

## Research Paper

# Healthcare facility water, sanitation, and hygiene service status and barriers in Addis Ababa, Ethiopia

Atimen Derso, Taffere Addis and Bezatu Mengistie\*

Ethiopian Institute of Water Resource, Addis Ababa University, Addis Ababa, Ethiopia

\*Corresponding author. E-mail: bezatum@gmail.com

## ABSTRACT

Inadequate water, sanitation, and hygiene (WASH) practices within healthcare facilities heighten the likelihood of hospital-acquired infections. Therefore, this study aimed to assess the status of WASH services and barriers at public healthcare facilities in Addis Ababa. A converging parallel mixed design was conducted among 86 public health care facilities and 16 key informants. A stratified sampling technique was used to select health care facilities. Quantitative data was collected using a semi-structured checklist, and qualitative data was collected using key informant interviews. Thematic data analysis was done to identify the barriers. Independent analysis of the healthcare WASH domain revealed that 86% and 14% of healthcare facilities had access to basic and limited water services, respectively; 100% had limited access to sanitation services; and 88.4% had limited hand hygiene services. While 97.7% and 29% did not have environmental cleaning or waste management services, respectively. Lack of WASH service infrastructure, resource availability, governance and collaborative work, capacity and awareness building, and a framework for monitoring and evaluation were found to be barriers to WASH services. Lack of basic WASH service access and existing challenges at healthcare facilities hinder efforts towards infection prevention and control.

**Key words:** barriers, Ethiopia, healthcare facilities, sanitation and hygiene, water

## HIGHLIGHTS

- 100% of healthcare facilities had limited access to sanitation service.
- 88.4%, and 3.5% of healthcare facilities had limited, and no service access for hand hygiene, respectively.
- 97.7% and 29% of healthcare facilities had not environmental cleaning service and waste management service respectively.
- Lack of access to basic WASH services, combined with multiple existing challenges at healthcare facilities in Addis Ababa, hinders efforts towards pandemic and healthcare-acquired infection prevention and control.

## INTRODUCTION

Inadequate basic healthcare Water, Sanitation and Hygiene (WASH) services remain a major public health problem, in both international communities and Ethiopia. By 2022, worldwide, 11% of healthcare facilities had no water service, and 10% had no sanitation service (WHO and UNICEF 2022); around 3.85 billion people worldwide lacked basic hand hygiene services in healthcare facilities, and over 681 million people in Sub-Saharan African countries lacked basic waste management services (WHO and UNICEF 2022).

Poor healthcare WASH services contribute to the higher burden of healthcare-associated infection in developing countries; and the risk of patients admitted to a healthcare facility acquiring one or more infections is more than two-fold in developing countries than in developed countries (Didier Pittet 2005; Allegranzi *et al.* 2011).

Despite the fact that WASH has a long history of prevention and is crucial for health security, COVID-19 disease has amplified the importance of WASH in healthcare institutions (Howard *et al.* 2020). Ensuring appropriate access to WASH services and enforcing adherence to safety and hygiene procedures in health facilities is critical for reducing the risk of emerging and re-emerging disease transmission to clients and healthcare workers (Kanyangarara *et al.* 2021; Tusabe *et al.* 2022).

Inadequate WASH provision also denies the potential benefit of quality care for patients in the healthcare setting. Every year, more people die from unsafe care than from a lack of care (Bouزيد *et al.* 2018; WHO 2019). Every year, more than

17 million women give birth in the world's poorest countries in healthcare facilities lack basic WASH services (WHO and UNICEF 2019a; Esteves Mills *et al.* 2020). It consequently leads to an increase in patient dissatisfaction and women choosing home delivery (Bouزيد *et al.* 2018). So efforts to provide adequate WASH services contributed to a reduction of 810 women and 6,700 newborn deaths worldwide (WHO 2022).

The lesson learned from Ebola outbreak and Severe Acute Respiratory Syndrome (SARS) implies poor WASH service in the health system is ready to made clients and frontline workers to infection and spread the COVID-19 pandemic. SARS infected 20–60% of healthcare workers worldwide (Mcdonald *et al.* 2004). In the same way, with insufficient WASH services for infection prevention and control (IPC), it was difficult to prevent and control the Ebola outbreak in Liberian healthcare facilities (Cooper *et al.* 2016). Therefore, the availability of supplies and infrastructure for WASH services is critical for the protection of healthcare professionals and the improvements of IPC practice (Desta *et al.* 2018).

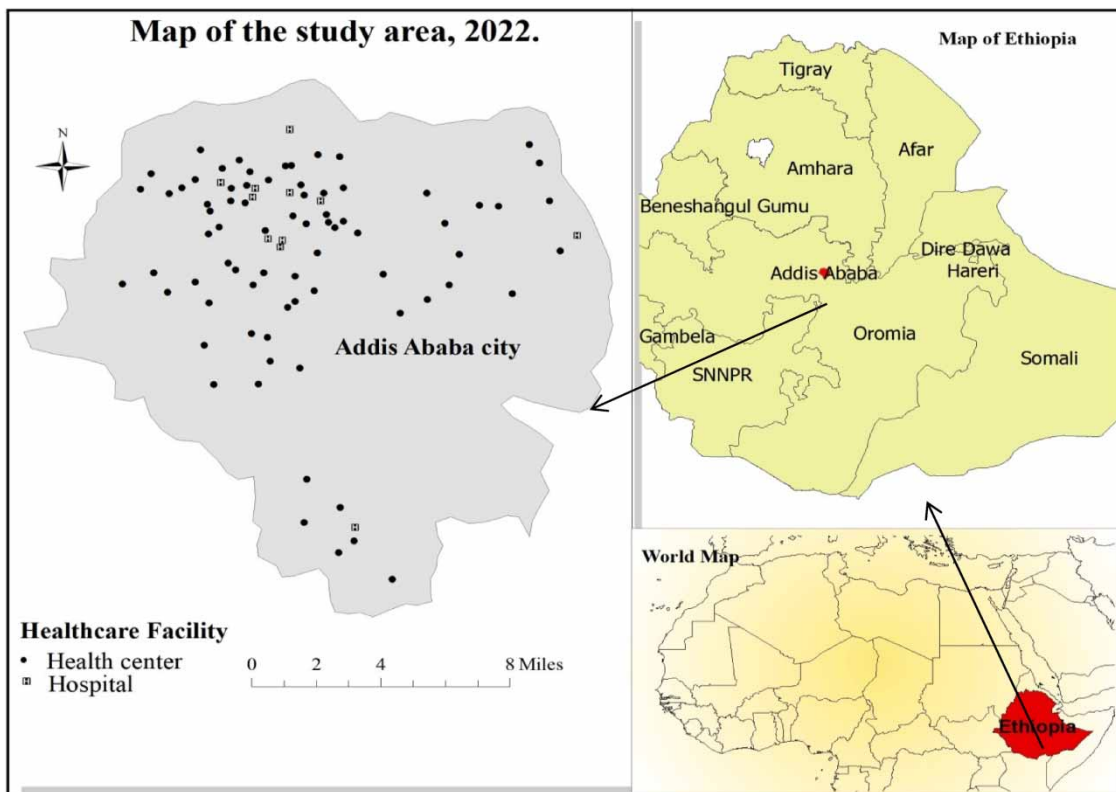
The availability of basic WASH services in healthcare facilities nationally remains poor, posing a challenge for many Ethiopians served by healthcare facilities that lack WASH services. National level estimates for 2021 revealed that 8 and 22% of healthcare facilities did not provide hand hygiene and sanitization services, respectively (WHO and UNICEF 2022).

While studies have shown the crucial role of WASH in healthcare facilities of Ethiopia, there are sparse data on the current situation of WASH service ladder in healthcare facilities after the inauguration of a community-based health insurance program where many patients are seeking care. Therefore the aim of this study was to assess the status of basic WASH service availability and explore the barriers to providing basic WASH services in public healthcare setting in Addis Ababa, Ethiopia.

## MATERIALS AND METHODS

### Study area

The study was carried out in Addis Ababa, Ethiopia. In Addis Ababa, there are 14 public hospitals, including specialized facilities and COVID-19 treatment centres and 100 health centres (Figure 1).



**Figure 1** | Spatial location of sampled healthcare facilities.

### Study design/approach and period

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 frame (Halcomb 2015). The study was conducted from April 2022 to June 2022.

### Study population

This study was performed in all public healthcare facilities, health centre, specialty centres, and referral and teaching hospitals located in Addis Ababa.

### Inclusion and exclusion criteria

Public healthcare facilities in Addis Ababa that provide service for the communities during the study were included, whereas a public healthcare facility in the city that is exclusively serving as a COVID-19 treatment centre was excluded.

### Study variables

The study variables are WASH services status (basic, limited, no service) and WASH barriers.

### Outcome variable measurement

*WASH services status:* The status of WASH services in the healthcare facility was measured by JMP healthcare 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 the JMP standard (WHO and UNICEF 2019b).

*Basic water service:* Healthcare 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 (WHO and UNICEF 2019b).

*Limited water service:* Healthcare facility that has access to an improved water source that is either located off the premises (within 500 m) or does not have water available at the time of the survey.

*No water service:* Healthcare facility that has access to water from either unimproved water source or improved water source that is more than 500 m or no water source at all.

*Basic sanitation service:* Healthcare 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 (WHO and UNICEF 2019b).

*Limited sanitation service:* Healthcare 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:* Healthcare facility with unimproved toilet facilities or no toilet facilities.

*Basic hand hygiene service:* Healthcare facility with functional hand hygiene facilities available at one or more points of care and within 5 m of toilets (WHO and UNICEF 2019b).

*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 facilities lack functional hand hygiene facilities at the point of care and toilets.

*Basic healthcare 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 (WHO and UNICEF 2019b).

*Limited healthcare 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 healthcare 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:* Healthcare facility that have a protocol for cleaning, and staff with cleaning responsibilities have all received training on cleaning procedures (WHO and UNICEF 2019b).

*Limited environmental cleaning services:* Healthcare facilities that have cleaning protocols and/or at least some staff 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 healthcare facilities to provide adequate WASH service or to the improvement of WASH services in healthcare facility (WHO 2017a).

### Sample size determination and sampling procedure for quantitative study

Sample size was determined using a single proportion formula with the assumption that the estimated availability of basic healthcare waste management services in Ethiopia was 64% from the JMP baseline healthcare WASH report (WHO & UNICEF 2019a), 95% confidence interval, and  $\alpha = 5\%$ , 5% marginal error:

$$n = \frac{[(z^{\frac{\alpha}{2}}) * (p(1-p))]}{w^2}; \quad n = \frac{[(1.96)^2 \times 0.64 \times (1 - 0.64)]}{0.05^2} = 354$$

Finally, on the basis of the size of the population, we used correction formula to calculate final sample size correction formula, and a total of 86 healthcare facilities were observed.

$$n' = \frac{n}{1 + \frac{(n-1)}{N}} = n' = \frac{354}{1 + \frac{(354-1)}{114}} = 86$$

To get a representative sample, stratified random sampling technique was used. After stratifying healthcare facility by health centre and hospital types of healthcare facility, simple random sampling technique was applied to select 11 hospitals and 75 health centre after proportional allocation of the sample to each stratum.

### Study participants and recruitment technic for qualitative study

For a qualitative study, the saturation or redundancy of information about all needed concepts after conducting a sequential interview was determined by the sample size (Cleary *et al.* 2014). Accordingly, 16 key informants were selected through the purposive sampling method based on their experience with or knowledge of healthcare WASH services and their exposure to WASH service barriers at a healthcare facility, and whose views or opinions can provide focused, useful, and creditable rich information.

### Data collection tool and procedure for quantitative study

The quantitative data were collected by a semi-structured observational checklist adapted from the WHO and UNICEF joint monitoring program core questions and indicators for monitoring WASH service level in healthcare facilities (WHO and UNICEF 2018). The observation of WASH services was carried out by observing a randomly selected outpatient service area.

### Data collection tool and procedure for the qualitative study

For qualitative data collection, face-to-face and in-depth interviews were conducted with 16 purposively selected key informants by the principal investigator through a semi-structured interview guide. The interview was recorded by an audiotape recorder, and it was continued until no new information or concepts emerged for all questions.

### Data quality assurance

The quality of the data and research process were ensured through 1-day training for two data collectors (BSc on Environmental Health Science) and two supervisors (postgraduate). The data collection was started within a week after the training. To ensure the trustworthiness and reliability of qualitative findings, the interview technique was revised between interview periods. If there is any new insight from the prior interview, key informants were encouraged to express their ideas and opinions freely at the beginning of the interview and explain their experience with healthcare WASH service.

### Data management and analysis for quantitative study

Descriptive analysis was carried out on quantitative data through SPSS version 25. The percentage of water, sanitation, hygiene, waste management, and environmental cleanliness service availability across the healthcare facility was computed from the summation of core questions that are used to measure basic, limited, and no service level.

### Data management and analysis for the qualitative study

Thematic analysis was conducted for the qualitative data. First, audio-recorded data and filed note (memo) data were transcribed and translated to English, and the text data were stored and organized in qualitative data management Atlas Ti software. Second, the data were organized. Third, initial codes were generated; fourth, codes were organized; fifth, main themes were organized, and then, themes were revised, interrelated, and categorized, which included the barriers to WASH provision in the healthcare 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 the report.

### Ethical consideration

Ethical clearance approval letter was sought from the ethical review board of St. Paul's Hospital Millennium Medical College (Ref.No.pm23/515). Verbal and written consent was obtained from each study participant before the interview.

## RESULTS

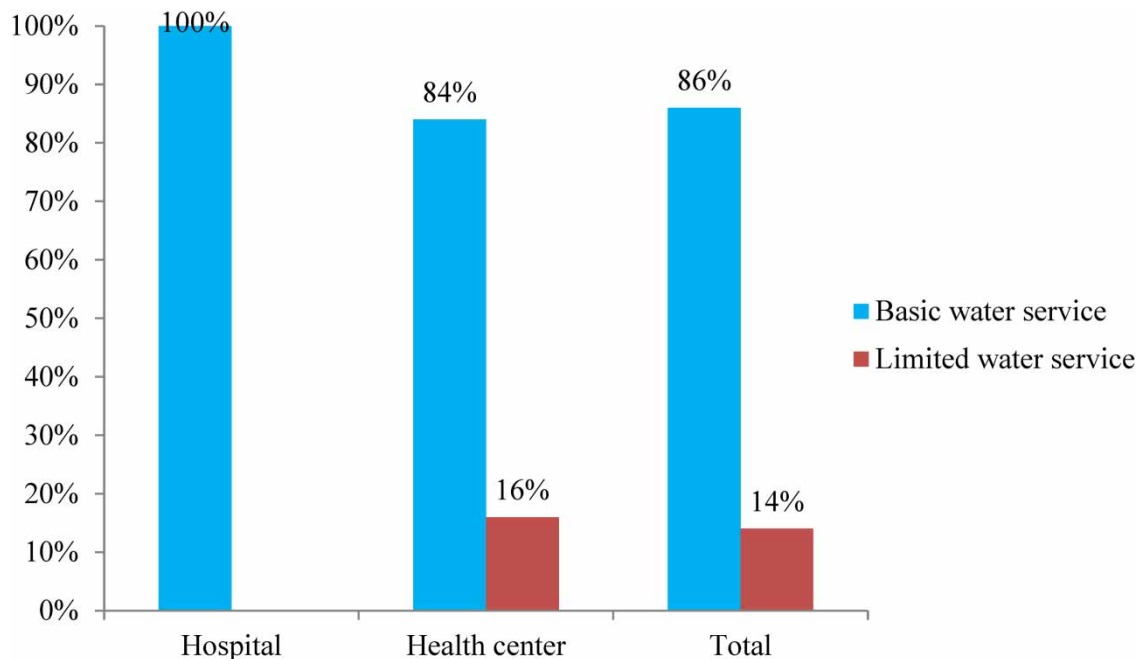
### Water service availability

During the assessment, 86 healthcare facilities were investigated. Of which, 75 (87.2%) were health centres, and 11 (12.8%) were hospitals. The mean daily client flowrates at hospital and health centre were 590.6 ( $\pm 541.5$ ) and 220.6 ( $\pm 88.8$ ), respectively. According to the JMP standard, the overall proportion of basic water service availability, where the main source of water is an improved source located on premises from which water is available, in healthcare facilities in Addis Ababa was 74 (86%) (Figure 2).

The entire healthcare facilities studied had piped water from an improved source located on the premises. However, water was not available from the main source at 12 (14%) of the healthcare facilities at the time of the assessment, and 64 (74.4%) of the healthcare facilities had experienced water discontinuity before the assessment (Table 1).

### Sanitation service availability

Based on JMP standards, there was no access to basic sanitation services in healthcare facilities, which are healthcare facilities with improved and usable sanitation facilities, with at least one toilet dedicated for staff, at least one sex-separated toilet with menstrual hygiene facilities, and at least one toilet accessible for users with limited mobility. There were usable toilets in



**Figure 2** | Water service availability among public healthcare facility in Addis Ababa city, Ethiopia 2022.

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

Water service indicators at HCF	Proportion by HCF		
	Hospital	Health centre	Total
Water availability during survey ( <i>N</i> = 86)			
• Yes	11 (100%)	63 (84%)	74 (86%)
• No	0 (0%)	12 (16%)	12 (14%)
Water discontinuity ( <i>N</i> = 86)			
• Yes	7 (63.6%)	57 (76%)	64 (74.4%)
• No	4 (36.6%)	18 (24%)	22 (25.6%)
Frequency of discontinuity ( <i>N</i> = 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 ( <i>N</i> = 86)			
• Yes	6 (54.5%)	4 (5.3%)	10 (11.6%)
• No	5 (45.5%)	71 (94.7%)	76 (88.4%)
Piped water at outpatient department ( <i>N</i> = 86)			
• Yes	8 (72.7%)	39 (52%)	47 (54.7%)
• No	3 (27.3%)	36 (48%)	39 (45.3%)

Note: HCF, healthcare facility.

49 (57%) of the healthcare facilities. Only 4 (4.7%) of healthcare facilities had menstrual hygiene toilets, and 17 (19.8%) had toilets accessible to users with limited mobility (Table 2).

### Hand hygiene service availability

Based on the JMP service ladder, only 7 (8.1%) of the 86 observed healthcare facilities had basic hygiene service access and functional hand hygiene facilities available at one or more points of care and within 5 m of toilets, while three (3.5%) healthcare facilities did not have access to hand hygiene services both at the point of care and within 5 m of the toilet (Figure 3).

At the point of care, 59 (68.6%) of healthcare facilities provided functional hand hygiene facilities (either with water and soap or with alcohol hand rub). However, 11 (or 12.8%) of healthcare facilities were unable to provide hygiene services at the point of care (Table 3).

### Healthcare waste management service availability

Of 86 healthcare facilities studied, 25 (29%) had no waste management service at all. Unfortunately, only one (1.2%) facility provided basic healthcare waste management services: healthcare facilities where waste is safely segregated in consultation areas and sharps and infectious wastes are treated and disposed of safely (Figure 4).

Only one hospital safely separated medical waste in three labelled bins. Of all healthcare facilities, 79 (91.8%) and 80 (93%) of healthcare facilities used brick-type incinerators for the disposal of infectious waste and sharp waste, respectively (Table 4).

### Environmental cleaning service availability

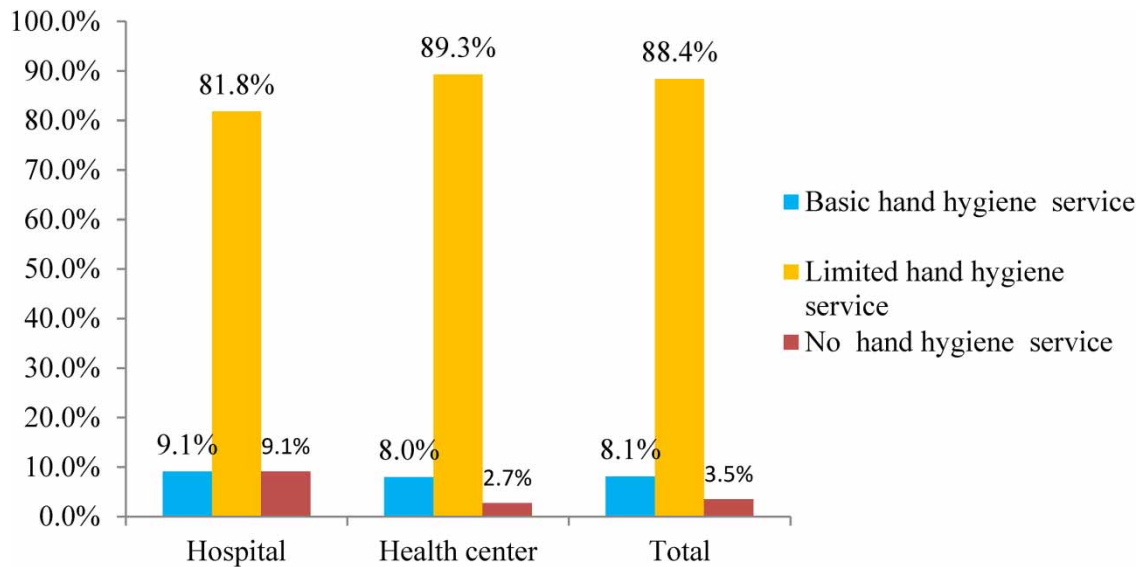
Only two (2.3%) of healthcare facilities provide basic environmental cleaning services; healthcare facilities have protocols for cleaning; and staff with cleaning responsibilities have all received training on cleaning procedures. The remaining 84 (97.7%) provided limited services (Figure 5). Only about one-quarter of healthcare facilities, 22 (25.6%) had cleaning protocols for all cleaning services with cleaning schedules, and only 2 (2.7%) health centres trained all staff on cleaning services and standards (Table 5).



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

Sanitation services indicator	Proportion by HCF type		
	Hospital	Health centre	Total
<b>Types of toilet</b>			
• 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%)
<b>Usable toilet</b>			
• Yes	7 (63.3%)	42 (56%)	49 (57%)
• No	4 (36.4%)	33 (44%)	37 (43%)
<b>Staff toilet</b>			
• Yes	9 (81.8%)	62 (82.7%)	71 (82.6%)
• No	2 (18.2%)	13 (17.3%)	15 (17.4%)
<b>Menstrual hygiene toilet</b>			
• Yes	0 (0%)	4 (5.3%)	4 (4.6%)
• No	11 (100%)	71 (94.7%)	82 (95.4%)
<b>Toilet for limited mobility</b>			
• Yes	0 (0%)	17 (22.7%)	17 (19.8%)
• No	11 (100%)	58 (77.3%)	69 (80.2%)
<b>Excreta/waste water disposal</b>			
• Sewerage system	6 (54.5%)	4 (5.3%)	10 (11.6%)
• Septic tank	5 (45.5%)	71 (94.7%)	76 (88.4%)
<b>Urinal service for male</b>			
• Yes	2 (12.8%)	9 (12%)	11 (12.8%)
• No	9 (81.8%)	66 (88%)	75 (87.2%)

Note: HCF, healthcare facility.



**Figure 3** | Hand hygiene service availability at public healthcare facilities in Addis Ababa city, Ethiopia 2022.

**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	Health centre	Total
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 m 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%)

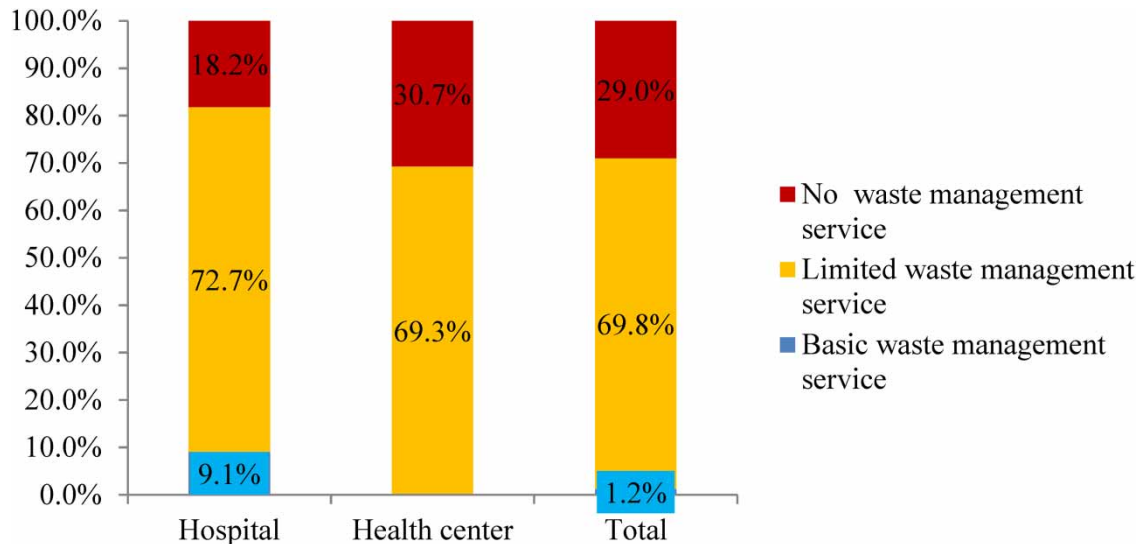
Note: HCF, healthcare facility.

**Healthcare WASH service barriers**

**Sociodemographic characteristics of key informants**

For the qualitative interview, 16 key informants have participated. Of these, 11 were recruited from hospitals, 4 were from health centre, and 1 was from Regional health bureau. The average time for the interview was 26.16 min (Table 6).

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



**Figure 4** | Healthcare waste management service availability at public healthcare facility in Addis Ababa city, Ethiopia 2022.



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

Waste management service indicators	Proportion by HCF type		
	Hospital	Health centre	Total
Medical waste segregation (N = 86)			
• Waste segregation meet the standard	1 (9.1%)	0 (0%)	1 (1.2%)
• Segregation and bins are not 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 (N = 86)			
• Incinerator (two-chamber, 850–1,000)	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 offsite	2 (18.2%)	0 (0%)	2 (2.3%)
Disposal of sharp waste (N = 86)			
• Incinerator (two-chamber, 850–1,000)	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 offsite	2 (18.2%)	0 (0%)	2 (2.3%)

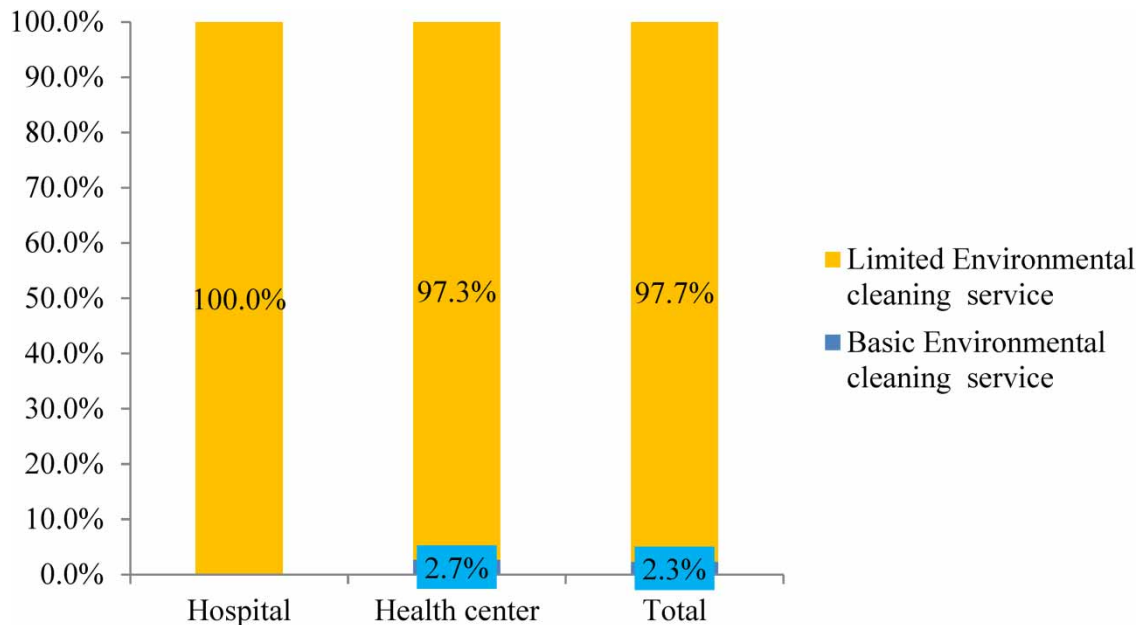
Note: HCF, healthcare facility.

**Built environment of WASH infrastructure**

This main theme describes the most frequently mentioned barriers related to hardware infrastructure and the need to provide basic healthcare WASH services by participants. The available WASH facilities were frequently not fully operational due to a lack of timely maintenance and renovation services.

**A. Inadequate availability of basic WASH infrastructure**

Healthcare facilities are not providing WASH services in accordance with the standard, and WASH facilities were not in accordance with client flow. Senior program officer participant stated that



**Figure 5** | Environmental cleaning service availability in Addis Ababa public health care facility, Ethiopia 2022.

**Table 5** | Proportion of environmental cleaning service status of public healthcare facility in Addis Ababa city, Ethiopia, 2022

Environmental cleaning service indicators	Proportion by HCF type		
	Hospital	Health centre	Total
Cleaning protocol availability ( <i>N</i> = 86)			
• 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 ( <i>N</i> = 86)			
• 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, and unpleasant smell ( <i>N</i> = 86)			
• Yes	11 (100%)	64 (85.3%)	75 (87.2%)
• No	0 (0%)	11 (14.7%)	11 (12.8%)
Cleaning supplies in the outpatient room ( <i>N</i> = 86)			
• Yes present	6 (54.5%)	1 (1.2%)	7 (8.2%)
• Not present	5 (45.5%)	74 (86%)	79 (91.8%)

Note: HCF, healthcare facility.

**Table 6** | Sociodemographic characteristics of 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 work experience	<5 years	4 (25)
	5–10 years	7 (43.7)
	>10 years	5 (31.3)
Working area of KI	Health centre	4 (25)
	Hospital	11 (68.7)
	Health Bureau	1 (6.3)

Note: KI, key informant.

*“A basic challenge is the availability of built facilities (hardware); you know ... All of the facilities were not built with adequacy and inclusive WASH issues in mind, which creates a significant challenge in addressing the issue right now.”* (KI 11)

Despite participants' recognition of the importance of WASH service availability at each point of care and critical area, availability varied across service points. A medical director from the health centre stated that:

*“Some rooms lack WASH service equipment (hardware facility). Every service provider at the point of care should wash their hands after visiting or counselling each patient, but the majority of our service point rooms lacked a hand washing station.”* (KI 12)

## B. Lack of maintenance service of WASH infrastructures

Due to a lack of active maintenance and renovation services not all WASH facilities were fully operational and ready for use. Frequently breaking and non-functioning hardware were impediments to healthcare WASH services. A senior IPC officer stated

*“In this hospital, I have seen broken or non-functioning toilets, sinks, and other WASH services hardware that are not maintained on a timely basis. There is a persistent inability to make the service fully (100%) functional in a timely and sustainable manner.” (KI 02)*

### C. Poor design of WASH infrastructure

Participants described how the design of the building and installation of WASH hardware significantly improved or hampered healthcare WASH services. The program officer from Regional Health Bureau explained that

*“The major bottlenecks are related to building design; for example, in the city’s available health centers, the toilets and hand washing facilities are inoperable, which is primarily due to poor design and installation of WASH facilities.” (KI 11)*

### D. Discontinuity of water

Even if the hardware is available, water interruption was mentioned as a challenge to fully functional all other WASH services across the building. The deputy medical director from the health centre explained that

*“We share water with the community, we do not have independent access to water, and water is interrupted for three or four days. We have a limited number of water tankers to serve us for a few days, the tankers eventually run out of water.” (KI 13)*

## WASH resource management

Insufficient budget allocation for WASH, insufficient supply procurement, an extended bid system, and high maintenance costs impacted the availability and practice of healthcare WASH services. An IPC officer said that

*“Basic financial resources are required to provide all of the required hygiene and sanitation equipment and practices; as we know, to prevent covid-19 and any infection, we should have hand sanitizer and hand soap, other cleaning detergent, and a water tank. All of these materials necessitated substantial financial resources.” (KI 06)*

One of the IPC officers from the hospital also supported it:

*“Due to a lack of supplies, the WASH service is not available in each room in the same way. For example, there is no segregation of biohazard waste; the government’s purchasing process (facility administration) is extremely slow. One of our issues is a lack of sharp waste collection bins (safety boxes); we use safety boxes made from regular cartons, which are not up to standard. This is available on the market system, but purchasing is delayed.” (KI 02).*

## Governance and collaboration

This theme describes the lack of healthcare governance and commitments of facility managers and responsible governmental institutions, as well as the lack of alignment and collaboration with partner organizations, as barriers to basic healthcare WASH access.

### A. Lack of healthcare governance

Facilities are facing the challenge of poor administrative support in each chain of command; this was the problem of most of the facilities at the time of the survey with a little variation, and the management staff either from the facility or higher offices did not have commitment to share and fix the challenges. One of the hospital IPC officers stated that

*“Senior management views WASH activities as an additional and/or auxiliary activity and task in addition to clinical services. For example, they did not budget for supplies and maintenance, and they did not provide routine support for WASH activities.” (KI 07)*

The problem was magnified at the health centre level, which denied them from seeking financial and technical support from higher health sector offices. The health centre depute medical director described that

*“We do not have supportive supervision or follow-up from the sub-city or any higher office. Despite having regular supervision of the other clinical services, this facility did not support WASH services. Since I began working in this facility, no one has come to support and supervise the WASH service.”* (KI 14).

#### B. Lack of collaboration with partner organizations

The absence of partner organization participation in the healthcare WASH project is another challenge to limited healthcare WASH service. According to the participant's opinion, involving partner organizations would improve and sustain basic healthcare WASH services, but this did not occur. The IPC officer highlighted this:

*“Lack of engagement of partner organizations working on it (WASH) is just one of the challenging factors for healthcare WASH services; because hospital renovations like waste management technology including incinerator, waste drainage system could be upgraded and sustained by external stockholder but that did not happen on the ground.”* (KI 04)

The deputy medical director also raised:

*“We require assistance from any partner organizations interested in supporting the healthcare WASH program because they may be a source of funds, have alternative technology, and can improve the overall status of WASH in terms of both hardware and capacity building.”* (KI 14)

Limited efforts regarding healthcare WASH, building strong relationships with partners, and integrating initiatives from the ministry of health and regional health bureau were also a problem that challenged healthcare WASH service. The WASH program officer said

*“Given the problem in Addis Ababa, healthcare WASH is not included in any WASH project. The city's exclusion from the One WASH project has a significant impact on the WASH program's budget availability.”* (KI 11)

### Capacity and awareness building

This theme describes how healthcare workforce training, skill transfer, best practice sharing, and behavioural change awareness status can improve the quality of healthcare WASH services.

#### A. Lack of capacity building

This includes lack of experience with healthcare workforce training (either pre-service or in-service), and sharing of skills and best practices on environmental cleaning service across departments and healthcare facilities as challenges to healthcare WASH service. The IPC officer said that

*“Despite the fact that the hospital is a CPD center, healthcare workers did not receive adequate training or any reminder action. As a result, poor adherence to WASH service practice during healthcare attachment, particularly poor hand hygiene compliance and waste management practice occurs.”* (KI 03)

#### B. Lack of behavioural change awareness

Both professionals and management did not believe that WASH activities were the responsibility of all other staff members; they did not want to play a role in improving healthcare WASH service. The IPC officer from one hospital noted

*“Some employees and management bodies believed that WASH was simply an IPC and that the focal person or IPC officers were solely responsible for it.”* (KI 04)

There was also professional negligence and ignorance; some professionals did not follow cleaning protocols. An IPC officer from one hospital described that

*“A physician and other health professionals believe that ICP is only about hand washing, so they are unconcerned about WASH activities such as waste segregation at the point of care, point of care cleaning, and the like.”* (KI 02)

### Monitoring and evaluation framework

This theme describes the role of frameworks, tools, and guidelines in tracking progress and making decisions on healthcare WASH services, as well as surveillance of healthcare-acquired infection.

#### A. Lack of standardized healthcare WASH framework

The poor state of healthcare WASH service is due to the lack of a standardized and institutionalized healthcare WASH framework supported by new tools and guidelines. An IPC officer from the hospital stated that

*“There is no functioning healthcare WASH framework. In the hospital, there is no institutionalized surveillance system or tracking staff to track healthcare-associated infections.”* (KI 03)

#### B. Lack of healthcare WASH guidelines

The lack of specific healthcare WASH guidelines for a year was also a challenge as participants raised. An IPC officer explained it as follows:

*“Healthcare facilities lacked independent guidance and professional staff who were primarily responsible for WASH services. We only have an IPC guideline and an IPC focal officer who is in charge of WASH, which is integrated with the IPC department.”* (KI 10)

## DISCUSSION

The findings of this mixed study provide the current state of healthcare WASH service and the contemporary opinion of healthcare professionals on healthcare WASH service barriers in public healthcare facilities in Addis Ababa. We found that all healthcare facilities lacked basic access to the full WASH service domain.

In this study, access to basic WASH services across all domains was poor compared to studies conducted in Uganda (12.12%) (Kayiwa *et al.* 2020) and Sub-Saharan African countries (21–50%) (Guo *et al.* 2017); this implies that public healthcare facilities provide insufficient access to essential healthcare WASH services. The lack of access to healthcare WASH services could be attributed to the year-long absence of healthcare facility WASH standards, lack of committed governance, and limited access and management of WASH resources across healthcare facilities.

In this study, basic hand hygiene service status (8.1%) was lower than in studies conducted in the northwestern part of Ethiopia and in East Show Oromia, and 21.4 and 25% of healthcare facilities had basic access to hand washing facilities, respectively (Berihun *et al.* 2022; Girmay *et al.* 2023). The lower level of basic hand hygiene service may be related to a lack of financial resources to facilitate supplies and maintenance of hand hygiene facilities, as well as a lack of locally created hand hygiene products and technology throughout healthcare facilities. Despite the fact that alcohol-based hand rubs (ABHR) have largely been used in healthcare settings, research in Uganda has investigated cheaper approaches to enhancing access to hand hygiene materials through local production of ABHR during non-outbreak situations (Tusabe *et al.* 2023).

The assessment found that all healthcare facilities had limited sanitation service similar to the study conducted in East Show Oromia (Girmay *et al.* 2023). The sanitation service availability was also lower than in Sub-Saharan African countries, and 13% of healthcare facilities had basic sanitation service by 2022 (WHO and UNICEF 2022). Similarly, findings reported on the proportion of sanitation facilities for menstrual use and disabled users remained low in Uganda and Zimbabwe (Kayiwa *et al.* 2020; Hirai *et al.* 2021). We found that more than 80% of public healthcare facilities in Addis Ababa were not user sensitive, so clients are more likely to be threatening their dignity and privacy (Kohler *et al.* 2019). This could be

because the essence of WASH for all was not emphasized, and the facility was not designed with user-sensitive sanitation in mind.

Although the generation rate of hazardous waste in Ethiopia is increasing, ranging from 21 to 70% (Yazie *et al.* 2019a), the collection and treatment practices of waste at healthcare facilities remain poor due to inappropriate waste management utilities and enforcement from the regulatory bodies (Yazie *et al.* 2019a; Legesse *et al.* 2022). Similarly, our study found that 69.8% of health facility had not safely separated medical waste in three labelled bins. Facilities which safely separate medical waste in three labelled bins (1.2%) were much lower than the study conducted in East Show Oromia (9.1%) (Girmay *et al.* 2023).

Participants provided detailed descriptions of their healthcare facility WASH barriers. In our study, the most frequently cited barrier to WASH service provision in all healthcare facilities was the built environment of WASH infrastructure. Similar to other studies (Maina *et al.* 2019; WHO and UNICEF 2020; Mersha *et al.* 2021), key informants identified inadequate availability of built facilities and a lack of maintenance service as significant barriers affecting healthcare WASH services. These barriers also increase the likelihood of adverse events in the healthcare system, such as healthcare-acquired infections and the risk of AMR (Berihun *et al.* 2022).

Despite the fact that participants agreed that built WASH facilities should be designed based on standards and user preferences, the WASH infrastructure in the study area was not designed at every point of care and did not take special needs into account in healthcare settings, which increased the incidence and prevalence of healthcare-acquired infections and COVID-19 disease (Kanyangarara *et al.* 2021). The lack of an adequate and user-friendly built sanitation service could contribute significantly to poor quality of care and increase the risk of infection; the contaminated working environment in the healthcare setting contributed to 30–50% of the risk of disease transmission (Peters *et al.* 2018, 2019; Vermeil *et al.* 2019).

According to research conducted in Ethiopia and Kenya (WHO 2017a; Maina *et al.* 2019), insufficient resource availability and management are impeding access to basic healthcare WASH services in facilities. A qualitative study in Ethiopia and Malawi (Kenzie *et al.* 2019; Berihun *et al.* 2022), similar to this one, discussed how a lack of WASH supplies affects the availability of healthcare WASH services and practices. Basic financial resources and supplies are required to provide all required healthcare WASH facilities, and the government should allocate adequate budget and materials. During the covid-19 pandemic, the challenges in infection prevention doubled in countries with limited resources (Angrup *et al.* 2020).

A lack of WASH supplies leads to improper handling and management of healthcare waste, poor cleaning services, and poor hand hygiene practices throughout healthcare facilities. A similar study found that a lack of WASH supplies undermines trust in the workplace and has an impact on prevention practices (Engdaw *et al.* 2019; Kampf *et al.* 2020). This implies that patient care practice is compromised, which increases the risk of getting a healthcare-acquired infection or an emerging disease among patients, caregivers, waste handlers, and visitors across healthcare facilities (WHO 2017b; Yazie *et al.* 2019b).

Participants in our study, like in other studies (WHO 2017a; Maina *et al.* 2019), stated that the absence of committed governance and collaborative work with a variety of partner organizations impedes the implementation of basic WASH services in the healthcare setting. Other studies examined how the lack of commitment and engagement of government and senior facility managers affected the status of healthcare WASH services (Didier Pittet 2005; Maina *et al.* 2019; Kayiwa *et al.* 2020), and also found that government did not allocate enough budget and technical staff for WASH service; they did not actively participate in the design and construction of the facility; and they did not provide timely technical assistance to the IPC team to improve healthcare WASH service.

Integration of programs and agreements with partner organizations could be an alternative solution for healthcare facilities with limited resources to overcome financial and technical barriers (WHO 2017a; Peters *et al.* 2018). Similarly, participants identified the disadvantages of excluding the city from the One-WASH program and lack of engagement of partner organizations in healthcare WASH; the availability of WASH services could not be sustained, and lack of engagement of alliance organization causes financial resource constraints and technical skill gap, ultimately affecting the capacity to fix and maintain the gaps in the facility.

Consistent with reports from Ethiopia (Abebe *et al.* 2017; Yazie *et al.* 2019b; Mersha *et al.* 2021), we found that a lack of healthcare workforce capacity and an effort to raise awareness about healthcare WASH services practice affect the status of healthcare WASH services. According to a systematic review conducted in Ethiopia, a common barrier in the healthcare waste management service is a lack of awareness among healthcare professionals (Yazie *et al.* 2019a). A similar finding revealed that many healthcare facilities do not place value and credit on capacity and awareness building on environmental



cleaning services as a way to save money and increase patient satisfaction (Peters *et al.* 2018; Vermeil *et al.* 2019). Participants also emphasized that a lack of awareness generation activities to improve behavioural change increases negligence among care providers and janitors, leaving patients and caregivers vulnerable to infection (Engdaw *et al.* 2019; Peters *et al.* 2019).

This finding is found to be similar to previous studies which explained that the absence of standardize monitoring and evaluation framework and guidelines affect the status of healthcare WASH services (Didier Pittet 2005; WHO 2017a; Peters *et al.* 2018). Participants agreed on the importance of a healthcare WASH monitoring and evaluation framework that provides detailed understandings of the implementation and progress of healthcare WASH targets to be achieved and healthcare-acquired infections, a surveillance system, and a data management system.

### Strengths and limitations of the study

This study observed the basic healthcare WASH service status based on the JMP service ladder, but it did not address all of the advanced service level of WASH components. As strength, the study used a mixed method design and new healthcare WASH service assessment tool, accurately revealed the status of basic healthcare WASH services and underlying barriers to WASH service provision.

### The implication of the study

This article describes the current state of WASH service according to the JMP service ladder, as well as the barriers to service, and as a result, the study can assist policymakers and programmers in developing a healthcare WASH monitoring and evaluation framework to combat infection in healthcare settings. The study found that inadequate WASH services and multiple challenges across healthcare facilities have negative implications for healthcare-acquired IPC, AMR risk, and COVID-19 pandemics. The country must act immediately to ensure that basic WASH services are available in healthcare settings. Without significant improvements in healthcare WASH services, the prevention and control of healthcare-acquired infection remains difficult, putting healthcare providers, clients, and cleaners at risk of infection on a daily basis.

## CONCLUSIONS AND RECOMMENDATION

The availability of healthcare WASH services in Addis Ababa remains far behind the pace required to meet the Sustainable Development Goal target (80% of facilities have basic services) by 2025. According to the JMP service ladder, healthcare facilities in Addis Ababa had basic access to the overall domain of WASH service was nil. Lack of access to basic WASH services, combined with multiple existing challenges at healthcare facilities, worsens pandemic and healthcare-acquired IPC, necessitating more attention and commitment from government and facility management staff to improve WASH services, and additional investments are required to ensure the provision of basic services.

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## DATA AVAILABILITY STATEMENT

All relevant data are included in the paper or its Supplementary Information.

## CONFLICT OF INTEREST

The authors declare there is no conflict.

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