with menstrual hygiene facilities or with one toilet accessible for users with limited mobility.

No Sanitation Service: health care facility with unimproved toilet facilities or no toilet facilities.

Basic Hand Hygiene Service: health care facility with fictional hand hygiene facilities are available at one or more points of care and within 5 meters of toiles (48).

Limited Hand Hygiene Service: functional hand hygiene facilities are available at either point of care or at toilets, but not both.

No Hand Hygiene Service: healthcare facility lack functional hand hygiene facilities at the point of care and toilets.

Basic Health Care Waste Management Services: healthcare facilities where waste is safely segregated in consultation areas, and sharps wastes are treated and disposed of safely, and infectious wastes are treated and disposed of safely (48).

Limited Health Care Waste Management Services: healthcare facilities that have limited separation of waste and/or treatment, and disposal of sharps and infectious waste, but not all requirements for basic services are met.

No Health Care Waste Management Services: healthcare facility that has no separate bins for sharps or infectious waste, and sharps and/or infectious wastes are not treated or disposed of.

Basic environmental cleaning services: health care facility that have a protocol for cleaning, and staff with cleaning responsibilities have all received training on cleaning procedures (48).

Limited Environmental Cleaning Services: healthcare facilities that have cleaning protocols and/or at least some staffs have received training on cleaning.

No Environmental Cleaning Services: Healthcare facilities which have no cleaning protocols and no staff have received training on cleaning.

Barriers: barriers are challenges or bottlenecks that deter health care facilities to provide adequate WASH service or to the improvement of WASH services in health care facility (49).

4.7. Sample Size Determination and Sampling Procedure

4.7.1. Sample Size Determination and Sampling Procedure for quantitative study

There are 114 public health care facilities (14 hospitals and 100 health center) in Addis Ababa city. Sample size was determined using a single proportion formula with the assumption of the

estimated availability of basic treatment and disposal of healthcare waste service in Ethiopia was 64 % from JMP baseline healthcare WASH report (41), 95% confidence interval (CI) and α=5%, 5% marginal error.

$$n = \frac{[(z^2\,\alpha/_2)*(p(1-p)]}{w^2}$$

n= minimum requirement of sample size

$z_{\alpha/2}$= the critical value of SD at 5% of α ($z_{\alpha/2}$= $z_{0.025}$=1.96)

p= availability of healthcare waste management service

w =marginal error=5%=0.05

$$n = \frac{[(1.96)^2 * 0.64 * (1 - 0.64)]}{0.05^2}$$

$n = \mathbf{354}$

However, the total source population in this study is 114 healthcare facility which less than 10,000. Based on this population we used reduction formula to calculate final sample size as recommended by scholars.

$$n' = \frac{n}{1 + \frac{(n-1)}{N}}$$

n'= final sample size, n= first calculated sample size, N= total study/source population

$$n' = \frac{354}{1 + \frac{(354-1)}{114}}$$

n'= 86, the study need 86 healthcare facilities.

To get representative sample stratified random sampling technic was used. So that after stratifying health care facility by health center and hospital types of healthcare facility, simple random sampling technique was applied to select 11 hospitals and 75 health center after proportional allocation of the sample to each strata.

4.7.2. Study participants and recruitment technic for Qualitative study

For the qualitative study, there are no agreed ways to determine the sample size (47). However, the study participant, 16 key informants, were selected through purposive sampling method from hospitals (11 participants IPC focal person) and health center (4 medical directors), and Addis Ababa health bureau(one WASH program expert); the saturation or redundancy of information about all need concepts after conducting a sequential interview was determine the number of sample size (50). Key informants were invited based on personal experience or knowledge on healthcare WASH services and exposure to WASH services barriers at a health care facility and whose views or opinions can provide focused, useful, and creditable rich information; whose position was being represented and responsible for WASH unit in the hospitals and health center, or higher office level. The hospital or health center director, IPC focal person, ward focal person/manager, and frontline workers, were primary eligible for the study and they were invite to participate in the interview. Attempts were made to include the key health officials or programmers working at the Addis Ababa city Regional Health Bureau level and the Federal Ministry of Health. However, key informant from Federal Ministry of Health was not participated.

4.8. Data Collection Tool and Procedure

4.8.1. Data collection tool and procedure for quantitative study

The quantitative data was collected by a semi-structured observational checklist. Sort of document observation and interview was carried out to facilitate WASH service observation. The observational checklist adapted from WHO and UNICEF joint monitoring program core question, and indicators in monitoring WASH service level in health care facilities (23). The checklist had five main sections; water service questions, sanitation service questions, hygiene service questions, health care waste management questions, and environmental cleaning service questions. Observation of WASH services was carried out through observing water, sanitation, hand hygiene, and waste management facility and functioning of service at the time of observation, and asking and reviewing supportive documents and standards IPC department. The observation was held by trained two environmental health officers and two supervisors (MSc in environmental health). Data collection was start meeting with the hospital/health director or administrative office to facilitate the legal procedure and collecting structural information and

layout of the facility service area. After getting legitimacy the data collectors were taken the location of facilities GPS coordinate, and visit the WASH infrastructure of the facility's randomly selected outpatient service area and finally they were visit the hospital or health center environment related to health care waste treatment and disposal system; sanitation service with hand washing service; and observing and asking environmental cleaning services and protocols. At the time of visiting and after complete visiting the data collectors were recorded data on the checklist. The quality of data and research process was ensured through providing precise training (one-day training) for data collectors (BSc) and 2 supervisors (postgraduate) on the purpose of the study, part of questionnaire to assess WASH services, way of quality assurance, observing and data recording approach.

4.8.2. Data collection tool and procedure for the qualitative study

For qualitative data collection, face-to-face in-depth interviews with purposively selected key informants were conducted by the principal investigator through semi-structured interview guide which is adapted from relevant literatures. One-on-One interviews with key informants were conducted on-site at the selected hospitals or health centers. After getting participant consent in written and oral form, the principal investigator was conduct face-to-face dialogue with key informants. The interview was conduct in Amharic. The interview was conduct with the precaution of avoiding leading questions with a careful starting and closing approach. The interview was recorded by an audiotape recorder with additional key informant emphasis were held on memos by the interviewer. To ensure the trustworthiness of the data, participants were encourage expressing their ideas and opinion freely and explained their experience on healthcare WASH service; the interviewer primarily focusing on gathering information on WASH services barriers that have been experienced from or held by key informants at the study site (the roles of the interviewer was conduct interview with probes, take audiotaping from the interview, transcribe the interview); and key informants were from the position of having the experience on WASH service problem under study. The interview was continued until no new information or concepts emerged for all questions (total 16 interviews has been conducted). Overall process of the data collection was revised daily so that the question, and of the key informant to be interviewed and process of data collection were adjusted.

4.9. Data quality assurance

The quality of the data and research process were ensured through adequate training (one-day training) for data collectors (BSc) and 2 supervisors (postgraduate) on the purpose of the study, part of questionnaire to assess WASH services, way of quality assurance, research ethics, and observing and data recording approach. The training was taking into account practicing the tool on one hospital that was not selected (Alert) and amending the tool again. The data collection was started within a week after the training. Data collectors were also supervised every day at the time of the survey. The completeness of the questionnaire has been checked every day by data collectors before they submitted it. If any missing and unclear data recording, the data collector and supervisor were revised it and correct it again.

To ensure the trustfulness and reliability of qualitative findings, the interview technique was revised in between interview periods if there is any new insight from the prior interview, key informants were encourage expressing their ideas and opinion freely at begging of interview and explain their experience on healthcare WASH service. Audio reordered data was translated and transcribed immediately from the interview. Data entry was done thoroughly by the principal investigator. Hard paper data and audio recorded data had been kept securely. We were check carefully the meaning (description) of each code with the data given that code. A detailed description of major themes has been carried out. Qualitative researchers were invited to review the finding and raise questions on them to improve the credibility of the result.

4.10. Data Management and Statistical Analysis

4.10.1. Data management and analysis for quantitative study

The completeness of data was checked manually and after editing and clearing, data entry was done by using Epi data version 3.1. Then, the data was exported to SPSS version 25 for analysis. Descriptive analysis was carried out to quantitative data. All observed core questions under each WASH service indicator have been presented through frequency distribution tables, bar graphs, and narration. Based on the WHO and UNICEF joint monitoring program service ladder the main five indicators of WASH in health care facilities had computed from the core question of the service ladder. The three service levels (basic, limited, and no service) of each indicator were independently computed and analyzed. The percentage of water, sanitation, hygiene, waste

management, and environmental cleanliness service availability across the health care facility was compute from the summation of core questions that are used to measure basic, limited, and no service level.

4.10.2. Data management and analysis for the qualitative study

Thematic analysis method was conducted for the qualitative data. The analysis of qualitative data was undergoing after each interview has been ended. First, after conducting the interview, audio recorded data and filed note (memo) data were under go verbatim translation to English and the text data was stored and located in qualitative data management Atlas ti software. Second, organize the data and labeling codes; we were familiarizing text data after thoroughly reading to understand the overall meaning and importance of information. Third-generating initial codes; after reading the text many times segments of sentences were selected and labeled to possible codes by the most descriptive words at end of each paragraph. Fourth-organized codes; after revising the identified codes, potential themes or contents were created by clustering or categorizing related codes based on their concepts and relationship. Fifth-organized main themes; themes were revised, interrelating, and categorized which includes the barriers of WASH provision in the health care setting, and finally main themes were defined and explained with quotes of key informants' opinions on the barriers as a major finding as part of report. Side-by-side presentation of the findings was applied; the qualitative finding presented after the descriptive (quantitative) finding has been presented. The interpretation and comparisons of both findings were placed in the discussion part of the study.

4.11. Ethical Consideration

Ethical clearance approval was sought from the ethical review board of St. Paul's Hospital Millennium Medical College and Addis Ababa Public Health Research and Emergency Management Directorate. Before the data collection, supportive letter form EIWR, was written to Addis Ababa Regional Health Bureau and federal hospitals to get permission. Then Addis Ababa regional Health bureau was also writ an official letter to hospitals under the administrator of the bureau and sub city health office; then sub city health offices were also write supportive letter to health centers under the administrator of the health offices. Then after permission has been obtained from each hospital director's office, verbal and written consent was obtain for each

study participant before the interview. This study was address the code of research ethics on disclosing all the necessary information regarding autonomous rights, confidentiality, risk and benefit, free withdrawal at the time of interview.

4.12. Dissemination of the result

The final results of this study will be deposited at digital library and hard copy at Addis Ababa University libraries, and Ethiopian Institute of Water Resource. The finding will also be disseminate to Ministry of Health; Addis Ababa Health Bureau, Public Health Research and Emergency Management Directorate; and health facilities. It will be presented on different seminars, workshops, and national research conferences. Furthermore, it will be prepared and submitted for publication in peer-reviewed reputable journals to make it accessible for the scientific community.

5. Results

5.1 WASH service availability

5.1.1 Water service

A total of 86 health care facilities were studied during the survey. Of which, 75(87.2) were health centers, and 11(12.8%) of facility were hospitals including specialty center, referral, and specialized teaching hospitals. The mean daily client flow rate at hospital and health center was 590.6 (± 541.5) and 220.6 (± 88.8), respectively. The overall proportion of basic water service availability in healthcare facilities in Addis Ababa was 74 (86%), while limited water service was 12(14%). At the time of the survey, one out of six health centers (16%) in Addis Ababa city had limited water service (Figure 3).

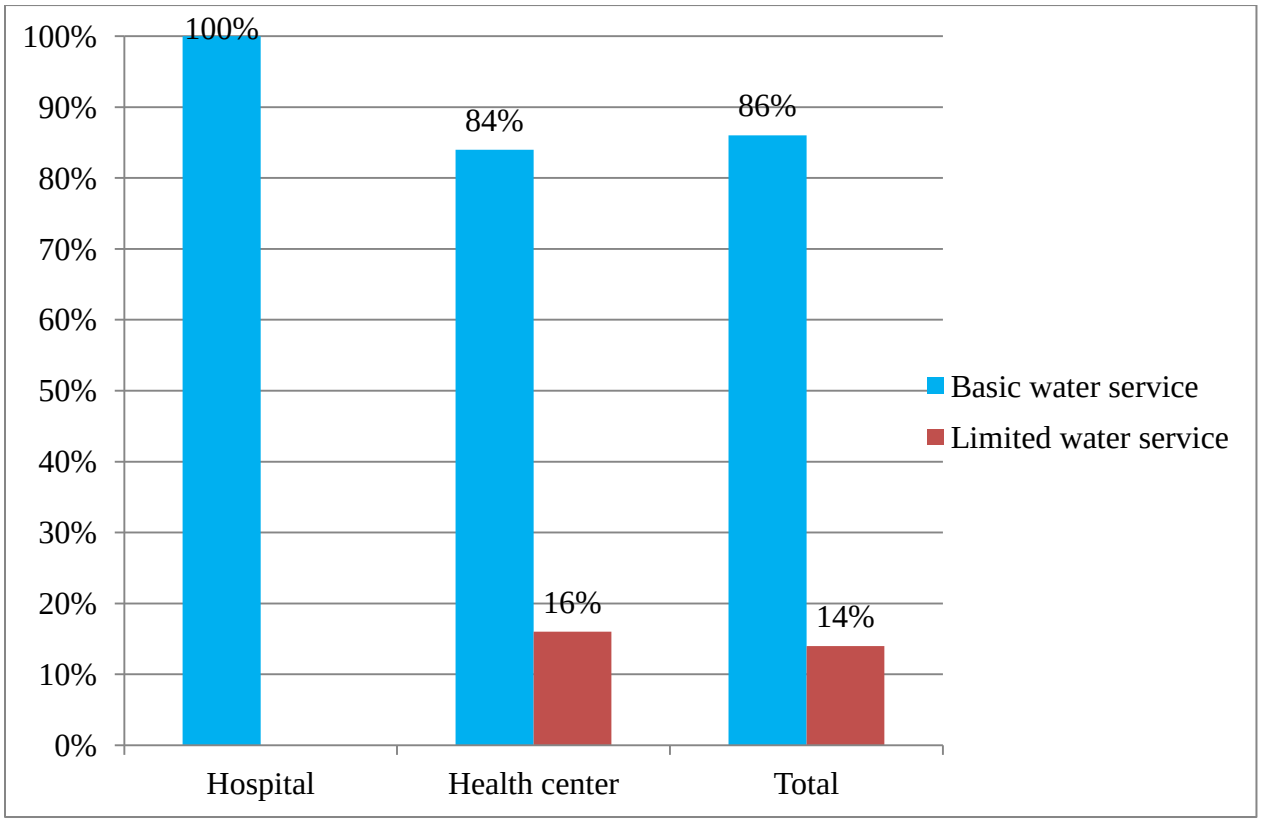

Figure 3: Water service availability among public healthcare facility in Addis Ababa city, Ethiopia 2022.

All studied healthcare facilities had access piped water from an improved source located within the health care facility premises. However, water was not available from main source at time of the survey at 12(14%) healthcare facility and nearly three-quarters 64(74.4%) of healthcare

facilities had faced water discontinuity before the survey. Moreover, 47(54.7 %) of healthcare facility had not piped water access at the OPD (Table 1).

Table 1: Proportion of water service availability indicator at public healthcare facilities in Addis Ababa city, Ethiopia 2022.

Water servicer indictors at HCF	**Proportion by HCF**		
	Hospital N(%)	**Health center N(%)**	**Total N(%)**
Water availability during survey (N=86)			
▪ yes	11(100%)	63(84%)	74(86%)
▪ no	0(0%)	12(16%)	12(14%)
Water discontinuity (N=86)			
▪ yes	7(63.6%)	57(76%)	64(74.4%)
▪ No	4(36.6%)	18(24%)	22(25.6%)
Frequency of discontinuity (N=64)			
▪ Frequently per day	2(28.6%)	27(47.4%)	29(45.3%)
▪ rarely per day	5(71.4%)	30(52.6%)	35(54.7%)
Alternative water source (N=86)			
▪ yes	6(54.5%)	4(5.3%)	10(11.6%)
▪ no	5(45.5%)	71(94.7%)	76(88.4%)
Piped water at OPD (N=86)			
▪ yes	8(72.7%)	39(52%)	47(54.7%)
▪ No	3(27.3%)	36(48%)	39(45.3%)

HCF: Healthcare Facility

5.1.2 Sanitation service availability in HCF

All healthcare facilities, 86(100%) had limited sanitation services, and no one the healthcare facilities had access to basic sanitation services. Of the total, 49(57%) healthcare facilities had usable toilets. Only 4(4.7%) of healthcare facilities and 17(19.8%) of healthcare facilities had access to menstrual hygiene toilets and toilets accessible for users with limited mobility respectively (Table 2).

Table 2: Sanitation service indicator at public healthcare facility in Addis Ababa city, Ethiopia 2022.

Sanitation services indicator	Proportion by HCF type		
	Hospital N (%)	Health center N (%)	Total N (%)
Types of Toilet			
▪ flush/pour flush to sewer system	6(54.5%)	2(2.7%)	8(9.3%)
▪ flush/pour flush to septic tank or pit	5(45.5%)	71(94.7%)	76(88.4%)
▪ Pit latrine with slab	0(%)	2(2.7%)	2(2.3%)
Usable toilet			
▪ yes	7(63.3%)	42(56%)	49(57%)
▪ no	4(36.4%)	33(44%)	37(43%)
Staff toilet			
▪ yes	9(81.8%)	62(82.7%)	71(82.6%)
▪ no	2(18.2%)	13(17.3%)	15(17.4%)
Menstrual hygiene toilet			
▪ yes	0(0%)	4(5.3%)	4(4.6%)
▪ no	11(100%)	71(94.7%)	82(95.4%)
Toilet for limited mobility			
▪ yes	0(0%)	17(22.7%)	17(19.8%)
▪ no	11(100%)	58(77.3%)	69(80.2%)
Excreta/waste-water disposal			
▪ Sewerage system	6(54.5%)	4(5.3%)	10(11.6%)
▪ Septic tank	5(45.5%)	71(94.7%)	76(88.4%)
Urinal service for male			
▪ yes	2(12.8%)	9(12%)	11(12.8%)
▪ no	9(81.8%)	66(88%)	75(87.2%)

5.1.3 Hand hygiene service

Out of 86 observed healthcare institutions, only 7(8.1%) institutions, one hospital, and six health centers, had access to basic hand hygiene services, while three healthcare facilities (3.5%), one hospital and two health centers, had not to hand hygiene service both at point of care and within 5 meters of the toilet. Majority of healthcare institution had limited hand hygiene service, meaning that they had not to hand hygiene service both at the point of care and nearby the toilet (Figure 4).

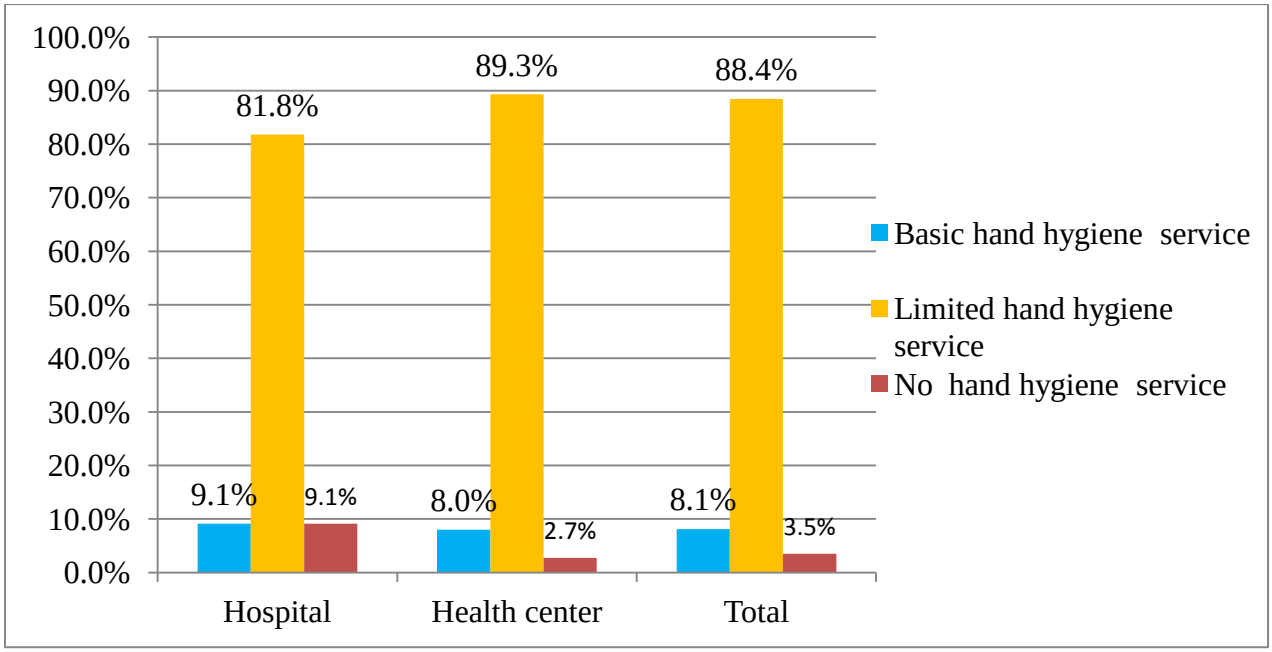

Figure 4: Hand hygiene service availability at public healthcare facilities in Addis Ababa city, Ethiopia 2022.

Of all, 59(68.6%) of healthcare facilities had functional hand hygiene facilities (either with water and soap or alcohol hand rub) at point of care. However, 11(12.8%) of healthcare facilities had not to hand hygiene service at the point of care. Of 72 healthcare facilities having hand washing facilities within 5 meters of the toilet, 67(93.1%) of hand washing facilities were not accessible for limited mobility users (Table 3).

Table 3: Proportion of Hand Hygiene service status at public healthcare facility in Addis Ababa city, Ethiopia 2022.

Hand hygiene services indicator	The proportion by HCF type		
	Hospital N(%)	Health center N(%)	Total N(%)
Hand hygiene facility at point of care (N=86)			
▪ Yes functional hand hygiene with water and soap	2(18.2%)	10(13.3%)	12(14 %)
▪ Yes Alcohol based hand rub(ABHR)	6(54.5%)	41(54.7%)	47(54.6%)
▪ Yes but it lacks water and/soap	2(18.2%)	14(18.7%)	16(18.6%)
▪ No hand hygiene service	1(9.1%)	10(13.3%)	11(12.8%)
Hand hygiene facility within 5 meter of the toilet (N=86)			
▪ Yes functional hand hygiene	1(9.1%)	9(12%)	10(11.6%)
▪ Yes but it lacks water and/soap	8(72.7%)	54(72%)	62(72.1%)
▪ No hand hygiene service	2(18.2%)	12(16%)	14(16.3%)
Hand hygiene Promotion material on washing facility (N=72)			
▪ yes	1(11.1%)	4(6.3%)	5(6.9%)
▪ no	8(88.9%)	59(93.7%)	67(93.1%)
Hand hygiene facility accessible to all users (N=72)			
▪ yes	1(11.1%)	4(6.3%)	5(6.9%)
▪ no	8(88.9%)	59(93.7%)	67(93.1%)

5.1.4 Healthcare waste management service

Out of 86, healthcare facilities studied 25(29%) had not to waste management service at all. Unfortunately, only one (1.2%) facility had basic healthcare waste management service. More

than two thirds 60(69.8%) of Public healthcare facilities in the city of Addis Ababa had limited waste management service (figure 5).

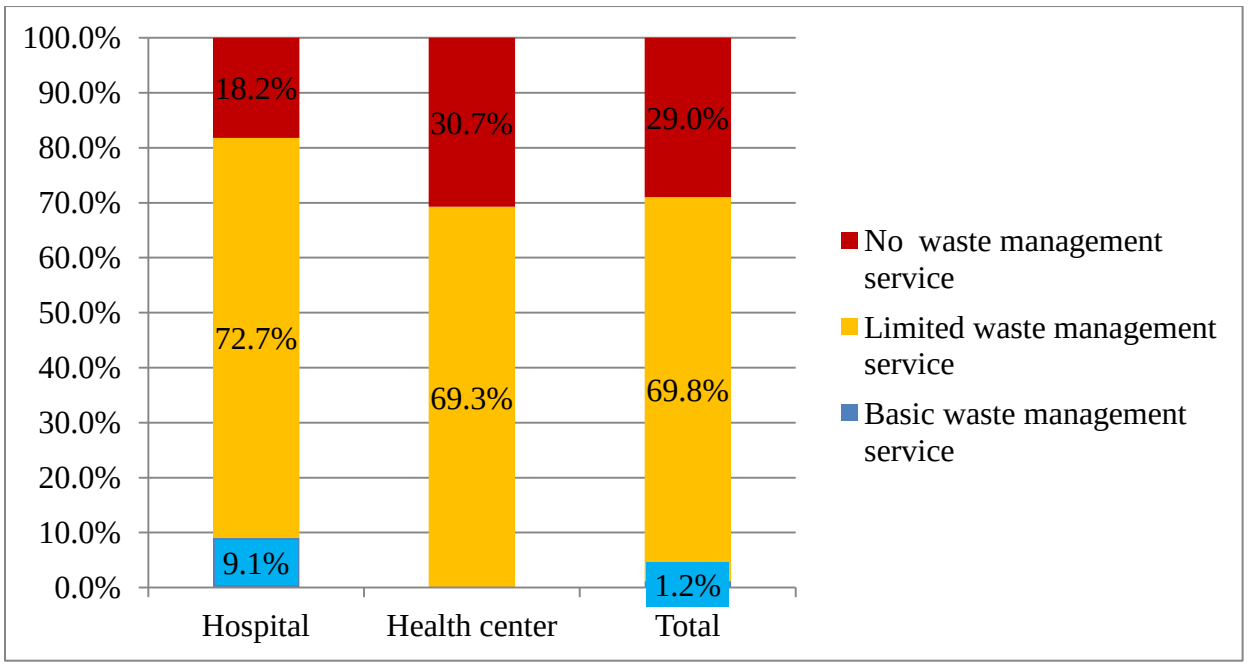

Figure 5: Healthcare waste management service availability at public healthcare facility in Addis Ababa city, Ethiopia 2022.

Of all healthcare facilities, 25(29%) of facilities had not to waste segregation bins in the outpatient department; only one hospital safely segregated medical waste in three labeled bins. Seventy-nine (91.8%) healthcare facilities and 80(93%) healthcare facilities used brick-type incinerators for the disposal of infectious waste and sharp waste respectively. A protected pit was used by all healthcare facilities to dispose placenta and pathological waste. All healthcare facilities dispose of pharmaceutical waste at the national waste collection point in collaboration with Food and Drug Administration Authority (FDA), Ministry of Health, and Addis Ababa Regional Health Bureau (Table 4).

Table 4: Proportion of healthcare waste management service status at public healthcare facilities in Addis Ababa city, Ethiopia, 2022.

Waste management service indictors	**Proportion by HCF type**		
	Hospital N(%)	**Health center N(%)**	**Total N(%)**
Medical waste segregation			
▪ Waste segregation meet the standard	1(9.1%)	0(0%)	1(1.2 %)
▪ Segregation and bines aren't meet the standard	8(72.7%)	52(69.3%)	60(69.8%)
▪ segregation bins are not present	2(18.2%)	23(30.7%)	25(29%)
Disposal of infectious waste			
▪ incinerator(two-chamber,850-1000)	2(18.2%)	0(0%)	2(2.3%)
▪ incinerator(brick type)	7(63.6%)	72(96%)	79(91.8%)
▪ burning in the protected pit	0(0%)	3(4%)	3(3.5%)
▪ Collected for disposal off-site	2(18.2%)	0(0%)	2(2.3%)
Disposal of sharp waste			
▪ incinerator(two-chamber,850-1000)	2(18.2%)	0(0%)	2(2.3%)
▪ incinerator(brick type)	7(63.6%)	73(97.3%)	80(93%)
▪ burning in protected pit	0(0%)	2(2.7%)	2(2.3%)
▪ Collected for disposal off-site	2(18.2%)	0(0%)	2(2.3%)

5.1.5 Environmental cleaning service

Only 2(2.3%) healthcare facilities had basic environmental cleaning services, while the rest 84(97.7%) healthcare facilities had limited service.

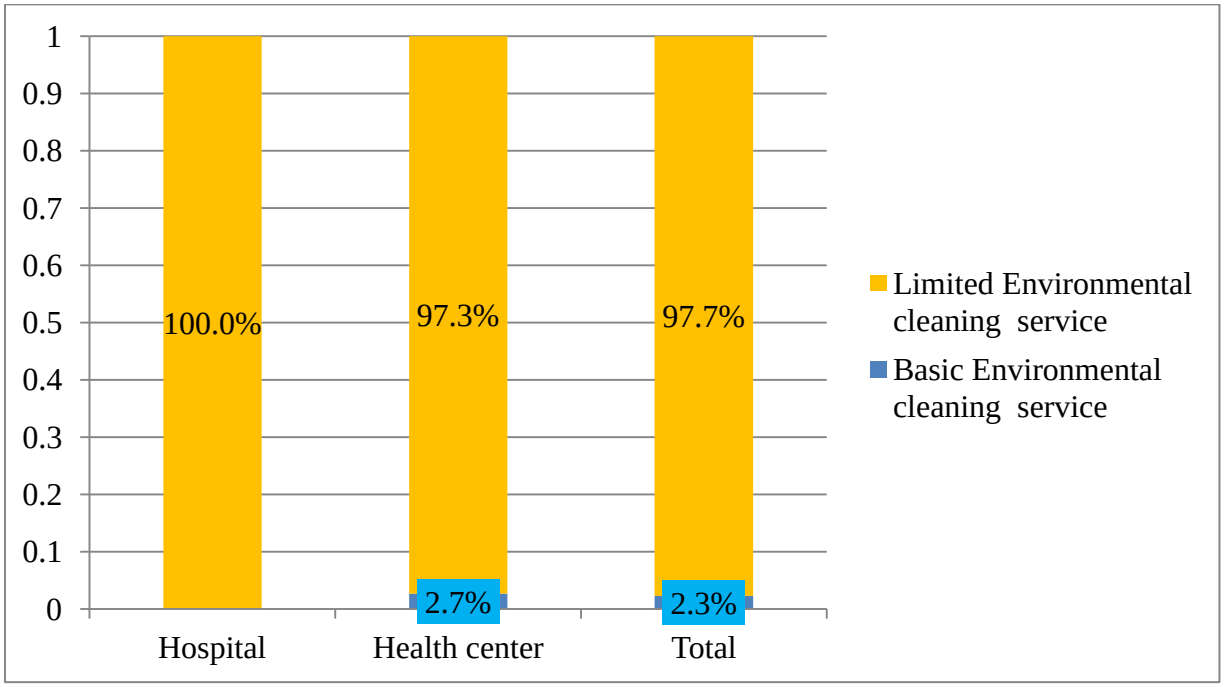

Figure 6: Environmental cleaning service availability in Addis Ababa public health care facility, Ethiopia 2022.

About one quarter 22(25.6%) of health care facilities had cleaning protocols for all cleaning services with cleaning schedules, and only 2(2.7%) health centers trained all staff related to cleaning services and standards. Furthermore, only 7(8.2%) of healthcare facilities had cleaning supplies including cleaning equipment and detergent in the patient care area (Table 5).

Table 5: Proportion of environmental cleaning service status of public health care facility in Addis Ababa city, Ethiopia, 2022.

Environmental cleaning service indicators	**Proportion by HCF type**		
	Hospital N(%)	**Health center N(%)**	**Total N(%)**
Cleaning protocol availability			
▪ Yes for all cleaning service	9(81.8%)	13(17.3%)	22(25.6 %)
▪ Yes, but not for all cleaning service	2(18.2%)	62(82.7%)	64(74.4%)
Training for responsible staff			
▪ Yes for all given	0(0%)	2(2.7%)	2(2.3%)
▪ Some staff had trained	11(100%)	70(93.3%)	81(94.2%)
▪ No one is trained	0(0%)	3(4%)	3(3.5%)
Cleaned floor, table & unpleasant smell			
▪ yes	11(100%)	64(85.3%)	75(87.2%)
▪ no	0(0%)	11(14.7%)	11(12.8%)
Cleaning supplies in the area of the outpatient room			
▪ Yes present	6(54.5%)	1(1.2%)	7(8.2%)
▪ Not present	5(45.5%)	74(86%)	79(91.8%)

5.2 Healthcare WASH service barriers

5.2.1 Socio-demographic characteristics of key informants

For the qualitative interview, 16 key informants have participated. Of these, 11 were recruited from hospitals, 4 were from health center, and one was from Addis Ababa Regional health bureau. Among the participants, 12(75%) were male. The participants were between the age of 26 and 58 with a mean age of 35.25 ± 7.77 years had 3 to 39 years of working experience with a mean of 10.94 ± 9.23 years. Thirteen and three participants had bachelor's degrees and master's degrees educational status, respectively. Of these, 11(68.7%) were working as infection prevention and control officers, 4(25%) participants were working as medical directors, and 1(6.3%) participant working as WASH program officer, respectively. The average time for the interview was 26.16 minutes.

Table 6: Socio-demographic characteristics of Key Informant (KI) in public healthcare facility in Addis Ababa city, Ethiopia 2022.

Characteristics		**Frequency (%)**
Sex	Male	4(25%)
	Female	12(75%)
Level of education	Degree	13(81.3%)
	Masters	3(18.7%)
Year of experience	< 5 years	4(25%)
	5-10 years	7(43.7%)
	> 10 years	5(31.3%)
Working area of KI	Health Center	4(25%)
	Hospital	11(68.7%)
	Health Bureau	1(6.3%)

5.2.2 Healthcare WASH service barriers

The qualitative parts of the study consist of five main themes and 12 subthemes of barrier, to providing basic healthcare WASH services, raised by the participants.

Built Environment and Necessity: the most frequently quoted challenges by participants; it describes limited availability, poor design, none functioning, poor maintenance service of healthcare WASH infrastructure and shortage of necessities like water affects healthcare WASH service provision. This theme emerged from four subthemes, non-availability (inadequate) of basic WASH infrastructure; lack of maintenance service; poor design and layout of facility and WASH infrastructures; and shortage of necessities.

Resource availability and allocation: in this theme, the availability of resource and allocation of it affects the status of WASH services. Participants mention that the inadequate procurements of supplies, extended bid system, high maintenance cost, and inadequate (lack) budget allocation for WASH impeded healthcare WASH service. The subthemes under this theme were inadequate (lack) budget allocation and shortage of supplies.

Stakeholder participation and Leadership commitment: this theme describes the lack of supervision and commitments of facility managers, and responsible governmental institutions, and the lack of partner organization participation are among the barriers to providing basic healthcare WASH service. Emerged subthemes are the lack of administrative support and leadership; and lack of partner organizations participation.

Individual level barrier: this theme describes individual level awareness, attitude, and behavior, able to improve or retard the level of healthcare WASH service. The emerged subthemes under this main theme are lack of training and awareness; and poor attitude and behavior.

Legal issue barrier: this theme describes the role of framework and guidelines on healthcare WASH service. Participants said the poor status of healthcare WASH service is attributed to unavailability of framework supported by healthcare WASH program documents and guidelines for a year. Emerged themes are the lack of program-supported framework, and the lack of healthcare WASH guidelines.

5.2.2.1 Built environment and Necessity related barrier

This main theme describes the most frequented barriers related to hardware infrastructure and the necessity to provide basic healthcare WASH service as mentioned by participants. Most of the time, the available WASH facilities were not fully functioning because of a lack of timely maintenance and renovation services.

Another barrier related to the build environment is the design of the building and WASH hardware; each service point of the facility had not WAHS system because of the poor design of the facility; even if the hardware is available, it might not be fully functional because of some of facilities (hospitals) had more than 5 decades of years old and they need to be renovated, and some of the hardware has not been properly installed. In addition, participants state that shortage of water is a critical challenge for healthcare WASH services.

A. Non-availability of basic WASH infrastructures

The participants described healthcare facilities are not doing WASH services as per the standard. The minimum requirement of basic WASH infrastructure has not been available and it was not in line with client flow and as per the standard. Senior program officer participant stated that;

> *"Availability of built facility (hardware) is a basic challenge; you know…all the facilities were not constructed considering adequacy and the inclusive WASH issues that create a significant challenge in the facility itself to address the issue right now". (KI 11)*

Healthcare facilities were not in the position to improve the dignity and privacy of patients, staff, women and people with limited mobility regarding WASH services. Participants noted that the construction of WASH facility at healthcare setting was not considered users continence and inclusive at the first beginning to address the issue of WASH for all; which was inadequate, and lack of user-sensitive toilets impact the usability of WASH service and compromise the needs of clients and facility staffs at all. The female deputy medical director of the health center stated that;

> *"…It makes me happy if you go and observe each OPD (outpatient unit), we do have a narrow outpatient room (small in surface area by m2) and they (OPD) do not have hand washing facility, except the delivery ward and operation room. We do have also small number of toilets; the users and number of toilets are not much, we do not have toilets for*

menstrual hygiene service, also we do not have toilets for limited mobility customers including staff. If cholera occurred at this time, personally I fear what will happen to these existing WASH services that we have". (KI 14)

Despite participants recognizing the significance of WASH service availability at each point of care and critical area, there was a variation of availability among service points. A medical director from the health center stated that

"....some rooms have not to WASH service equipment (hardware facility). As you know every service provider at the point of care should wash their hand after a visit or counseling each patient but most of our service point rooms had not to hand washing facility".

(KI 12)

The number of WASH facilities and users was not balanced, and Participants were stressed on the ratio of expected users to available hardware should be critically designed and planned at the time of healthcare facility construction. An infection prevention officer (IPC) from one hospital described;

".....One of the challenges is WASH infrastructure availability; for example, in our hospital, there are no built washing sinks (hand washing) at each point of care or service point. And also the hospitals have inadequate toilets, an estimated 1600-2000 visits are there per day, so if you think this number the hospital compound should have adequate number of toilets!!...but the reality is not as such". (KI 04)

B. Lack of maintenance service of WASH infrastructures

The other barrier described by participants was the lack of a functional WASH facility and poor maintenance services of it. Despite the limited availability of WASH service, not all WASH facilities were fully functioning and ready to use because of a lack of active maintenance and renovation services. Participants mentioned that frequently breaking and nonfunctioning hardware with poor maintenance ability of facility administration was hindering factors of healthcare WASH services. A senior IPC officer from one hospital stated;

"....from my experience, it is common to see broken or non-function toilets, sinks, and other WASH services hardware in this hospital, which are not maintained timely the same time. There is a maintained inability to make the service fully (100%) functional in

a timely and sustainable manner, I do not know really why this always continues as a problem…..may be related to technical gap or negligence or any else anyways". (KI 02)

Most of the healthcare facility had not sanitary maintenance workers and electricians at the time of the survey and the state of sustained functionality of WASH infrastructure are questionable; due to that lack of actively tracking and maintenance service was challenging for the healthcare facilities. IPC officer from one hospital described;

"…Lack of sustainability issues for the existing WASH facilities is a challenge in our hospital; what I have observed in our facility is there is no culture of prevention which means there is no active preventive maintenance and repair service for WASH systems rather corrective one; I believed that this kind of passive technical habit made the WASH service is not available at any time as per the standard in each room (service area)". (KI 08).

C. Poor design of WASH infrastructure

Another barrier related to the build environment is the design and layout of the building and WASH hardware; participants explained that how the design of the building and installation of WASH hardware substantially enhance or retarded healthcare WASH services. The program officer from Regional Health Bureau explained that;

"…The major bottlenecks are related to the design of buildings, if you experience the available health centers in the city the toilets and hand washing facilities are not functional which is mainly resulted from the poor design and installation of WASH facilities".(KI 11)

As stated by participants, each service point of the facility had not all WAHS system because of the poor design of the facility; even if the hardware is available, it might not be fully functional because some of the facilities (hospitals) were built many years ago and they need to be renovated, and some of the hardware has not been properly installed. The health center medical director stated;

"…If we observe the service delivery areas, they don't have water service; because water pipe is not installed towards many of the service areas in the first beginning, and also the rooms (service point) had not installed hand washing facility. Sometimes, I thought like…. the building was not built for healthcare facility at the first beginning". (KI 16)

The design of sanitation the facility across some healthcare settings was found not user-friendly, especially sitting types of the flush toilets which discourage users. Consequently, that made users to keep away from using it or use the toilet inappropriately. An IPC officer from the hospital said;

> *"We also encountered challenges of improper usage of facilities. For instance, the challenge that hinders the proper usage of toilets was the design of the toilet. Most of the time, the squatting position design of the toilet was the preferred one as compared to the sitting position which discourages them and creates room for excreting on the surface on the slab or cover of the toilet".(*KI 01*)*

D. Shortage of necessity:

In all healthcare facilities, shortage of water was found to be challenging for healthcare WASH service provision; even if the hardware is available, shortage of water was mentioned as a challenge to make fully functional all other WASH services across the building. Another deputy medical director from the health center explained that;

> *"…we are sharing water with the community, we do not access water independently and water is interrupted for three (3) or four(4) days…even we do have a limited number of tankers as a backup of water to serve us a couple of days and it will run away at the end. So that shortage of water is our main barrier since flush types of toilets without water is not a toilet and it is obvious for hand washing facility without water".* (KI 13)

5.2.2.2 Resource availability and allocation related barriers

In the healthcare setting, the availability and allocation of adequate resources have played a significant role in the hardware and software components of WASH service. The participant mentioned that the availability and practice of healthcare WASH service was affected by inadequate budget allocation for WASH, inadequate procurements of supplies, extended bid system, and high maintenance cost; An IPC officer from the hospital highlighted that;

> *"The challenge is no separate budget for the IPC and WASH service and there is frequently a shortage of WASH-related supplies. We did not ask them why supplies run out frequently and why purchased in a timely because there is no separate budget code assigned to WASH activities, even not for IPC. We try to fix facilities that are not*

working right but there will not be maintenance material needed at the time. We are facing such a challenge to avail basic WASH service in this hospital financial issue should be solved". (KI 07).

Despite the variation between facilities, participants explained how unavailability of the budget at healthcare facilities created a shortage of supplies; deter the maintenance services; and reduced the potential of environmental cleaning services which has been affecting the quality of care. An IPC officer said that;

"To avail all the required hygiene and sanitation equipment and practices, basic financial resources are required; as we know to prevent covid-19 and any infection we should have hand sanitizer and hand soap, other cleaning detergent, and water tank. All these materials required high financial resources at the same time we do not have adequate budget as a facility".(KI 06)

Participants said that not only a shortage of resources but also unable to use dedicated budget effectively was found to be a barrier; poor supply procurement habit of administration and extended or delayed bid system was challenging the healthcare WASH service. One of IPC officers from the hospital supported it;

"The WASH service is not available similarly in each room due to a shortage of supplies. For instance, lack of segregation of biohazard wastes; the purchasing process of the government (facility administration) is very lagging. Lack of sharp waste collecting bins (safety box) is also one of our problems; we use safety boxes prepared from normal cartons which are not as per the standard. This is available on the market system, but there is purchasing delay". (KI 02).

5.2.2.3 Stakeholder participation and Leadership

This theme describes the lack of supervision and commitments of facility managers and responsible governmental institutions, and the lack of partner organization participation are among the barriers that hampering basic healthcare WASH access. Emerged subthemes are inadequate administrative support and poor leadership, and lack of partner organization participation.

A. lack of administrative support and leadership

A great challenge is the lack of actively engaging in the implementation of WASH activities. The participants' explanation was agreed that the improvement of healthcare WASH services needs the engagement and support of governmental administration and committed health sector and facility leadership. As mentioned by participants, facilities are facing the challenge of poor administrative support in each chain of command; this is the problem of most of the facilities at the time of the survey, with a little bit of variation, the management staff either from the facility or higher offices did not have commitments to share and fix the challenges; so lack of actively coordinated support and ownership for healthcare WASH service are challenging back the healthcare WASH service. One of the hospital IPC officers stated that;

> "*One of the major challenges is lack of senior management engagement, they do not consider the WASH activities as the major one rather considering it as additional and/or auxiliary activity and task aside to the clinical service. For instance, they did not allocate budget for the supplies and maintenance service, they did not conduct routine support for WASH activities…" (KI 07)*

The problem was magnified at the health center level, which denied them from seeking financial and technical support from higher health sector offices like sub-cities and regional health bureaus. The health center depute medical director described that;

> *"…We do not have supportive supervision and follow-up from sub-city or any higher office regarding Health center WASH services. Even though they had regular supervision of the other clinical services, yet not supported WASH service in this facility. Since in my career in this facility, no one is visit here until now, to support and supervise WASH service specifically*" (KI 14).

Unlike the clinical service, WASH service was not emphasized by the Regional Heath Bureau and Ministry of health starting from the design and construction of the health facility to the implementation of the WASH program, participants described how this made challenging for the existing healthcare WASH service. The program officer supported this statement;

"The major problem is during the construction of buildings when the health facilities are constructed, it is based on the interest of engineer's taken the contract; owner of the facility, it may be health bureau or ministry of health even hospital or health center manager, is not participating at the time of design and construction, also WASH professionals are not participating in the design of buildings; health care professionals and WASH experts are not participating on it".(KI 11)

Health sector governance has not given attention to allocating WASH practitioners in the healthcare facility, particularly at health centers. Participants described that challenging of limited or shortage of technical personnel assigned for effective implementation of healthcare WASH service, unavailability of environmental health and hygiene experts in the health facilities (87% of healthcare facilities) is affecting the system which resulted from lack of emphasis given for healthcare WASH services. The WASH program officer highlighted that;

"Most of the health facilities use health officers or other professionals at IP (infection prevention) focal persons. Currently, vacant positions are allowed for environmental health professionals in the health center, but no environmental health professional is deployed for the position. So, the challenge is related to the shortage of environmental health professionals". (KI 11)

B. lack of partner organization participation

Some of participant raised that, the other challenge to limited healthcare WASH service is due to the absence of partner organization participation in healthcare WASH project. The participant's opinion described that engagement of partner organizations would improve and sustain basic healthcare WASH service yet that did not happen. The unavailability of agreement between partner organizations and healthcare facility administering body is the unmeet opportunity for healthcare WASH services. The IPC officer highlighted this;

"…I think lack of engagement of partner organizations like NGOs…..or governmental stakeholders working on it(WASH), is just one of the enabling environments for limited services of healthcare WASH; yes…..because renovation of hospitals like waste management technology including incinerator, waste drainage system could be upgraded and sustained by external stockholder yet not that happened on the ground". (KI 04)

Although partner organizations are participating in many clinical service programs in most of the surveyed hospitals, the participants indicated that the WASH service was overlooked in the health settings. Participants believed that the constraints of resource and technology limitations of the facility could be overcome by engagements of partner organizations, as highlighted by the deputy medical director;

> *"We need support from partner organizations like……NGOs or……anyone who is concerns to support healthcare WASH program, because they could be the source of funds, there may do have alternative technology and improve all over the status of WASH both in hardware and capacity building aspects".(KI 14)*

Limited efforts regarding healthcare WASH, creating a strong relationship with partners, and integrate initiatives, from the side of ministry of health and regional health bureau was also a problem that is challenging healthcare WASH service. The WASH program officer said;

> *"…only limited numbers of partner organizations participated. One partner organization called (partners x) is providing hardware for the WASH system otherwise the involvement of partner organizations is very limited in Addis Ababa,...their interest may not be in line with the health bureau. Considering the problem in Addis Ababa also, the region is not included in one WASH project. The non-inclusion of the city in the one WASH project also significantly affects the availability of budget for the WASH program*". (KI 11)

5.2.2.4 Individual level barriers

This theme describes individual level awareness; attitude and behavior can improve or retard the level of healthcare WASH service. The emerged subthemes under this main theme are lack of training and awareness; and attitude and behavior.

A. Lack of Training and Awareness

The training was given to healthcare professionals including cleaners across healthcare facilities. However, participants pointed out how low levels of awareness and inadequate training on healthcare WASH among staff and allied workers were challenging to healthcare WASH service, leading to the poor practice of it. The IPC officer said that;

> *"Even though the hospital is continuous professional development (CPD) center, healthcare workers did not take adequate training; you know…healthcare-associated*

infection is one of the major challenges in Ethiopia but no reminder and supervision system and they(healthcare workers) do have a low level of awareness on the importance of healthcare WASH; which leads to poor adherence to WASH service practice during healthcare attachment particularly poor hand hygiene compliance and waste management practice"(KI 03)

B. Poor Attitude and Behavior

Participants said that both professionals and management did not feel that WASH activities are the responsibility of all other staff beyond designated IPC officers and cleaners; They considered WASH is just an IPC, and they did not want to take a role in the improvements of healthcare WASH service. IPC officer from one hospital noted;

"One of the first challenges is attitude problem on IPC and WASH because IPC is not individual responsibility its responsibility of all staff, patients and management bodies; however, some staffs even management bodies perceived that WASH is just an IPC and it is only the duty of the focal person or IPC officers" (KI 04)

There was also professional negligence and ignorance towards the importance of healthcare WASH service at the point of care; participants pointed out that some professionals were not adhering to the practice of cleaning protocols. An IPC officer from one hospital described that;

"There are a physician and other health professionals who perceived that ICP is just bout hand washing; so that they do not mind about WASH activities like waste segregation at point of care, cleaning of point of care and the like".(KI 02)

Similarly, participants noted that negligence of proper waste segregation among clients was found one of the challenges to healthcare WASH services, as spoken by the IPC officer;

"Waste segregation practice is very poor among caregiver of the patient and health professionals have poor practice in waste segregation. For example, they damp gloves inappropriately but mostly waste segregation problem raised from the client, caregiver and visitors and we try to face the problem by giving health education" (KI 05)

5.2.2.5 Legal issue towards healthcare WASH

This theme describes the role of framework and guidelines on healthcare WASH service. Legal issues, like the consolidated stepwise approach of healthcare WASH supported by guidelines; have played a positive role in healthcare WASH service improvement. Participants believed that

the existing poor healthcare WASH service was attributed to unavailability of a framework supported by healthcare WASH guidelines.

A compressive healthcare WASH framework enhances the capacity of the healthcare facilities to run basic WASH services integrated with other clinical services. Participants noted that the absence of holistic WASH framework, able to address WASH challenges at healthcare setting, was a challenge to WASH service provision. For example, unavailability of healthcare associated infection surveillance systems, and unavailability of guidelines in healthcare settings. An IPC officer from the hospital stated that;

> *"There are many factors we are facing for poor WASH services provision in our facilities; lack of strong structural framework for healthcare WASH; there is no working healthcare WASH framework unlike other clinical services given in the hospital; there was not specific healthcare WASH guideline for years; there is no surveillance system and tracking staff in the hospital that conduct tracking of healthcare associated infections*". (KI 03)

Among the surveyed healthcare facility not more than 4 facilities started to apply and practice new healthcare WASH guideline; hence unavailability of specific healthcare WASH guideline for a year was also a challenge as participants raised. An IPC officer explained it;

> "…….*There is no specific WASH document or officer. You know…..WASH activities are overlooked in healthcare setting… not only in our facility if you go other healthcare facilities you will get IPC guideline and IPC focal officer who runs WASH integrated with the IPC department. Healthcare facilities had no independent guideline and professional staff responsible for primarily to WASH service". (KI 10)*

6. Discussion

The findings of this mixed study provide the current status of healthcare WASH service and the contemporary opinion of participants (healthcare professionals) experience on healthcare WASH service barriers in public healthcare facilities of Addis Ababa City. In this study, we found that no one healthcare facility had basic access to all WASH services. The independent WASH domain analysis showed that about 86% of healthcare facilities had basic water access, 100% had limited sanitation access, 88.4 % had limited hand hygiene service, 69.8% had limited healthcare waste management service, and 97.7% had limited environmental cleaning service.

Compared with the findings of other studies, overall access to basic healthcare WASH service in our study was lower than from the study conducted on urban healthcare facilities in Uganda (12.12%) (22), and a study conducted on rural healthcare facilities in sub-Saharan Africa countries e.g: Zambia (21%), Kenya (30%), Uganda (30%) and Ruanda (50%) (20). The limited access to healthcare WASH service might be due to unavailability of healthcare facility WASH standards for a year, and the lack of committed leadership from the side of the government. The other possible explanation could be due to unavailability of adequate resources distribution across healthcare facilities for the WASH services, building, and maintenance of infrastructure.

To our findings, healthcare facilities are facing challenges in providing basic access to WASH service. In this study, the finding was different from the national level of WASH service reported by the WHO and UNICEF joint monitoring healthcare WASH baseline report. The basic access to water service (86%) was higher than from national level access (30%) (41), and the worldwide level of basic water service (78%) (8). However, the available basic sanitation service(0%) and basic hand hygiene service (8.1%) in our study were lower than from national level of access 59% and 52% respectively by 2016 (41), and from the study conducted in the northwestern part of Ethiopia, 21.4% of facility had basic access to hand washing facility (51). The higher level of basic water service access might be attributed to the study area conducted in urban setting, which is the capital city of Ethiopia with better investment to access improved water sources as compared to studies conducted in urban and rural parts of the country. The lower level of basic hand hygiene service could be due to the limited availability of financial resources to facilitate supplies and maintenance service of hand hygiene facilities and the lack of timely repair system across healthcare facilities.

In this study, all healthcare facilities had limited sanitation service which is lower than in sub-Saharan African countries, 13% of healthcare facilities had basic sanitation service by 2022 (8); only 5% and 20% of healthcare facilities had access to a toilet for menstrual hygiene and limited mobility clients respectively; which means that more than 80% of public healthcare facilities in Addis Ababa were not user sensitive. These are more likely to affect the dignity and privacy of users. Unavailability of insufficient gender-sensitive sanitation facilities, the menstrual hygiene toilets, was also shown in studies conducted in Uganda and Zimbabwe (21,22), the proportion of sanitation facilities for menstrual use and disabled user remains poor. This could be due to that the essence of WASH for all might not be given emphasis and the design of the facility not considering user sensitive sanitation facility.

This study identified healthcare WASH service barriers, participants provided detailed descriptions of their healthcare facility WASH barriers, and the identified themes explained the limited access to healthcare WASH service findings. We found that built environments of WASH related barriers; lack of resource availability and allocation; partner organization and leadership barrier; individual level barriers and legal related barriers were the identified barriers to healthcare WASH service provision in the study area.

In the context of poor healthcare WASH services, adverse events including healthcare acquired infection and risk of AMR significantly affect the healthcare system (51). In our study, built environments of WASH infrastructure was found to be the most commonly cited barrier to WASH services provision in all healthcare facility. The unavailability of the built facility, lack of maintenance service, and poor design of the facility were among the significant barriers that were affecting the healthcare WASH services. The findings were found to be consistent with studies conducted in Kenya and Ethiopia, and the JMP baseline report (26,43,44). The design and availability of built WASH facilities were the most prevalent challenges; facilities were not built considering adequacy for users, and facilities were not designed at every point of care and did not consider special needs in the healthcare settings; maintenance service was not also given attention. These all affect the availability and practice of WASH services in the healthcare settings to the prevention of healthcare acquired infection and COVID-19 disease (52).

In the absence of an adequate and user friendly built sanitation service, an estimated risk of transmission of hospital acquired infection by contaminated environment contributed to 30-50% (24). The descriptive parts of our findings indicated that 95% of facilities had not to gender sensitive WASH service which makes to feel discomfort among menstruating girls and women due to issues of privacy and dignity (53); 80% of facilities had no a toilet for limited mobility users, this physical barrier kept away the disable users from using the toilet in the facility (54); 17% of healthcare facilities had not staff toilet, and 87.2% of the facility had not urinal service for men nearby the toilet. Due to that existing built sanitation facilities in the study area could have the significant contribution to poor quality of care and increase the risk of getting an infection (17,24,37).

Lack of functional hygiene facility at healthcare setting has the potential to increase the risk of healthcare acquired infection at the point of care and within the facility compound (17,24). In this study, due to physical, financial, and leadership related barriers raised by participants, 31.2% and 88.4% of healthcare facility had not functional hand hygiene facilities at the point of care and nearby the toilet respectively, either it has not to hand hygiene services at all, lacks water and/or soap at time of survey or it lacks maintenance services; and 93% of hand washing facility was not accessible to users with special need.

Similarly mixed method evaluation in part of Ethiopia (51), lack of functional hand hygiene facility and lack of washing materials at the point of care and nearby the toilet was impeding factors indicating that quality of care and patient safety was compromised across all healthcare facility, which makes that the risk of catching with COVID-19, monkey box, Ebola and any else among patients and caregivers are high (37,38).

Shortage of water was found to be one of the main barriers in most the healthcare facilities surveyed; Interruption of water availability affects the function of WASH service. This finding was also highlighted from studies conducted in Uganda and India (22,53). In our finding, facilities were suffering from a shortage of water; three-quarters of healthcare facility were faced water discontinuity previous to the survey due to that healthcare facilities were accessing water through shifting (*fereka*) program with the community; of which nearly half(45.3%) of the facility was experienced daily water interruption. In the healthcare setting, having only a built facility is not good enough to prevent infection; all WASH domains must work synergistically;

in the absence of water service toilet and hand washing facility would nor functional, clients also would not use the WASH facility and exposed to infection and which has led to developing negative experience and frustration that will deny them seeking care and loss of trust on the future (11,44).

The other most frequently cited barrier in our finding was inadequate resource availability impeding the availability of basic healthcare WASH service in the facilities. This was in line with studies conducted in Ethiopia and Kenya about resource barriers to health care WASH (15,43). The challenges in the prevention of infection have doubled in countries with the limited resources at the time of covid-19 pandemic (42). To avail all the required healthcare WASH facilities, to provide adequate and timely training for healthcare staff, and timely maintenance of services, basic financial resources and supplies are required and government should allocate adequate budget and materials. Similar to the qualitative study conducted in Malawi (51), a shortage of WASH supplies affect the availability of WASH services and practice in the study area.

Shortage of supplies (materials and equipment) for healthcare WASH service was found to be a significant barrier that hampering healthcare professionals, janitors, and clients to practice hygienic behaviors and environmental cleaning services. Shortage of WASH supplies causes to miss handling and management of healthcare waste, poor cleaning services, and poor hand hygiene practices across healthcare facilities, these could be due to the unavailability of budget and poor management of supplies which makes that care provider, patients, and cleaners vulnerable to infection and poor quality of care in the facilities. This challenge similarly reported from studies conducted in Ethiopia (12,44), highlighted the significance of adequate WASH service supplies to safeguard healthcare providers and to enhance the quality of care.

Therefore, a shortage of supplies do not build trust in the working environment and affects prevention practices (38,39), this implies that patient care practice is compromised that able to facilitate the chance of getting healthcare acquired infection or any emerging disease among patients, caregivers, waste handlers, and visitors across the healthcare facilities (28,29). These all could be attributed to a lack of and/or inadequate budget allocation for WASH services and a delayed bid system to purchase WASH materials and equipment.

Our finding showed that nearly one-third of the facilities in the study area had no healthcare waste segregation bins at the point of care, and two third of facilities had limited waste segregation services. Later shortage of waste segregation bines including safety boxes at the point of care leads to the poor practice of waste management and exposure to occupational hazards in the facility (28,30).

The other major barriers reported in this study were the lack of committed leadership and stakeholder participation. To the improvement of healthcare WASH service engagement and support of governmental administration, and committed health sector and facility leadership are worthy issues. Studies reported the implementation of basic WASH services in the healthcare setting is affected by the absence of committed leadership, lack of timely and ongoing monitoring system for implementation and maintenance, cleaning and waste management system; and the absence of a range of stakeholders capable of influencing or responsible for the provision of sustainable basic healthcare WASH services (15,43).

In this study, the most challenging in most healthcare facilities was, senior management staff, either from the facility or higher offices, were not taking a role in WASH service improvement in a good way. They did not allocate enough budget and technical staff for WASH service; they were not actively to engage in the design and construction of the facility; they were not providing timely technical assistant to IPC team to improve healthcare WASH service. Similarly, studies reported the degree of commitment and engagement of government and senior facility managers to take an action to improve healthcare WASH services was significantly attributed to the variation in WASH services availability in the healthcare facilities (10,22,43).

Evidence showed that the lack of integration of WASH service with other key national programs, and the lack of participation of private or none profit organizations in healthcare WASH projects were affecting the status and sustainability of healthcare WASH services. To solve the financial and technical barriers, integration of programs and agreements with partner organizations could be an alternative solution for healthcare facilities with the limited resources (15,24). In this study, the lack of engagement of partner organizations in healthcare WASH, and excluding the city from the One-WASH program was mentioned as barriers to WASH service provision. This might be due to that the lack of an effort to institute functional multi-sectorial coordination and

technical working force to healthcare WASH service by the ministry of health and regional health bureau.

This study found that individual level barrier was affecting healthcare WASH service; participants noted that lack of awareness, lack of training, poor attitude and negligence among care providers and janitors, and lack of awareness and inattention of healthcare attendants in the study area were the barriers for healthcare WASH service practice. The study found to be consistent with other findings in Ethiopia, inadequate training on WASH and IPC, low awareness of janitors and healthcare workers, and visitors were challenged to improving and manage healthcare WASH service in the facility (29,44,45).

We found that healthcare WASH service was suffering from the absence of healthcare WASH framework and guidelines. Participants in this study noted out the absence of compressive healthcare WASH service framework was attributed to limited healthcare WASH service in the facilities; healthcare WASH framework provides a clear road map for healthcare facility including targets to be achieved, healthcare infection surveillance system, monitoring tool and integration of it with the other clinical services. The other barrier raised by participants was the lack of healthcare WASH guidelines for a year. The absence of updated and inclusive guidelines focusing on healthcare WASH was significantly affecting facilities. Healthcare WASH facilities were not adequate, inclusive, and user friendly as a result of the absence of updated guidelines. The finding was in line with studies (10,15,24), gaps in the national level healthcare WASH framework and guidelines were the barriers to improving healthcare WASH service.

Strengths and limitations of the study

As a limitation, since the key informants were selected purposely generalization of healthcare WASH service barriers to the larger population cannot be made. As the strength, the study used a mixed method design by observing the WASH facilities and involving the key informant interview to have a complete understanding of the availability of healthcare WASH services and the barriers to WASH services provision. Using the new healthcare WASH service assessment tool, including details of WASH domains, accurately revealed the status of WASH services in healthcare facilities.

The implication of the Study

This study is the first in kind to assess the availability of healthcare WASH services based on the JMP service ladder, and to describe the experience of IPC focal officers, medical directors, and program officer about the barriers to healthcare WASH services provision in Ethiopia. Despite improvements of WASH related hygienic behavior at the time of the COVID-19 pandemic, the study revealed inadequate WASH services and multiple challenges across healthcare facilities have negative implications on the prevention and control measure of the COVID-19 disease, healthcare acquired infection and increase risk of AMR, and emerging future pandemics.

In the absence of significant improvement in basic service of healthcare WASH services, COVID-19 disease, healthcare acquired infection and AMR risk are still challenging for healthcare facilities that causing healthcare providers, clients, and cleaners are daily facing the risk of infection. We contribute scientific evidence to the literature by assessing the current status of healthcare WASH services and engaging the experience of healthcare professionals and experts on the barriers to healthcare WASH service. The country needs to act now to ensure basic WASH services in at the healthcare setting. Hence, the study serves as an input for policymakers and programmers to design healthcare WASH frameworks and appropriate monitoring tools to tackle infection in healthcare settings. The finding also pledges leverage of adequate resources from partners, the ministry of health and healthcare facilities; and leadership commitment for the attainment of basic access to healthcare WASH services.

7. Conclusion

The availability of healthcare WASH services in Addis Ababa city remains far short of the pace to achieve the SDG target (80% of facilities have basic services) by 2025. This study founds, based on the JMP service ladder none of the healthcare facilities in Addis Ababa city had basic access to all WASH services. The majority of public healthcare facilities had limited sanitation service (100%), limited hand hygiene service (88.4%), limited waste management service (68.9%), and limited environmental cleaning service (97.7%). However, most healthcare facilities had basic water supply services (86%).

According to key informants opinions and experience, inadequate WASH infrastructure, lack of maintenance service, poor design of the facility, lack of adequate budget, and shortage of supplies for WASH service were affecting the healthcare WASH service provision indicating that more investments are needed to ensure the provision of basic services. Besides, lack of administrative support and committed leadership, and absence of partner organization engagement were identified as the most common barriers that required more attention and commitment from government and facility management staff to improve WASH services.

Low awareness and shortage of training, and poor attitude and negligence towards healthcare WASH service from clients and healthcare staff were hindering barriers attributed to the limited availability of WASH service in the study area. The absence of a well-organized national healthcare WASH framework, and guideline for years at the national level were significantly affecting the provision of basic WASH services. Limited access to WASH services and multiple existing challenges at healthcare facilities makes worsening the prevention and control of COVID-19 pandemics, healthcare acquired infection, and AMR risk. It should be given priority and the need for more financial investment, capacity building, the commitment of leadership, and participation of partners in healthcare WASH service to address various barriers and minimized the risk of health emergencies and AMR in healthcare settings.

8. Recommendation

Based on the finding of the study, the following recommendations are forwarded;

Federal Ministry of Health: Ministry of Health should set compressive healthcare WASH strategies and appropriate monitoring tools and integrate with the national One-WASH program; In collaboration with regional bureau and facility administration, the Ministry of Health should be actively engaging in the design and construction of healthcare facility and ensure availability of women and disable friendly WASH technology in healthcare facilities; In addition, adequate budget, supplies, and human resource should be allocated across healthcare facilities.

Addis Ababa Regional Health Bureau: Regional Health Bureau should provide financial and technical support to improve healthcare WASH infrastructures as per the standard, and should deploy adequate environmental health professionals and maintenance staff in each healthcare facility to enforce the new WASH guideline. Besides, the health bureau should be facilitated and provide capacity building training and offer stakeholders including NGOs to participate in the healthcare WASH project.

Sub-city Health Office: Health office at sub-city level should conduct regular supervision and provide technical support in line with clinical service. Sub-city health offices should be addressed and follow the implementation of new healthcare WASH guidelines in each health center. The health offices should also assign independent budget codes for the healthcare WASH programs.

Healthcare Facility: Management staff should be given more attention to healthcare WASH service, and they should be actively engaged to follow and support activities to be done focusing on WASH services. They should properly manage utilities and supplies. In addition, they should prepare refreshment training for all healthcare professionals and cleaners and encourage them to adhere to and follow the guideline in each department and service area.

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10. Annex

10.1 Information sheet and consent form

My name is Atimen Derso. I am a second year master of science in Water and Health student at Ethiopian Institute of Water Resource, Addis Ababa University. I am doing my master's thesis entitled 'Assessment of WASH service availability and its barriers at public health care facilities in Addis Ababa; and its impact on COVID-19 prevention'. As you know WASH services are significant for the prevention of health care infection in the health care setting. However little is known on the availability of services and its barriers in Ethiopia. To fill such a gap, I am interested to conduct research to assess the current status of WASH services and explore barriers at public health care facility. Evidence from this research will help the health care manager, Addis Ababa regional health bureau, ministry of health, and policymakers to prioritize barriers and allocate resources in the development of intervention strategies.

The procedure of data collection has an observation checklist and key-informant interview, and it will have audiotape recording at the time of interview. Your name, title, or health facility will never be mentioned at the time of tape recording, and in the final report including publication; and the information you provide will not be accessed to anyone except the supervisor for data checking and cleaning purposes. If you are not interested in audiotaping interview will not be recorded. This study has no risk and no compensation. You have the right to withhold information, skip questions to answer, or withdraw from the interview at any time. I also clear to you there will be no effect at all in your benefit or other administrative effects that you get from the health care facility. You have the right to ask for information that is not clear during the interview. The purpose, ethical issue, and significance of the study have been approved by the Ethical Review Board of Addis Ababa University and Addis Ababa Public Health Research and Emergency Management Directorate. You are invited to participate in the study because we are believed your experience in your position can contribute much to our understanding of barriers to WASH service at the health care facility. For any further information please contact by these address; **Atimen Derso, cell Phone:+251(0)940286156; E-mail: atimen.de@gmail.com**

If you are volunteering to participate in this survey please put your signature here.

Participant signature _____ date _____

Name of interviewer _____Signature _____Date _____

Thank You for Participation in This Survey and your time!

10.2 Health care facility WASH service availability assessment observation checklist

Health care facility code _____ Facility type_____
Data collector name_____ Date of observation_____
Starting time _____; Ending time_____
Please encircle the answer option you observed.

Part 1: Water Service Availability Observation Checklist in Health Facility.		**Skip pattern**
S.No	**Observation questionnaire with answer option**	
Q101	**What is the main water supply source for the facility? Encircle one of the options below(observation with interview)**	
	1. Piped supply inside the building	
	2. Piped supply outside the building	
	3. Tube well/borehole	
	4. Protected dug well	
	5. Protected spring	
	6. Unprotected dug well	
	7. Unprotected spring	
	8. Rainwater	
	9. Tanker truck	
	10. Surface water(river/lake/pond	
	11. Other (specify)……	
	12. Don't know	
	13. No water source	Skip to Q201
Q102	**Where is the location of the main water supply accessed for use in the facility?**	
	1. On-premises(within the building or facility grounds)	
	2. Up to 500 m	
	3. 500 m or further	
Q103	**Is water available from the main water supply at the time of the observation?**	
	1. Yes (check the tap if the water is available at the time of observation)	
	2. No	
Q104	**Is there water reservoir in the compound of the health care facility?**	
	1. Yes	
	2. No	Skip to Q106
Q105	**If there is water reservoir how many liters can be stored in full size……**	
Q106	**Is there an instance of Water discontinuity from the main water**	

	source?	
	1. Yes	
	2. No	
Q107	**Frequency of discontinuity in water supply**	
	1. Frequently for part of the day	
	2. Rarely for part of the day	
	3. Frequently for part of the year	
	4. Rarely in part of the year	
	5. Water is always available	
	6. Don't know	
Q108	**Is HCF at a time facing harsh water shortage?**	
	1. Yes	
	2. No	
	3. Don't know	
Q109	**Is the health care facility having an alternative water supply source?**	
	1. Yes	
	2. No	
Q110	**Is water is piped towards/ unit you are currently present to observe?**	
	1. Yes	
	2. Yes, but currently an available	
	3. No	
Part 2: Sanitation service availability in the health facility		
Q201	**What types of toilets or latrines are available at the health facility for patients and hospital staff commonly used? (observation)**	
	1. Flush/pour-flush toilet to the sewer connection	
	2. Flush/pour-flush toilet to thank or pit	
	3. Pit latrine with slab	
	4. composting toilet	
	5. Flush/pour-flush toilet to open drain	
	6. Pit latrine without slab/open pit	
	7. bucket	
	8. Hanging toilet/latrine	
	9. Other (specify)…….	
	10. No toilet/latrine	Skip to Q301
	Guidance Note*:* If more than one type of toilet is used, the most common type of toilet/latrine in the service area should be selected.	
Q202	**A number of toilets in health facilities ……(served for observed ward or outpatient service)**	
Q203	**Methods of excreta and wastewater disposal at health care facility(interview with observation)**	
	1. Sewerage system(sewerage connection like municipal sewer system)	
	2. Septic tank	
	3. Pit or champers	

	4. Other (specify)…….	
	5. No toilet facility	
Q204	**Is at least one toilet usable (available, functional, and private)?**	
	1. Yes	
	2. No	
	Guidance Note: To be considered usable, a toilet should be available, functional, *and* private at the time of the survey or questionnaire. ✓ Toilets are *available* when on-premises, doors are unlocked, or with a key available at all times. ✓ To be *functional*, the hole or pit is not blocked, water is available for flush/pour-flush toilets, and there are no cracks or leaks in the toilet structure. ✓ To be considered *private*, the toilet stall has doors that can be locked from the inside and there are no large gaps or holes in the structure. ✓ If *any* of these criteria are not met, the toilet/latrine is not counted as usable.	
Q205	**Are there urinals services around male toilet block?**	
	1. Yes	
	2. No	
Q206	**Are there toilets that are dedicated to staff with separated for male and female?**	
	1. Yes	
	2. No	
	Notes: Staff toilets should be for the exclusive use of staff.	
Q207	**No of staff toilet……**	
Q208	**Are there toilets that are in sex-separated or gender-neutral rooms in the reception or waiting areas?**	
	1. Yes	
	2. No	
	Guidance Notes: Toilets can be in a room with multiple stalls or in a private room with a single toilet. Toilets in rooms with multiple stalls should all be dedicated for use by either women or men. A gender-neutral room with a single toilet is also considered sex-separated, as it allows women and men to use toilets separately.	
Q209	**Are there toilets that have menstrual hygiene facilities?**	
	1. Yes	
	2. No	
	Guidance Notes; A toilet can be considered to have menstrual hygiene facilities if ✓ It has foot operated bin with a lid on it for disposal of used menstrual hygiene products, and	

	✓ It has water and soap available in a private space for washing.	
Q210	**Are there toilets that are accessible for people with limited mobility?**	
	1. Yes	
	2. No	
	Guidance Notes: A toilet can be considered accessible for people with limited mobility if it meets relevant national or local standards. In the absence of such standards, it should meet the following conditions: ✓ can be accessed without stairs or steps, ✓ handrails for support are attached either to the floor or sidewalls, ✓ the door is at least 80 cm wide, and ✓ The door handle and seat are within reach of people using wheelchairs or crutches/sticks.	
Q211	**Cleanliness of toilet(Visible cleanliness of HCF toilet blocks)**	
	1. Yes	
	2. No	
	Guidance Note: the toilet has been consider not clean when the presence of significant flies/insects in improved toilets, Presence of unpleasant smell(sign of urine or faces), no bin with a lid, and visible soiled waste at the toilet room/ around block	
Q212	**Any sign of open defecation practice(observed fecal matter in HCF)**	
	1. Yes	
	2. No	
Part 3: Hand hygiene service availability observation checklist		
Q301	**Is there a functional hand hygiene facility at points of care on the day of the survey?**	
	1. Yes functional Hand hygiene facility at the point of care with water and soap	
	2. Yes Alcohol-Based Hand Rubs(ABHR) at point of care	
	3. Yes hand hygiene facilities at point of care but not functional, or lacking soap and/ water	
	4. No hand hygiene facilities at point of care.	

	Guidance Note: For facilities with multiple consultation rooms or areas, select one at random and observe if a functional hand hygiene facility is present. A functional hand hygiene facility is any device that enables staff, patients, and visitors to clean their hands effectively. It may consist of soap and water with a basin/pan for washing hands, or an alcohol-based hand rub (ABHR). If ABHR is used, health care staff may carry a dispenser around between points of care. Chlorinated water (a prepared solution of chlorine suspended in water) is not considered an adequate substitute for soap and water or ABHR. Points of care are any location in the health care facility where care or treatment is delivered (e.g. consultation/exam rooms). The term "hand hygiene" is used in place of "hand washing" because this is an umbrella term that also includes cleaning hands with ABHR.	
Q302	**Is there a functional hand washing facility at one or more toilets on the day of the survey?**	
	1. Yes there are functional hand washing facilities with water and soap within 5 meters of the toilets	
	2. No, there are hand washing facilities near the toilets but lacking soap and/or water	
	3. No, no hand washing facilities near toilets(within 5 meters)	
	Note: Hand washing facilities at toilets must include water and soap, rather than ABHR alone since ABHR does not remove fecal matter. • tick "yes" if at least one toilet has a hand washing facility with soap and water within 5 meters	
Q303	**Is there any hand hygiene promotion material on the washing facility**	
	1. Yes	
	2. No	
Q304	**Does the available hand washing facility is accessible to all users (considering special need people)?**	
	1. Yes	skip
	2. No	
Q305	**Is there hand washing facilities/basin for special need peoples?**	
	1. Yes	
	2. No	
Part 4: health care waste management service availability observation checklist		
Q401	**Is medical waste correctly segregated into at least three labeled bins in the consultation area?**	
	1. Waste is segregated into three color-coded or labeled bins covered with a lid (except bins for general waste) and full not more than 75% of the size	

	2. Bins and segregation of waste do not meet all requirements	
	3. Bins are not present	
	Note: • For facilities with multiple consultation rooms, select one at random and observe whether sharps waste, infectious waste, and non-infectious general waste are segregated into three different bins. • The bins should be color-coded and/or clearly labeled, no more than three quarters (75%) full, and each bin should not contain waste other than that corresponding to its label. • Bins should be appropriate to the type of waste they are to contain; sharps containers should be puncture-proof and others should be leak-proof. • Bins for sharps waste and infectious waste should have lids	
Q402	**Dose health care facility has trolley or wheelbarrow to transport waste from point of generation to storage, treatment and disposal site?**	
	1. yes	
	2. no	
Q403	**Is there a protected area for storage of medical waste waiting for treatment and/or disposal?**	
	1. Yes	
	2. No	
Q404	**How does this facility usually treat/dispose of infection waste? (Interview with observation)**	
	1. autoclaved	
	2. Incineration(two-chamber, 850-1000)	
	3. Incinerators (other like brick types)	
	4. Burning in a protected pit	
	5. Not treated, but buried in in lined, protected pit	
	6. Not treated, but collected for medical waste disposal off-site	
	7. Open dumping without treatment	
	8. Open burning	
	9. Not treated and added to general waste	
	10. Other(specify)	
	Guidance Note*:* If more than one applies, select the method used most often. • Methods considered to meet the basic service level include autoclaving; incineration; burial in a lined, protected pit; and collection for medical waste disposal off-site.	
Q405	**How does this facility usually treat/ dispose of sharps waste?**	
	1. Autoclaved	
	2. Incinerated(two-chamber, 850-1000 incinerator)	
	3. Incinerator (other like brick type)	
	4. Burning in a protected pit	
	5. Not treated, but buried in inlined, protected pit	

	6. Not treated, but collected for medical waste disposal off-site	
	7. Open dumping without treatment	
	8. Open burning	
	9. Not treated and added to general waste	
	10. Other(specify)	
	Note: If more than one applies, select the method used most often. • Methods considered to meet the basic service level include autoclaving; incineration; burial in a lined, protected pit; and collection for medical waste disposal off-site	
Q406	**How does the facility dispose of pathological waste and placental?**	
	1. Buried in a protected pit	
	2. Burning in protected pit	
	3. Incinerated	
	4. Other (specify)…….	
	5. No delivery service	
Q407	**How does the facility dispose of pharmaceutical wastes?**	
	1. National central collection point	
	2. autoclaved	
	3. Incineration(two-chamber, 850-1000)	
	4. Incinerators (other like brick types)	
	5. Burning in a protected pit	
	6. Not treated, but buried in in lined, protected pit	
	7. Not treated, but collected for medical waste disposal off-site	
	8. Open dumping without treatment	
	9. Open burning	
	10. Not treated and added to general waste	
	11. Other(specify)	
Q408	**How does the facility dispose of radioactive wastes?**	
	1. Septic tank or sewerage line	
	2. Autoclaved	
	3. Incinerated(two-chamber, 850-1000 incinerator)	
	4. Incinerator (other like brick type)	
	5. Burning in a protected pit	
	6. Not treated, but buried in inlined, protected pit	
	7. Not treated, but collected for medical waste disposal off-site	
	8. Open dumping without treatment	
	9. Open burning	
	10. Not treated and added to general waste	
	11. Other(specify)	
Q409	**If the usual treatment and disposal method of medical waste is an**	

	incinerator, does it functional?	
	1. Yes	
	2. No	
Q410	**Dose the health care facility select waste to be disposed by incinerator?**	
	1. Yes	
	2. No	
Part 5: Environmental cleaning services availability (Interview with observation)		
Q501	**Are cleaning protocols available?**	
	1. Yes, protocols for cleaning a floor, sink, spillage of blood or body fluids, and cleaning roster or schedule are available.	
	2. Yes protocols are available but not for all for cleaning activities	
	3. No, there is no any protocol for cleaning services	
	Guidance Note: Protocols should include: ✓ step-by-step techniques for specific tasks, such as cleaning a floor, cleaning a sink, cleaning a spillage of blood or body fluids, and ✓ a cleaning roster or schedule specifying responsibility for cleaning tasks and the frequency at which they should be performed. ✓ The term for protocols may differ according to local practice; they may be referred to as Standard Operating Procedures (SOPs), guidelines, instructions, etc. Where possible, protocols should be observed during a survey	
Q502	**Have all staff responsible for cleaning received training?**	
	1. Yes, all have been trained	
	2. No, some but not all have been trained	
	3. No, none have been trained	
	4. No, there are no staff responsible for cleaning	
	Note: "Staff responsible for cleaning" refers to ✓ Non-health care providers such as cleaners, orderlies, or auxiliary staff, as well as health care providers who, in addition to their clinical and patient care duties, perform cleaning tasks as part of their role. ✓ Training refers to structured training plans or programs led by a trainer or appropriately qualified supervisor	
Cleanliness of observed room at the time of observation		
Q503	**HCF had a clean floor, and table(no observed body fluid blood spillages, soiled waste); and no unpleased smell**	
	1. Yes	
	2. No	
Q504	**Are there cleaning supplies including equipment detergent and**	

	disinfectant available for a routine cleaning on that observed room?	
	1. Yes	
	2. No	
Q505	**Is there any observed cleaning schedule and frequency posted?**	
	1. Yes	
	2. No	
Part 6: General information of health care facility		
Q601	**The number of environmental health professional ----------**	
Q602	**Number of cleaners in health care facility----------**	
Q603	**Number of maintenance and electricians----------**	
Q604	**The number of outpatient per day/month…….**	
Q605	**The number of inpatients per day/month ……**	
Q606	**The number of delivery per day/month……**	
Q607	**The number of all staff in health care facility……..**	

10.3 Semi-structured key informant interview guide Health care WASH service barriers

Data collector name_____ **Date of interview**_____

Starting time _____ **Ending time**_____

Part 1: Closed question (key informant background information)

1. Key informant (interviewee) code:_____
2. Health facility type/code:_____
3. Position/role:_____
4. Age:_____
5. Sex:_____
6. Highest Education level/training:_____
7. Work experience (in year):_____
8. Do you have experience in IPC Yes_____ No_____
9. Any comment here:_____

_____

Part 2: interview questions

1. What understanding do you have about health care WASH services (Water, sanitation, hygiene, and waste management of health care facility)? (Concept, role related to quality of care, standard…..)

   Opinion and memo note_____

   _____

   _____

2. What training (pre-service and in-service) do you have on WASH services (water, sanitation, hand hygiene, and waste management) in a health care setting? What else? like IPC, quality, ….

   Opinion and memo note _____

   _____

   _____

3. Is there health care WASH guideline the facility follows or applied? What guidelines are currently available in this health care facility to provide and control Healthcare WASH services?

   Probes: In your view, what guidelines or documents do you feel have governed the basic WASH service provision in your health care facility? Is that part of IPC or an independent document or SOP?

   Opinion and memo note _____

   _____

   _____

4. In your view, how do you describe the current availability of water, sanitation, hygiene, waste management, and environmental cleanliness services in your health care facility?

   Probes: (Poor, good, very good……. Focusing on readiness to provide quality health care service, able to face or prevent COVID-19, positively contributing to prevent HCAI).

   Opinion and memo note _____

   _____

   _____

   _____

   _____

5. Do you have any experience or observation in related to WASH service limitation in this health care facility? What are the main WASH problems you experience in this health care facility including each ward? Which WASH services you would most likely to change or improve in this facility?

   Probes: Kinds of problem you face….shortage of water, poor sanitation service, inadequate waste management, poor/lack of hand hygiene facility and supply, poor cleanliness of service area.

   Opinion and memo note _____

   _____

   _____

   _____

6. How is your facility practicing to improve WASH services? How facility management group are going to solve limitation of WASH services before and right now?
   (Any attempt which is the facility was going to improve WASH services …)
   Opinion and memo note _____
   _____
   _____
   _____

7. Is there any training (internal or external) for staff related to WASH or specifically environmental cleaning protocols? How health care workers are trained? How many of them? Who gives?
   Opinion and memo note _____
   _____
   _____
   _____

8. In your opinion, what are major perceived barriers for the provision of basic/standard WASH services in your health care facility?
   Probes: (lack of healthcare WASH standard/or guideline, inadequate budget allocation and sources, and utilization for the purpose, poor management at facility and ward level, poor infrastructural design, non-functionality and poor maintenance, inadequate and poor supply of WASH service equipment, inadequate manpower related to WASH infrastructure maintenance, absents of WASH focal person, ….lack of/inadequate training/orientation on WASH or general cleanliness, lack of regulatory and supportive supervision, poor personal and professional attitude towards WASH, absence of linkage from external partnership/stakeholders that provide training, supplies, or develop guideline…any else)
   Opinion and memo note _____
   _____
   _____
   _____
   _____

_____

_____

_____

_____

9. What do you recommend/suggest to address the problem of WASH services in the health care setting?

   Opinion and memo note _____

   _____

   _____

10. Anything else you would like to tell me that I have not asked you related to health care WASH and/ or barriers.

    _____

    _____

I completed my question, thank you very much for your time!