

Status of Water, Sanitation and Hygiene in Healthcare Facilities in the Greater Kampala Metropolitan Area, Uganda.

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Research article

Keywords: Water, Sanitation and Hygiene, Healthcare facilities, WASHCon, JMP, Uganda

Posted Date: March 24th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-18740/v1>

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Version of Record: A version of this preprint was published on November 23rd, 2020. See the published version at

<https://doi.org/10.1186/s12889-020-09895-9>.

Abstract

Background: Improved Water, Sanitation and Hygiene (WASH) services in Health Care Facilities (HCFs) is of significant public health importance. It is associated with a reduction in the transmission of hospital acquired infections (HAIs), increased trust and uptake of healthcare services, cost saving from infections averted, increased efficiency and improved staff morale. Despite these benefits, there is limited evidence on the status of WASH in HCFs in the Greater Kampala Metropolitan Area (GKMA). This study assessed the status of WASH within HCFs in the GKMA in order to inform policy and WASH programming.

Methods: A cross-sectional study was conducted in 60 HCFs. The status of WASH in the study facilities was assessed using a validated WASH Conditions (WASHCon) tool comprising of structured interviews, HCF observations and microbial water quality analysis. Data were analysed using Stata 14 software and R software. The relationships between WASH status and HCF characteristics were assessed using Fishers' exact tests.

Results: Overall, 84.5% (49/58) and 12.1% (7/58) of HCFs had limited and basic WASH status respectively. About 48.3% (28/58) had a limited water supply status, 84.5% (49/58) had limited sanitation status, 50.0% (29/58) had limited environmental cleanliness status, 56.9% (33/58) had limited hand hygiene status and 51.7% (30/58) had limited waste management status. Overall, there were significant differences in water supply status by ownership of the HCF and level of HCF. There was a significant statistical difference in WASH status between public and private not for profit facilities ($p = 0.021$). A significant difference was also observed in WASH status between hospitals and lower levels HCFs ($p = 0.004$).

Conclusion: Majority of the HCFs in the GKMA had limited access to all WASH service domains i.e. water supply, sanitation, hand hygiene, environmental cleanliness and healthcare waste management. We recommend deliberate increased investments in WASH for healthcare services, especially for sanitation and hand hygiene provisions which were in the poorest state. Improvements in WASH conditions will not only minimize the risk of transmission of HAIs but also associated costs.

Background

Water, Sanitation and Hygiene (WASH) in HealthCare facilities (HCFs) encompasses the provision of water, sanitation, health care waste management, hand hygiene and environmental cleaning infrastructure, and services across all parts of a facility (1). WASH in HCFs is fundamental for the provision of quality health care. Good WASH infrastructure and practices in HCFs, especially in maternity and primary care settings have the potential to reduce health care-related infections, increase trust and uptake of healthcare services, increase efficiency and improve staff morale (1, 2). In addition, an improved WASH service supports the core universal health care aspects of quality, equity, and dignity for all people (1).

Globally, WASH in HCFs remains a significant public health challenge. Global baseline estimates on WASH in HCFs indicate that 26% of HCFs lack access to an improved source on the premises, 14% of HCFs have a limited water service and 12% have no water service at all (1). Water supply indicators are worse in low resourced countries where 45% of HCFs do not have access to basic water services (1). About 16% of HCFs globally also lack hand hygiene facilities at points of care, in addition to lack of soap and water at toilet facilities (1). In terms of access to sanitation service, over 21% of HCFs worldwide depend on unimproved toilets or had no toilets at all while in sub-Saharan Africa only 23% have a basic sanitation service (1).

A lack of adequate WASH infrastructure compromises safety and quality of health care services, and places a huge preventable risk to both health providers and clients (3). Mothers and new-borns are at greater risk. Given the profound impact of WASH on patient dissatisfaction and quality of care (3), there is growing attention towards WASH in HCFs. Access to WASH services has for instance been recognised as key to the attainment of universal health coverage (1). Besides, Sustainable Development Goal (SDG) 6 includes a target to achieve universal access to basic drinking water, sanitation and hygiene for all including households, schools and HCFs, by 2030. However, even with just a decade to the evaluation of the attainment of the SDG 6, there is limited evidence on the status of WASH in HCFs (1).

There is limited data on WASH in HCFs in urban Uganda, however, a study conducted in south western Uganda indicated critical gaps in the provision of WASH in HCFs in rural facilities (4). In this study, only 38% of the HCFs had toilets with hand washing facilities; with only 24% having soap and water (4). Similarly, Guo, Bowling (5) reported that less than 50% of rural HCFs in Uganda had access to improved water sources on premises, improved sanitation, and consistent access to water and soap for handwashing. Whereas Mulogo, Matte (4) and Guo, Bowling (5) give useful insights into WASH in HCFs in rural settings, their findings do not explicitly give a picture of the WASH status in a typically growing urban setting such as the Greater Kampala Metropolitan area (GKMA). Besides, the findings are not comparable to the recently developed 2019 Joint Monitoring Programme (JMP) WASH status service ladders. In light of the above gaps, this study established the status of WASH in HCFs in the GKMA. This setting was chosen given its representativeness of many growing cities in the global South (6). Findings from this study can be used to inform WASH programming and policy. Besides, data generated by this study can be used to track progress towards the attainment of national and international standards for WASH in HCFs.

Materials And Methods

Study setting and design

This was a cross sectional study carried out in selected public and private not for profit HCFs in the GKMA from January to March 2019. The GKMA includes the districts of Kampala, Wakiso and Mukono whose HCFs serve over 14% of Uganda's population (7). In this study, we considered HCFs at level III or above since these have a core mandate to deliver Maternal, New-born and Child Health (MNCH) services. The study was restricted to public and private not for profit HCFs because these offer affordable MNCH services to majority of the population in the GKMA. In Uganda, the health care system is organised into a four-tier system (i.e., hospitals, health centres of levels IV, III and II) (8). Level II HCs have a catchment population of about 5,000 people and only provide outpatient care and community outreach services. Level III HCs with a catchment population of about 20,000 people provide basic preventive, promotive, laboratory and curative services. They have limited inpatient capacity mainly maternity and general patient wards. Level IV HCs (catchment population 100,000) provide outpatient and inpatient services, maternity, children and adults' wards, laboratory and blood transfusion services as well as an operating theatre. General hospitals (catchment population 500,000) provide preventive, promotive, curative, maternity, and inpatient health services and surgery, blood transfusion, laboratory, and medical imaging services. In this study, we considered HCFs at level of HCIII or above since these have a core mandate to deliver MNCH services.

Sample Size And Sampling Procedure

We sampled 60 out of 105 HCFs in the GKMA. This proportion was considered representative enough as per the criteria described by Ramsey and Hewitt (9). In the sampling, we included all public hospitals and HC IVs since these provide MNCH services to majority of the population. High volume private not for profit (PNFP) hospitals and HC IVs were also purposively selected. Purposive selection was done for public and PNFP HC IIIIs with large catchment population.

Data Collection And Measurement Of Study Variables

Data collection was conducted using the validated WASH Conditions (WASHCon) tool on the Commcare mobile data collection platform. The tool, developed by the Centre for Global Safe Water, Sanitation, and Hygiene (CGSW) at Emory University has been used to evaluate WASH conditions within HCFs in low- and middle-income countries including Uganda (10). The WASHCon tool relies on data collected through surveys, observational checklists and water quality testing. Data collection was done using mobile devices. The data was then uploaded into pre-programmed dashboards via a cellular or wireless internet network (not required during data collection). The WASHCon tool has been previously used in a number of studies (11, 12)

For this study, the outcome of the WASHCon tool was WASH status which was categorized as basic, limited or unimproved/no service similar to the JMP WASH service ladders (10). Based on WASHCon indicators, WASH status is a composite variable generated from five variables (water supply status, sanitation status, environmental cleanliness, hand hygiene status and waste management status). In order to establish the water supply status, data was collected on source and accessibility, quantity and quality of water. Sanitation status was assessed by collecting data on accessibility to toilet facilities, quantity of toilets and existence of the infrastructure, while for hand hygiene data was collected on availability of hand hygiene services and availability of associated supplies. Assessment of the status of environmental cleanliness was based on availability of cleaning supplies, cleaning practices and frequency, and facility hygiene. In order to establish the status of healthcare waste management, data was collected on segregation, treatment and disposal of healthcare waste. These five constituent variables were also independently categorized as basic, limited or unimproved/no service. The independent variables included ownership and level of HCF.

Using the WASHCon dashboard, evaluation scores were calculated on a scale of 1–3 for each of the WASH domains, as well as an overall score that is an average of all the domains. The scores were determined based on the responses to the survey questions, observation checklists, and water quality testing results (appendix 1). These scores were further categorized into basic, limited or improved/ no service. HCFs that scored between 2.8 to 3.0 were classified as basic, and were considered to meet the minimum WASH in HCF requirements or were on track to meet them; HCFs that scored between 1.9 to 2.7 were classified as limited, and were considered to have made some progress towards meeting minimum WASH in HCFs but were not on track to meet them; while HCFs that scored between 1.0 to 1.8 were classified as having no service or unimproved. Such facilities were considered to have made little or no progress towards achieving the minimum WASH in HCFs requirements (10) (Table 1)

Table 1
Definitions of WASH status indicators (domains)

| Domains (Indicators) | Service level | | |
|---------------------------------|---|--|--|
| | Basic | Limited | Unimproved / No Service |
| Water supply in HCFs | Water from an improved source is available on premises | Water from an improved source is available off premises; or an improved source is onsite, but no water is available | Unprotected dug well or spring, surface water, or no water source |
| Sanitation in HCFs | Improved facilities are usable, separated for patients and staff, separated for women, provide menstrual hygiene facilities, and meet the needs of people with limited mobility | Improved sanitation facilities are present but are not usable or do not meet the needs of specific groups (staff, women, people with limited mobility) | Pit latrines without a slab or platform, hanging latrines, or no toilets or latrines at the facility |
| Hand hygiene in HCFs | Hand hygiene materials, either a basin with water and soap or alcohol hand rub, are available at points of care and toilet | Hand hygiene station at either point of care or toilets, but not both | Hand hygiene stations are absent, or present but with no soap or water |
| Healthcare waste status in HCFs | Waste is safely segregated into at least 3 bins in the consultation area, and sharps and infectious waste are safely treated and disposed of | Waste is segregated but not disposed of safely, or bins are in place but not used effectively | Waste is not segregated or safely treated and disposed of |

Adapted from the JMP service ladders for monitoring WASH in HCF in the SDGs

Quality control

Prior to data collection, study enumerators received training on the use of the WASHCon tool, quality control and research ethics. The observations and interviews were conducted by trained enumerators who had a minimum of a Bachelor's degree in Environmental Health Science; Nursing; or Social Sciences. All the study enumerators were supervised to ensure quality control.

Water Quality Assessment

In order to determine the water supply status of HCFs, microbial water quality tests were conducted. At each HCF, observations were done to establish the type of water source and availability of water. Observations were followed by collection of duplicate water samples from the maternity ward. Maternity wards were prioritised due to an elevated risk of transmission of HAIs compared to other patient care areas (13). Water samples were collected using Whirl-Pak bags of 100 mls (with sodium thiosulfate to halt chlorine action in chlorinated supplies) and stored on ice until laboratory analysis. All samples were analysed within four hours from the time of collection. Water was tested for faecal coliform, i.e. E. coli using the membrane filtration method (14). Chromocult agar was used for culturing E-Coli at 37 °C for 24 hours. Colonies of E-coli (i.e. dark blue to violet in colour) were counted and results recorded per 100 ml of sample.

Data Management And Analysis

The data obtained using the WASHCon Commcare app, preinstalled on a mobile device were uploaded onto a server managed by Makerere University School of Public Health and Emory University CGSW. Forms were synchronized daily by each enumerator. The investigators had access to preliminary results through a pre-programmed dashboard.

Analysis was performed using Stata version 14 (StataCorp, Texas) and R 3.5.2. Descriptive statistics such as frequencies and proportions were used to summarize quantitative categorical data. Continuous data was expressed as means and standard deviations. Classification of WASH status and its five domains into basic, limited and unimproved/no service was guided by the scoring tool shown in appendix 1. Fishers exact tests were used to establish any statistically significant difference in WASH status based on ownership and level of HCF. Fishers exact test was preferred over chi-square tests due to low expected counts in some categories.

Results

Characteristics of study health facilities

Among the 60 HCFs, 31.7% (19/60) were from Kampala capital city; and about 70.0% (42/60) of HCFs were HC III. About 65.0% (39/60) were public HCFs. The average number of patients seen at these facilities in a month was 3718. The number of patients seen at the HCFs per month ranged from 6 to 50,200. (Table 2).

Table 2
Characteristics of study healthcare facilities

| Variable | Characteristic | Frequency | Percentage (%) (N = 60) |
|--------------|-------------------|-----------|----------------------------|
| District | Kampala | 19 | 31.7 |
| | Mukono | 14 | 23.3 |
| | Wakiso | 27 | 45.0 |
| Level of HCF | Health centre III | 42 | 70.0 |
| | Health Centre IV | 7 | 11.7 |
| | Hospital | 11 | 18.3 |
| Ownership | Public | 39 | 65.0 |
| | PNFP | 21 | 35.0 |

Water Supply

Most HCFs, 70.7% (41/60), depended on piped water supply. In 93.1% (54/58) of the HCFs, the primary source of water was on facility premises. At the time of the survey, water from main source was available at 93.3% (56/60) of the HCFs. In about 58.3% (35/60) of the HCFs, water was piped into the wards. Three quarters 75.9% (44/60) of the HCFs had previous instances of water discontinuity. Overall, 87.9% (51/58) of the HCFs had water that met the World Health Organization (WHO) microbial drinking water quality guidelines of 0 coliform forming units per 100 ml of water (Table 3).

Table 3
Water supply

| Variable | Characteristic | Frequency (n = 60) | Percentage (%) |
|--|--|-----------------------|-------------------|
| Main water source (n = 58) * | Borehole | 1 | 1.7 |
| | Protected dug well | 2 | 3.4 |
| | Piped supply from outside the healthcare facility | 41 | 70.7 |
| | Rainwater | 13 | 22.4 |
| | Tanker truck | 1 | 1.7 |
| Location of main water source (n = 58)* | Off premises, within 500 m | 3 | 5.2 |
| | Off premises, further than 500 m | 1 | 1.7 |
| | On premises | 54 | 93.1 |
| Instances of discontinuity (when water from the main water source is unavailable?) (n = 58)* | Yes | 44 | 75.9 |
| | No | 14 | 24.1 |
| Frequency of discontinuity in water supply (n = 58)* | For part of the day, frequently | 9 | 15.5 |
| | For part of the day, rarely | 15 | 25.9 |
| | For part of the year (seasonal problem frequently) | 8 | 13.8 |
| | For part of the year (seasonal problem rarely) | 11 | 19.0 |
| | Water is always available | 14 | 24.1 |
| | Do not know | 1 | 1.7 |
| Healthcare facility at times faces a severe water shortage (n = 44)* | Yes | 14 | 31.8 |
| | No | 28 | 63.7 |
| | Don't know | 2 | 4.5 |
| HCF has an alternative water source | Yes, and the alternative source is improved | 36 | 60.0 |
| | Yes, but the alternative source is unimproved | 3 | 5.0 |
| | No alternative water source | 17 | 28.3 |
| | Have alternative source but water is unavailable | 3 | 5.0 |
| | Do not know | 1 | 1.7 |
| Water accessible to all users at all times at HCF | Yes | 55 | 94.8 |

Note: *sample size less than 60 due to missing data.

| Variable | Characteristic | Frequency (n = 60) | Percentage (%) |
|---|--|-----------------------|-------------------|
| | No, patients/caregivers do not have access at times | 2 | 3.4 |
| | No, both staff and patients/caregivers do not have access at times | 1 | 1.8 |
| Water is available from the main water source at the time of the survey | Yes | 56 | 93.3 |
| | No | 4 | 6.7 |
| Is water piped into the wards | Yes | 35 | 58.3 |
| | Yes, but currently unavailable | 3 | 5.0 |
| | No | 22 | 36.7 |
| Water at HCF meets the WHO microbial water quality standards (n = 58)* | Fewer than 50% of all samples met | 6 | 10.3 |
| | Between 50–89% of all samples | 1 | 1.7 |
| | Between 90–100% of all samples | 51 | 87.9 |

Note: *sample size less than 60 due to missing data.

Sanitation

One HCF had no sanitation facility. About, 25.9% (15/58) of the HCFs used onsite sanitation systems. More than half, 68.3% (41/59) of the HCFs did not provide for menstrual hygiene needs. Only 20.0% (12/58) of the HCFs had improved toilets that meet the needs of people with reduced mobility (Table 4).

Table 4
Sanitation in healthcare facilities in the GKMA

| Variable | Characteristic | Frequency (n = 60) | Percentage (%) |
|---|---|-------------------------------|---------------------------|
| Type of toilet facilities available at HCF | Flush | 23 | 38.3 |
| | Pour flush | 4 | 6.7 |
| | Pit latrine with a slab | 7 | 11.7 |
| | Ventilated Improved Pit latrine | 20 | 33.3 |
| | Pit latrine without a slab | 5 | 8.3 |
| | No toilet facility | 1 | 1.7 |
| Method of excreta disposal at the HCF (n = 58) * | Sewerage system | 14 | 24.1 |
| | Septic tank | 15 | 25.9 |
| | Pit or chamber | 28 | 48.3 |
| | No toilet facility | 1 | 1.7 |
| Main users of toilet blocks at HCF | Both staff and patients/ caregiver | 16 | 26.7 |
| | Both staff and patients/ caregiver, but separated | 15 | 25.0 |
| | Patients/ caregivers | 28 | 46.7 |
| | Staff | 1 | 1.7 |
| Presence of flies in improved toilets | Present in all facilities | 5 | 8.3 |
| | Absent in all facilities | 41 | 68.3 |
| | Present in some facilities | 13 | 21.7 |
| | No toilet facility | 1 | 1.7 |
| Presence of unpleasant smell (of urine or faeces) at the toilet/latrine block | Yes | 27 | 45.0 |
| | No | 32 | 53.3 |
| | No toilet facility | 1 | 1.7 |
| Visible cleanliness of HCF toilet blocks | Yes | 45 | 75.0 |
| | No | 14 | 23.3 |
| | No toilet facility | 1 | 1.7 |
| Adequacy of lighting at the toilet blocks, including at night | Yes | 32 | 53.3 |
| | No | 27 | 45.0 |
| | No toilet facility | 1 | 1.7 |

Note: *sample size less than 60 due to missing data.

| Variable | Characteristic | Frequency (n = 60) | Percentage (%) |
|--|---------------------------------------|-----------------------|-------------------|
| Provision for menstrual hygiene needs (n = 59) * | Yes | 18 | 30.5 |
| | No | 41 | 69.5 |
| Presence of lockable doors | Present on all facilities | 56 | 93.3 |
| | Present on some facilities | 1 | 1.7 |
| | No toilet facility | 1 | 1.7 |
| Presence of an improved toilet that meets the needs of people with reduced mobility (n = 58) * | Present | 12 | 20.0 |
| | Absent | 46 | 76.7 |
| | Did not observe | 1 | 1.7 |
| | No toilet facility | 1 | 1.7 |
| Gender-based separation of toilet blocks | Both males and females, unseparated | 9 | 15.0 |
| | Both males and females, but separated | 43 | 71.7 |
| | Females only | 8 | 13.3 |

Note: *sample size less than 60 due to missing data.

Hand Hygiene Status

Over 41.6 (25/60) of the HCFs did not have a fully functional hand hygiene facility (HHF) in patient care areas; and only 56.6% (34/60) had functional HHF with soap and water within five metres of the toilet block. (Table 5).

Table 5
Hygiene in healthcare facilities in the GKMA

| Variable | Characteristic | Frequency (n = 60) | Percentage (%) |
|--|--|-----------------------|-------------------|
| Status of hand hygiene facility in patient care areas | No supplies available | 6 | 10.0 |
| | Water only | 17 | 28.3 |
| | Water and sanitiser available | 1 | 1.7 |
| | Water and soap available | 35 | 58.3 |
| | Water, soap and sanitiser available | 1 | 1.7 |
| HCF has functioning hand hygiene facility within five meters of the toilet block | Hand hygiene facility available but non-functional | 2 | 3.3 |
| | Did not observe | 1 | 1.7 |
| | No toilet facility | 1 | 1.7 |
| | Hand hygiene facility not available | 6 | 10.0 |
| | Hand hygiene facility available with water only | 24 | 40.0 |
| | Hand hygiene facility available with both water and soap | 26 | 43.3 |

Environmental cleanliness

Open defecation was practiced at one of the HCFs. Most facilities 81.7% (49/60) had proper containment of faeces from babies. Most HCFs had patient care areas with visibly clean wards 86.7% (52/60), and 88.3% (53/60) had clean floors. However, 3.3% (2/60) had uncleaned spills from bodily fluids. About 20.0% (12/60) of the HCFs had uncontaminated solid waste. About 79.3% (46/58) and 6.9% (4/58) of the HCFs reported cleaning beds, mattresses, pillowcases or mats always and sometimes respectively between patients but in 12.1% (7/58) beddings were not provided.

Table 6
Environmental cleanliness

| Variable | Characteristic | Frequency (n = 60) | Percentage (%) |
|--|-----------------------------|-----------------------|-------------------|
| Open defecation practiced (visible faecal matter at the HCF) | No | 57 | 95.0 |
| | Yes | 1 | 1.7 |
| | Did not observe (No access) | 2 | 3.3 |
| Containment of babies' faeces | Well contained | 49 | 81.7 |
| | Not well contained | 10 | 16.7 |
| | Didn't observe | 1 | 1.7 |
| HCF has uncontained solid waste | Yes | 12 | 20.0 |
| | No | 48 | 80.0 |
| HCFs had clean floors | Yes | 53 | 88.3 |
| | No | 7 | 11.7 |
| Beds, mattresses, pillows and/or mats cleaned between patients | Yes, always | 46 | 79.3 |
| | Yes, sometimes | 4 | 6.9 |
| | No inpatient | 1 | 1.7 |
| | Beddings not provided | 7 | 12.1 |
| HCFs have unclean bodily spills | Yes | 2 | 3.3 |
| | No | 58 | 96.7 |

Healthcare Waste Management

Majority 63.2% (36/57) of the HCFs had fenced and protected areas for the storage of healthcare waste (HCW) awaiting disposal or removal. More than half, 58.6% (34/58) did not treat infectious waste before disposal and 27.6% (16/58) of the HCFs disposed infectious waste offsite. More than half, 58.6% (34/58) of HCFs did not treat sharps waste most of the time while 37.9% (22/58) disposed these sharps offsite. Waste segregation into at least three labelled bins (for sharps waste, infectious waste and non-infectious general waste) was done in 85.0% (51/60) of the HCFs (Table 6).

Table 7
Waste management in healthcare facilities in GKMA

| Variable | Characteristic | Frequency, n | Percentage (%) |
|--|--|-----------------|-------------------|
| Availability of protected areas for the storage of HCW awaiting disposal or removal (n = 57) * | Yes | 36 | 63.2 |
| | Sometimes | 2 | 3.5 |
| | No | 19 | 33.3 |
| Commonest means of treating infectious waste (n = 58) * | Autoclave | 4 | 6.9 |
| | Chemical disinfection with hypochlorite | 12 | 20.7 |
| | Not treated | 34 | 58.6 |
| | Other | 8 | 13.8 |
| Commonest method of disposal of infectious waste disposed? (n = 58) * | Incinerate (brick incinerator) | 12 | 20.7 |
| | Incinerate (two chamber, 850 – 100 °C) | 4 | 6.9 |
| | Burn in protected pit | 5 | 8.6 |
| | Burry in a lined, protected pit | 2 | 3.4 |
| | Collect for medical waste disposal offsite | 16 | 27.6 |
| | Collected for general waste disposal offsite | 4 | 6.9 |
| | Open burning | 14 | 24.1 |
| | Don't know | 1 | 1.7 |
| Main treatment method for sharps (n = 58) * | Autoclave | 4 | 6.9 |
| | Chemical disinfection with hypochlorite | 6 | 10.3 |
| | Not treated | 34 | 58.6 |
| | Other | 12 | 20.7 |
| | Don't know | 2 | 3.4 |
| Main disposal method for sharps (n = 58) * | Incinerate (brick incinerator) | 11 | 19.0 |
| | Incinerate (two chamber, 850 – 100 °C) | 3 | 5.2 |
| | Burn in protected pit | 6 | 10.3 |
| | Collected for medical waste disposal offsite | 22 | 37.9 |
| | | | |
| Note: *sample size less than 60 due to missing data. | | | |

| Variable | Characteristic | Frequency, n | Percentage (%) |
|---|--|-----------------|-------------------|
| Waste disposal methods | Collected for general waste disposal offsite | 4 | 6.9 |
| | Open burning | 11 | 19.0 |
| | Don't know | 1 | 1.7 |
| Waste safely segregated into at least three labelled bins (for sharps, infectious waste and non-infectious waste) | Yes | 51 | 85.0 |
| | Bins present but waste is not segregated | 7 | 11.7 |
| | No | 2 | 3.3 |

Note: *sample size less than 60 due to missing data.

WASH status based on JMP service ladders

The average scores (SD) for the WASH service domains were: water supply 2.6 ± 0.3 ; for sanitation 2.1 ± 0.2 ; for environmental cleanliness 2.4 ± 0.5 ; hand hygiene 2.4 ± 0.4 ; and healthcare waste management 2.5 ± 0.4 . The overall average score for the WASH status was 2.4 ± 0.2 . Overall, only 12.1% (7/58) of HCFs were found to have basic WASH service status; 48.3% (28/58) had a limited water supply status, 84.5% (49/58) had a limited sanitation status, 50.0% (29/58) had limited environmental cleanliness status, 56.9% (33/58) had a limited hand hygiene status and 51.7% (30/58) had a limited waste management status.

Relationship between WASH status, ownership and level of health facility

Overall WASH status was associated with ownership of the HCF ($p = 0.021$) and level of HCF ($p = 0.004$). Water supply status was associated with ownership of the healthcare facility ($p = 0.039$) and level of HCF ($p = 0.003$) (Table 7).

Table 8
Association between status of WASH and facility characteristics.

| Score (Range) | Characteristic | Overall frequency (n) (%) | Ownership | | P value | Level of healthcare facility | | | P value |
|--|-----------------------|---------------------------|-----------|-----------|---------|------------------------------|----------|-----------|---------|
| | | | Public | PNFP | | Hospital | HC IV | HC III | |
| Overall WASH status (Min score = 1.5, 3.0) | Basic | 7 (12.1) | 2 (5.6) | 5 (22.7) | 0.021* | 5 (45.5) | 1 (14.3) | 1 (2.5) | 0.004* |
| | Limited | 49 (84.5) | 34 (94.4) | 15 (68.2) | | 6 (54.5) | 6 (85.7) | 37 (92.5) | |
| | Unimproved/No service | 2 (3.4) | 0 (0) | 2 (9.1) | | 0 (0) | 0 (0) | 2 (5.0) | |
| Water supply status (1.6, 3.0) | Basic | 27 (46.6) | 13 (36.1) | 14 (63.6) | 0.039* | 11 (100) | 3 (42.9) | 13 (32.5) | 0.003* |
| | Limited | 28 (48.3) | 22 (61.1) | 6 (27.3) | | 0 (0) | 4 (57.1) | 24 (60.0) | |
| | Unimproved/No service | 3 (5.2) | 1 (2.8) | 2 (9.1) | | 0 (0) | 0 (0) | 3 (7.5) | |
| Sanitation status (1.5, 3.0) | Basic | 2 (3.4) | 0 (0) | 2 (9.1) | 0.084 | 0 (0) | 1 (14.3) | 1 (2.5) | 0.289 |
| | Limited | 49 (84.5) | 30 (83.3) | 19 (86.4) | | 11 (100) | 5 (71.4) | 33 (82.5) | |
| | Unimproved/No service | 7 (12.1) | 6 (16.7) | 1 (4.5) | | 0 (0) | 1 (14.3) | 6 (15.0) | |
| Environmental cleanliness (1.0, 3.0) | Basic | 23 (39.7) | 13 (36.1) | 10 (50.0) | 0.470 | 6 (54.5) | 1 (14.3) | 16 (40.0) | 0.107 |
| | Limited | 29 (50.0) | 20 (55.6) | 10 (45.5) | | 5 (55.4) | 4 (57.1) | 23 (57.5) | |
| | Unimproved/No service | 6 (10.3) | 3 (8.3) | 2 (9.1) | | 0 (0) | 2 (28.6) | 1 (2.5) | |
| Hand hygiene status (1.4, 3.0) | Basic | 21 (36.2) | 10 (27.8) | 11 (50.0) | 0.227 | 6 (55.5) | 2 (28.6) | 13 (32.5) | 0.463 |
| | Limited | 33 (56.9) | 23 (63.9) | 10 (45.5) | | 5 (45.5) | 5 (71.4) | 23 (57.5) | |
| | Unimproved/No service | 4 (6.9) | 3 (8.3) | 1 (4.5) | | 0 (0) | 0 (0) | 4 (10.0) | |
| Waste management status (1.5, 3.0) | Basic | 27 (46.6) | 16 (44.4) | 11 (50.0) | 0.697 | 9 (81.8) | 2 (28.6) | 16 (40.0) | 0.115 |
| | Limited | 30 (51.7) | 19 (52.8) | 11 (50.0) | | 2 (18.2) | 5 (71.4) | 23 (57.5) | |
| | Unimproved/No service | 1 (1.7) | 1 (2.8) | 0 (0) | | 0 (0) | 0 (0) | 1 (2.5) | |

Note: PNFP= Private not for profit

Discussion

Understanding the WASH status in HCFs has a profound impact on utilisation of healthcare services and quality of healthcare. This study brings to light the status of WASH in HCFs in an urban setting in Uganda. Though existing literature on WASH in HCFs in low resource settings indicates limited access to improved water sources, this study found out that almost all the HCFs in the GKMA had access to an improved water source but access rates remain below the WHO target of 100% coverage by 2030. The high access to improved water sources in our study could be attributed to deliberate efforts by the government and line ministries to invest in improved access to safe water in urban settings. For Uganda's case, our findings are not different from those of rural settings as reported by Mulogo, Matte (4). While almost all HCFs had an improved water source, a significant proportion did not have an alternative water source. Lack of an alternative source may compromise access during times of seasonal scarcity and breakdown of water facilities.

More than a quarter of the HCFs in the study area reported experiencing intermittent water supply, and often suffered severe water shortage. These results are similar to those of a study conducted in Rwanda which indicated seasonal water shortages in HCFs (Huttinger, Dreibelbis (15)). Besides seasonal shortages, intermittent water supply in HCFs in Uganda could also be related to failure of HCFs to pay water bills. In addition, the national utility which is mandated to supply water in the urban areas often fails to meet the water demand (16, 17). This poses a serious challenge in urban settings where the population and the number of clients seeking care from HCFs are large. Therefore, intermittent water supplies could provide an environment for opportunistic infections especially among immunocompromised patients such as the new-borns and mothers.

A tenth of the water samples from HCFs did not meet the recommended WHO microbial water quality guidelines of 0 CFU per 100 mL of water sample. The presence of E.coli in drinking water in a tenth of the HCFs suggests faecal pollution and this presents a serious potential hazard in those HCFs (18). Our finding is similar to a previous study by Huttinger, Dreibelbis (15) in which over 25% of water samples in selected rural HCFs in Rwanda did not meet the WHO standards of microbial water quality. The low microbial quality of water in urban HCFs in the GKMA could be attributed to contamination resulting from pipe leakages, lack of clean storage reservoirs such as water tanks and poor environmental sanitation surrounding the water sources (19).

Our study indicates that almost all HCFs in the study area had access to a sanitation facility. Ideally all HCFs should have adequate sanitation facilities to guarantee good quality care (1). Our findings corroborate those of a study in Jordan where all HCFs had sufficient toilets (20). Despite availability of sanitation facilities in most of the HCFs in our study, about 71.7% of these facilities were not gender sensitive. The low gender sensitivity in toilet design may affect proper usability of these facilities due to issues of privacy and comfort. Huttinger, Dreibelbis (15) in their study also highlighted lack of gender sensitive sanitation facilities in HCFs. Unhygienic conditions of visible flies, unpleasant smells and visibly unclean toilets were common. The unpleasant smells that characterise sanitation facilities in the GKMA could be related to inadequate funding for WASH services, and consequently poor cleaning routines. This study also brings to light a lack of menstrual hygiene facilities in HCFs. Though rarely studied, a lack of menstrual hygiene facilities could result into patient dissatisfaction with health care services (1). Therefore, provision of these menstrual hygiene facilities would improve usability of sanitary facilities. From our study, we reveal that a significant proportion of sanitation facilities in healthcare settings lack adequate lighting, most especially at night. This is likely to affect usability of the facilities and may result into indiscriminate excreta disposal. Adequate lighting in sanitation facilities should be ensured since lighting increases feelings of security and safety for users and encourages their optimal use (21, 22).

Hand hygiene remains a significant challenge in HCFs. This study revealed that only 58% of the HCFs had at least one functional hand hygiene facility with both water and soap in patient care areas. This low proportion of functional hand hygiene facilities indicates potential for elevated risk of for transmission of HAIs at point of care across HCFs. Our findings differ from a study conducted by Mulogo, Matte (4) that revealed that only 24% of the HCFs in southwestern Uganda had water and soap present at the hand washing stations. The disparity in these findings could be related to the

fact that our study was conducted in urban area with considerably more WASH investments as compared to Mulogo's study which was conducted in predominantly rural HCFs. Lack of functional hand hygiene facilities in HCFs is likely to compromise infection prevention and control efforts for highly infectious diseases such as Ebola and COVID-19. Furthermore, less than half of the HCFs had a functional hand hygiene facility with water and soap within 5 metres of the toilet block, similar to a study by Guo, Bowling (5) which showed that only a small proportion of HCFs in Uganda have water and soap available for hand washing near the toilets. The low proportion of hygiene facilities with water and soap may be attributed to limited funds to put up and sustain functioning hand hygiene facilities that meet the basic requirements at the HCF. This indicates a need for more financial investments but also improve attitudes among both health care in charges and administrators.

It was noted in this study that most HCFs segregated waste safely into separate bins, contrary to what has been reported in previous studies about the absence of proper waste segregation practices at the point of generation in HCFs (23–25). More than half of the HCFs did not treat infectious waste and sharps most of the time. These findings concur with those of an Ethiopian study, where there was no pre-treatment of infectious wastes by the HCFs (26). This implies that health workers, waste handlers and the public could be at risk of infections from the waste. Nonetheless, majority the HCFs had protected areas for the storage of HCW awaiting disposal. Protected waste storage areas can minimize risks of potential injuries and infection, particularly among the public and stray animals venturing to the waste sites are deterred.

In comparison with the JMP indicators, this study revealed that majority of the HCFs had a limited WASH service status. This indicates gaps in WASH in HCFs and the need for more investments for attainment of optimal WASH status. Limited investment in WASH in HCFs could partly explain this. To put this into context, any improvements in WASH in HCFs in Uganda are dependent on the availability of the already meagre primary healthcare funds (27). Therefore, with always limited funds, HCFs may have to make a trade-off between financing WASH services and sustaining other HCF operations such as paying non-wage staff and paying off other utility bills such as electricity.

From this study, there is some evidence that the WASH status is associated with the ownership and level of HCFs. More PNFP HCFs had better WASH status compared to the public HCFs. It has been assumed that private facilities at the same level as public facilities generally have better services standards (4). Private facilities are interested in attracting more clientele so they may have more deliberate efforts to improve WASH so as to attract more clients and ensure patient satisfaction.

A higher proportion of hospitals in the study area had an overall basic WASH status based on JMP service ladders compared to the lower level HCFs. This could be attributed to the fact that hospitals in Uganda are given more primary healthcare funds to support improvements in WASH, given that hospitals have relatively large population catchments and offer a wider range of MNCH services. In addition, hospitals are often accorded more attention due to a higher patient load and a higher risk of transmission of hospital acquired infections compared to the lower level HCFs. The higher patient load in hospitals could also trigger more investments in WASH services due to the fear of transmission of HAIs, thus a higher proportion having an overall basic WASH supply (28).

Conclusion And Recommendation

Overall, majority of the HCFs had access to improved water sources and sanitation facilities but few had functional hygiene facilities. Majority of the HCFs had a limited WASH service based on the JMP service ladders. There were significant differences in water supply and overall WASH status by level of HCF and ownership. The findings demonstrate more gaps in WASH provision in HCF settings and indicate the need for more deliberate investments in health care WASH services in terms of finances, infrastructure and policies. Improvements in WASH conditions will not

only minimize the risk of transmission of hospital acquired infections but also may cut on associated costs. We therefore suggest improvements in WASH conditions in HCFs to improve healthcare seeking among patients.

Declarations

Ethical considerations

The study was approved by Makerere University School of Public Health Higher Degrees, Research and Ethics Committee (HDREC) and registered by the Uganda national Council of Science and Technology. Participation in the study was voluntary, and participants provided written informed consent.

Consent for publication: Not applicable

Availability of data and materials

The datasets analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

Funding

Funding for this study was provided by WaterAid Uganda

Authors' contributions

DK, RKM, JSM, JBI, TS, JCS, EB, JAM and YH conceptualized the study, participated in data collection and analysis and drafted the manuscript. STW, RN, JZ, MOR, CK, EN, NLB, and YW participated in the analysis and drafting of the manuscript. BW and AN participated in the review of study tools, data collection and drafting the manuscript. WK and CB conducted the water quality tests and participated in drafting the manuscript. All authors read and approved the manuscript before submission. All authors reviewed and approved the final manuscript.

Acknowledgement

We would like to thank the study participants for sparing their time to participate in this study. Credit also goes to the research assistants for according the data collection process the attention and dedication it deserved.

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