Journal of
Water, Sanitation & Hygiene for Development

IWA PUBLISHING

 Journal of Water, Sanitation and Hygiene for Development Vol 11 No 6, 926 doi: 10.2166/washdev.2021.075

Research Paper

Water, sanitation, and hygiene in healthcare centres: appraisal in a pandemic

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ABSTRACT

Assessment of water, sanitation, and hygiene (WASH) facilities in Primary Healthcare Centres (PHCs) and water source quality in parts of Southwestern Nigeria was conducted. Sixty-one PHCs in urban and rural areas were selected using a stratified random sampling technique. A WASH profile of the PHCs was conducted based on the water source type, type of toilet facilities, and handwashing practice using the Joint Monitoring Programme service ladder for monitoring WASH services in healthcare facilities. Water sources were tested for pH, electrical conductivity, total dissolved solids, turbidity, chloride, nitrate, and *E. coli*. Boreholes and hand-dug wells are the most prevalent water source type, and flush toilets and pit latrines are the major types of toilet facilities used. All but two PHCs engaged in handwashing practices. Water quality analysis results showed that chloride, nitrate, and turbidity were within the WHO drinking-water standards. Poor water quality and sanitation practices could expose health staff and patients to healthcare-associated infections. The study recommends the construction of safe, secure and accessible water sources and toilet facilities, provision of water treatment facilities, and the training of staff and patients on the significance of handwashing practices.

Key words: infections, pandemic, primary healthcare facilities, SDGs, WASH

HIGHLIGHTS

- Status of Water, Sanitation, and Hygiene (WASH) in Primary Healthcare Centres (PHCs).
- Disparities in WASH facilities in PHCs with respect to urban and rural settings.
- Classification of WASH facilities in PHCs into Joint Monitoring Programme's 'Basic Service', 'Limited Service', and 'No Service'.
- The impact of poor WASH facilities on the spread of COVID-19.
- Government's efforts in improving WASH in PHCs.

INTRODUCTION

Adequate, functional, and affordable healthcare services is a continuous requirement globally, particularly in the race towards Sustainable Development Goals (SDGs) 2030. The COVID-19 global pandemic has further stretched existing facilities and tested the preparedness of many countries for providing safe, quality, and equitable healthcare. For instance, access to healthcare services (especially community-based Primary Health Care) in low- and middle-income countries (LMICs) is hampered in part, by insufficient facilities, poor patient–staff ratios and limited or total absence of water, sanitation, and hygiene (WASH), and healthcare waste management. At the International Conference on Primary Health Care in 1978, 134 member countries of the World Health Organization (WHO) signed the Alma Ata Declaration, seeking to provide health for all by the year 2000 by adopting the declaration as the official health policy of all member countries. The Declaration recognized health as a basic human right and emphasized the need for the provision of affordable and community-based healthcare through the establishment of Primary Healthcare Centres (PHCs). Primary healthcare is aimed at addressing key health issues at a community level through the provision of promotive, preventive, curative, and rehabilitative services (Bryant & Richmond 2009).

Nigeria, in line with the global agenda, launched two interventions: The Basic Health Services Scheme and the National Health Policy. The years 1985–1992 saw giant strides in the development and expansion of PHC across Nigeria (Lambo 2015; Aregbeshola & Khan 2017). Long years of military rule, subsequent dwindling of the budgetary allocation on health and the poor attitude of government towards the development of healthcare facilities has left WASH facilities in many PHCs either non-functioning or functioning with poor WASH facilities. As of 2005, PHCs made up over 85% of healthcare facilities in Nigeria (Federal Ministry of Health (FMOH) 2004; Aigbiremolen *et al.* 2014). Nigeria's healthcare is classified according to a three-tier system, namely tertiary, secondary, and primary healthcare. The tertiary and primary healthcare systems represent the two extremes. The tertiary healthcare system comprises highly specialized health services available at teaching and specialist hospitals, while the secondary healthcare system is designed to cater for referrals from the primary healthcare system (Raheem *et al.* 2019). However, the primary healthcare system which, through the PHCs, is expected to be the entry point to Nigeria's national healthcare system (Ladi-Akinyemi *et al.* 2019) has fallen short in many ways. Inadequate access to WASH facilities in Nigeria's PHCs has hindered their capacity to provide basic healthcare services (Aregbeshola & Khan 2017).

WASH and healthcare waste management facilities are essential in the operations of PHCs. When WASH facilities are absent or inadequate in PHCs, patients and staff are exposed to the risk of healthcare-associated infections (HAIs; UNICEF 2016), with new-borns, pregnant women, and geriatric patients as the most vulnerable group. Millions of HAIs are recorded annually (Allegranzi *et al.* 2011). Poor WASH facilities have been a major factor that discouraged patients from visiting PHCs, especially pregnant mothers in labour (Velleman *et al.* 2014; Bouzid *et al.* 2018). Patients' trust in PHCs can only be restored by improving WASH facilities, an action that would significantly reduce maternal and neonatal mortality rates. WHO & UNICEF (2020) suggested four ways of improving WASH in healthcare facilities, which are: to implement costed national roadmap with appropriate funding; monitor and regularly review progress in improving WASH services, practices and enabling environment; develop capacities of health workforce to sustain WASH services and promote and practice good hygiene; and integrate WASH into regular health sector planning, budgeting, and programming, including COVID-19 response and recovery efforts to deliver quality services.

A country's robust healthcare system, mostly at the community level, could have a significant impact on its development. For example, Bryant & Richmond (2009) described primary healthcare as an essential part of a country's health system, contributing to the country's advancement policy. In this study, a comparative assessment of WASH facilities in selected PHCs in urban and rural communities in parts of Southwest Nigeria was conducted. Emphasis of the study is on government-owned and operated PHCs. Nigeria (including World Health Assembly member states), as a signatory to the SDGs, must commit to the responsibility of providing adequate, affordable, and accessible health care for her citizens, especially at the community level (WHA 72.7 2019).

Description of the study area

Ogun State, Southwest Nigeria (latitudes 2°45′E and 4°45′E and longitudes 6°15′N and 7°60′N) covers a land area of 16,409.26 km^2, with an estimated population of 5,340,113; 50.3% (2,686,077) of which are men and 49.7% (2,654,036) are women at 2.6% annual growth rate (National Population Commission 2009; World Bank 2017). The management of PHCs in Ogun State is overseen by the Ogun State Primary Health Care Development Board. The board was founded in 2009 to develop a sustainable, high-quality, equitable, and affordable Primary Health Care system in partnership with all levels of government and non-governmental organizations. The board is also involved in planning, budgetary provisions, monitoring primary healthcare services, and committed to ensuring the availability of proper WASH facilities in PHCs in Ogun State. The board is equally involved in the review of the activities of PHCs across all 20 local government areas.

METHODOLOGY

Sixty-one PHCs serving four communities (two urban and two rural) and their environs across five Local Government Areas (LGAs), were assessed in this study. The PHCs were selected using a stratified random sampling technique based on healthcare centre accessibility, functionality, and presence of water source. The WASH profile of the PHCs was assessed using key indicators of the JMP service ladder: the water source type, type of toilet facilities, and handwashing facilities and practices. Two methods of data collection were employed in this study (see Figure 1). Data were collected from primary (field survey) and secondary source. Observations (non-participant) and interviewing (unstructured) were used in data collection from primary sources, while government publications (PHCs database for the study area) were used in secondary data collection.

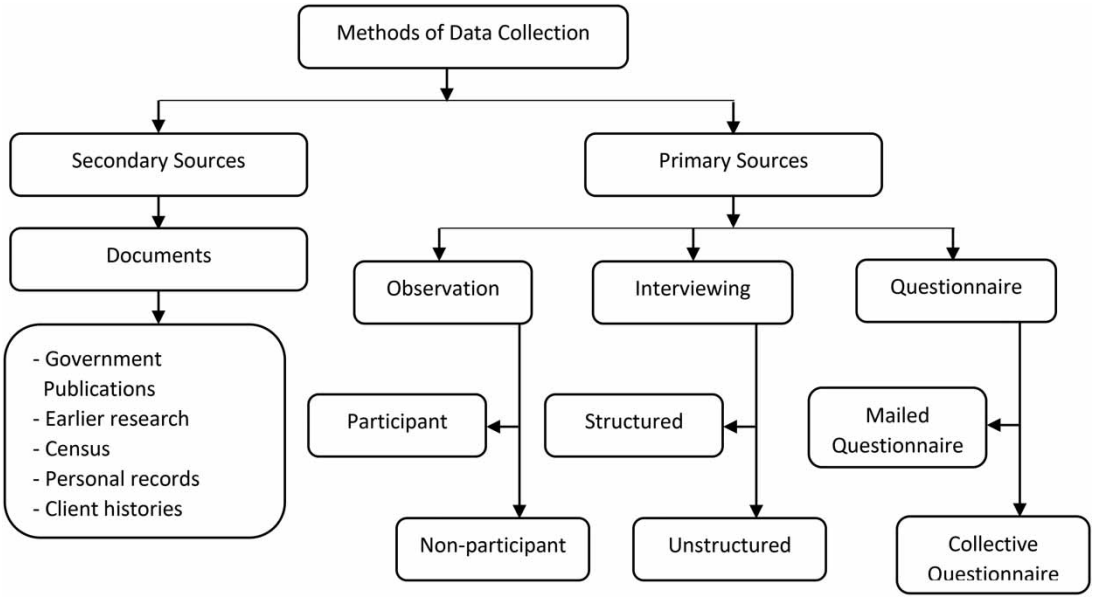

Figure 1 | Methods of data collection (Kumar 2011).

According to Kumar (2011), observation is a decisive, orderly, and selective method of watching and listening to a phenomenon or interaction take place and he described non-participatory observation as a method of collecting data where a researcher is not involved in the activities of the group (item or situation being studied) but remains a passive observer. The interview method (Kumar 2011) is used to obtain information from people and the unstructured method allows for flexible interview structure, contents, and questions. The unstructured method of interview was chosen to allow quality interactions between researcher and respondents and enable the collection of in-depth information.

The WASH profile was carried out by assessing each PHC to ascertain the type of water source, type of toilet facility (if any, whether the toilets were gender-separated, presence of menstrual supplies, accessibility to persons with limited mobility) and where toilet facilities were absent, what alternative methods were used. Lastly, the PHCs were assessed for the presence and functionality of handwashing stations. The WASH profile of the PHCs was classified using the Joint Monitoring Programme (JMP) service ladder for monitoring WASH facilities in healthcare facilities. The JMP is a monitoring programme established by WHO and UNICEF to evaluate access to water, sanitation, and hygiene services globally. The multi-level service ladders allow for the progressive realization of the SDG criteria, enabling countries at different stages of development to track and compare progress. The JMP basic service ladder is presented in Table 1. Water samples from the water sources of the PHCs were collected and tested for pH, turbidity, chloride, nitrate, and *E. coli*. The choice of pH, turbidity, nitrate, *E. coli*, and chloride as indicator parameters for water quality was based on Howard (2002a).

A limitation of this study is the non-inclusion of waste management and environmental cleaning component of the service ladder in the WASH assessment of PHCs. Non-inclusion of the waste management and environmental cleaning components does not in any way deny the importance of both components at efficient service delivery of healthcare facilities. However, the two components were not part of the scope of the study. Depending on the availability of funding, the authors wish to expand the scope of the study to include additional healthcare facilities, with the inclusion of waste management and environmental cleaning components in subsequent studies.

Research ethics compliance

The National Health Research Ethics Committee of Nigeria of the Federal Ministry of Health, Nigeria developed the National Code of Health Research Ethics (NCHRE). It should be noted that this study did not involve any form of contact with patients, collection of body fluids/samples and patients' health records and as such the NCHRE regulations. Only, the status of WASH facilities within the healthcare facilities visited were virtually assessed and documented.

Table 1 | Joint Monitoring Programme (JMP) service ladder for monitoring WASH facilities in healthcare facilities

	Water	Sanitation	Hygiene	Waste management	Environmental cleaning
Basic service	Water is available from an improved source on the premises.	Improved sanitation facilities are usable, 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 people with limited mobility.	Functional hand hygiene facilities (with water and soap and/or alcohol-based hand rub) are available at points of care, and within 5 m of toilets.	Waste is safely segregated into at least three bins, and sharps and infectious waste are treated and disposed of safely.	Basic protocols for cleaning are available, and staff with cleaning responsibilities have all received training.
Limited service	An improved water source is within 500 m of the premises, but not all requirements for basic service are met.	At least one improved sanitation facility is available, but not all requirements for basic service are met.	Functional hand hygiene facilities are available either at points of care or toilets but not both.	There is limited separation and/or treatment and disposal of sharps and infectious waste, but not all requirements for basic service are met.	There are cleaning protocols and/or at least some staff have received training on cleaning.
No service	Water is taken from unprotected dug wells or springs, or surface water sources; or an improved source that is more than 500 m from the premises; or there is no water source.	Toilet facilities are unimproved (e.g. pit latrines without a slab or platform, hanging latrines, bucket latrines) or there are no toilets.	No functional hand hygiene facilities are available either at points of care or toilets.	There are no separate bins for sharps or infectious waste, and sharps and/or infectious waste are not treated/disposed of safely.	No cleaning protocols are available and no staff have received training on cleaning.

Source: WHO & UNICEF (2018).

RESULTS

Figures 2–4 show a comparison of the WASH profile of the PHCs in urban and rural areas. As indicated in Figure 2(a), borehole is the most prevalent water source type in urban PHCs, while hand-dug well is the most common source in rural PHCs. However, four PHCs relied on surface water (from a river) as their water source. Based on the JMP service ladder classification (Figure 2(b)), 97% of the water sources in urban PHCs and 85% of water sources in rural PHCs are classified as basic service (Figure 2(b)).

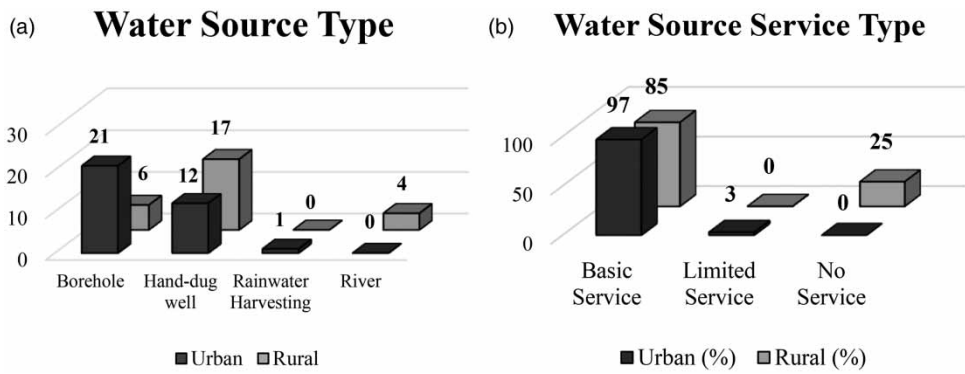

Figure 2 | Water sources classification in the Primary Healthcare Centres.

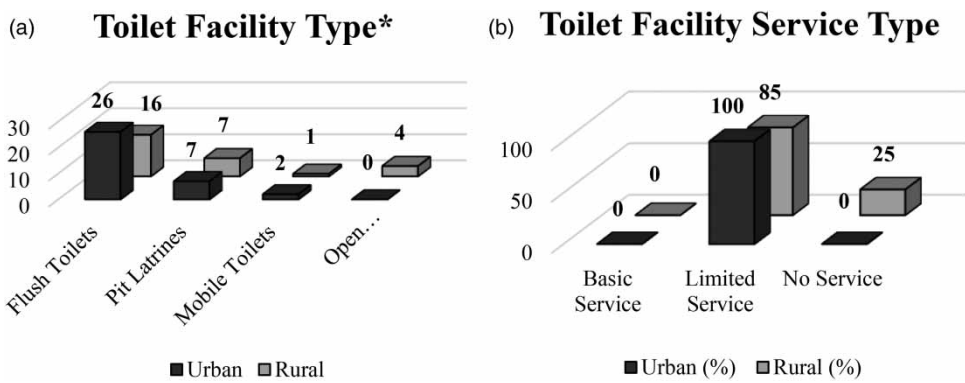

Figure 3 | Toilet facility type classification in the Primary Healthcare Centres (PHCs). *Two PHCs had flush toilets and pit latrines bringing the total sum of toilet facility to 63.

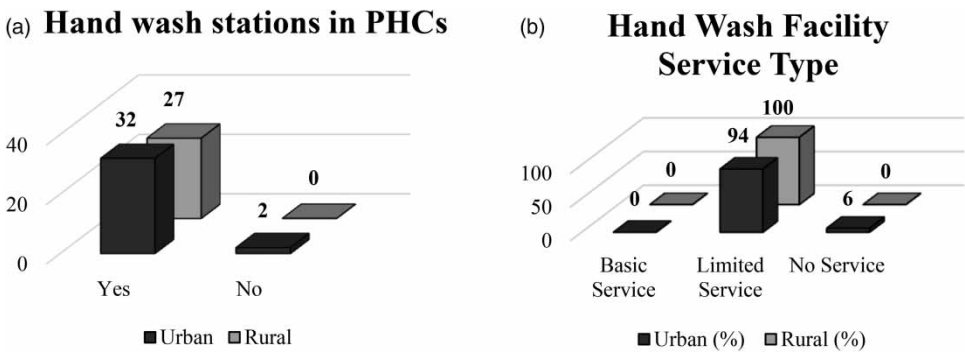

Figure 4 | Handwash practices classification in the Primary Healthcare Centres.

This implies that water is available on the premises and the water sources are improved. Three percent of the water source in rural PHCs are classified as limited service. There was no urban PHC water source in the limited service category. No urban PHC water source was classified as no service, while 25% of the water sources of rural PHCs were classified as no service, because four PHCs abstracted water from surface water. For the results of water quality analysis, the mean values pH of water sources in urban PHCs and rural PHCs were 5.49 $\pm$ 1.00 and 5.72 $\pm$ 0.19, respectively, mean turbidity values of 0.36 $\pm$ 0.45 and 0.14 $\pm$ 0.48, respectively; and mean nitrate values of 1.26 $\pm$ 1.61 and 2.38 $\pm$ 2.33, respectively. For chloride and *E. coli*, mean values of water sources in urban PHCs and rural PHCs were 49.35 $\pm$ 29.28 and 39.96 $\pm$ 30.27, respectively, and 7.12 $\pm$ 6.4 and 10.3 $\pm$ 9.67, respectively. The values of chloride, nitrate, and turbidity were within the WHO drinking-water standard for both urban and rural water sources. In the rural areas, though, all pH and *E. coli* values did not meet the recommended drinking-water standard, while pH and *E. coli* values in 11 and 6 water sources, respectively, in urban areas were within the recommended standard.

Flush toilets and pit latrines are the two types of toilet facilities used in the study area. Four PHCs in the rural area lacked toilet facilities, implying that patients and staff practice open defecation. Toilet facilities captured under sanitation using the JMP classification (Figure 3(b)) indicates that no toilet facility in both the urban and rural PHCs is classified as basic service, 100% and 85% are classified as limited service in the urban and rural PHCs, respectively, and 25% in rural PHCs as no service; no facility in the urban PHCs is classified as no service. No toilet facility could be classified as a basic service in this study; though some PHCs had dedicated toilet for staff and were sex-separated, toilet facilities with menstrual supplies and accessibility to people with limited mobility were lacking.

Toilet facilities in all urban PHCs are classified as limited service since not all requirements for basic service are met. Unimproved toilet facilities or absence of toilets is classified as no service. Open defecation practice by four rural PHCs is classified as no service due to the absence of toilet facilities.

Thirty-two of the 34 urban PHCs had functional handwashing stations. All PHCs in the rural areas had functional handwashing stations. Handwashing practice in 94% of urban PHCs and 100% in rural PHCs are classified as limited service. No PHC's handwashing practice is classified as basic service, while handwashing practice in 2% of urban PHCs is classified as no service. The absence of functional handwash stations either at points of care or toilets is classified as no service. Nevertheless, the presence of functional handwash station either at points of care or toilets, but not both, is classified as limited service.

DISCUSSION

The percentages of water sources that are classified as basic service in this study are significantly high. Nevertheless, scores below 100% is an indication of the need for improvement. The implications of improved water sources on premises at healthcare facilities cannot be overemphasized, as inadequate safe and reliable water, or lack of it, is a key hygiene risk and a herald for infections.

Generally, disparities have been reported in the WASH service levels between urban healthcare facilities and rural healthcare facilities (WHO 2015, 2020a). For instance, WHO (2015) reports that healthcare facilities in rural areas have disproportionately fewer WASH services than facilities in urban areas. Expect for handwash practice, urban PHCs fared better than rural PHCs in water source and toilet facilities in this study. This outcome mirrors a concentration of improved service delivery of PHCs at urban PHCs, while neglecting rural PHCs. The reason for this disparity could be attributed to factors, such as hard to reach facilities in remote communities, poor funding of rural community developments and services, and forgotten groups, among others and as reported in WHO (2020a) that WASH services in healthcare facilities are 'outright neglected'. The overall norm had been that urban areas enjoy better services in all sectors than rural setting, a phenomenon that has increased rural–urban migration and resulting in congestion in urban areas. Nonetheless, international human rights law recognizes WASH in PHCs as a human right, without regard to race, gender, or geographical location. Consequently, efforts should be made to address the problem of poor WASH facilities in rural areas. The WHO and other relevant stakeholders have increasingly provided support for countries around the world to improve the state of their healthcare facilities. However, policy design, implementation, and periodic review remain the exclusive responsibility of government and its appropriate agencies.

Nigeria has no existing policy on WASH in PHCs at present. However, a technical guide for WASH in PHC in Nigeria has been published by the National Primary Health Care Development Agency (NPHCDA) with the support of UNICEF and other stakeholders. The technical guide outlines the basic requirements for ensuring a clean and healthy PHC in line with

national developmental objectives and international best practices. Compliance with the technical guide requires the combined effort of PHC staff, host community, Ministry of Health, Primary Health Care Development Agencies at the National and State levels as well as WASH Consultants. As the WHO (2015) points out, improving WASH services requires leadership from the health sector, strong technical support, and political commitment from government. As laudable as the development of a technical guide is, the slow speed of implementation in line with the urgent need for improvement in WASH in PHCs is a concern.

Sensitization on community hand washing techniques and disinfection in PHCs: the wake of COVID-19

As a follow-up to this study and prior to the outbreak of the COVID-19 pandemic, the authors participated in a lecture series organized by the Department of Water Resources Management and Agrometeorology, Federal University of Agriculture, Abeokuta, Nigeria, as part of Community Extension Services and Training. A key component of the lecture series was training of participants on appropriate handwashing techniques (Figure 5). Participants, the authors believe, are currently finding the techniques handy as the battle to contain the COVID-19 pandemic ranges on.

Also, in the wake of the COVID-19 pandemic, sensitization of health workers at PHCs on disinfection have been conducted in some of the PHCs assessed in this study. Authors in partnership with a student volunteer group tagged 'Safe Environment' and WaterStep, a United States based donor organization, carried out the sensitization initiative. As part of the initiative, sodium hypochlorite (bleach) was manufactured using a bleach maker (Figure 6) and donated to the PHCs visited (Figure 7).

The bleach maker was donated to the Department of Water Resources Management and Agrometeorology, Federal University of Agriculture, Abeokuta, Nigeria, by WaterStep. The bleach is manufactured using table salt, water, and electricity. The sensitization process is currently ongoing as at the time of submitting this paper.

COVID-19 and the future of WASH in healthcare facilities

Healthcare facilities play a key role in managing COVID-19 and cannot be neglected for the battle against the pandemic to be won. Healthcare facilities can be regarded as the meeting point for patients, healthcare professionals, and sometimes accompanying family members of patients and can be regarded as a major point of transmission of infections, especially nosocomial infections also called HAI. The transmission risk posed by the COVID-19 has been established in the literature (Hu *et al.* 2020; Tian *et al.* 2020; WHO 2020b).

Figure 5 | The lead author demonstrating the hand washing technique at a lecture series as part of Community Extension Services and Training.

Figure 6 | Bleach making process in operation using the bleach maker donated by WaterStep.

Figure 7 | Bleach donation during the sensitization process.

Handwashing, besides social distancing and face-masking, has been highlighted as the strategy towards flattening the COVID-19 curve (WHO 2020b). Hu *et al.* (2020), in a review of the global strategy in addressing COVID-19, had outlined two approaches: face-masking and handwashing combination approach and the social distancing and handwashing combination approach. The interim guidance by the (WHO 2020b), on management and transmission of COVID-19 emphasized that consistent application of WASH and waste management practices in communities, healthcare facilities, and homes prevents the human–human transmission of pathogens, particularly, COVID-19. Hu *et al.* (2020) reports further that countries applying the social distancing and handwashing combination approach fared better in terms of reported cases/death. Handwashing, therefore, remains vital in the COVID-19 war; however, inadequate/lack of water supply can hamper a handwashing process. For instance, patients and healthcare professionals in PHCs without handwash stations reported in

this study are at a greater risk of HAI. Thus, the impact of the absence of adequate, safe, and easily accessible water supply in the fight against COVID-19 cannot be overstressed. Incidentally, availability of safe water and soap is a major factor for appropriate sanitation and hygiene, which promotes a healthy and sustainable environment. Although functional and gender-segregated, toilet facilities are also important in meeting the basic service criteria.

The obligation for ensuring the provision of WASH facilities in PHCs still lies with government particularly in low-income countries, Nigeria inclusive. Sadly, the state of WASH facilities in many PHCs in Nigeria has been reported as poor (UNICEF 2016). To improve the state of PHCs in Nigeria, the Minimum Standards for establishing, operating and support systems for PHCs issued by the Nigerian Government must strictly be followed. While drawing up policies and further implementing the procedures are two different steps, hopefully, implementation of the standards itemized in the document would be adequately carried out and appropriate compliance follow-up periodically done.

As the race towards SDG 2030 draws near, it is believed that the Nigerian government would rise to the occasion of improving WASH in healthcare facilities in general and not just in PHCs. The major task should be to ensure that existing facilities are upgraded to basic service status. Though an increase in the number of toilet facilities and ensuring accessibility by persons with disability, provision of water supply systems and creating/upgrading handwash station may be achieved, provision of menstrual supplies would be difficult. The increasing cost of commercial menstrual supplies would be a significant limiting factor.

Lastly, WHO (2020a) statistics on the global access to basic WASH facilities in PHCs states that 1.8 billion people use PHCs facilities with no basic water services and 800 million with no toilets, hence the need for global attention on PHCs, particularly in LMICs. The difficulty in managing community transmission of pathogens during a pandemic cannot be overstated. Control of a pandemic (particularly COVID-19) may be best achieved through proper monitoring of the provision of basic WASH facilities, their maintenance, and community (patients) responses to appropriate handwashing practices at PHCs.

CONCLUSION AND RECOMMENDATION

A comparative assessment of water sources in urban and rural PHCs, and the WASH profile of the PHCs, has been carried out in this study. WASH facilities in urban and rural PHCs were assessed based on the JMP service ladder classification of facilities, and shortcomings were highlighted. The detection of *E. coli* in some water samples tested is a health concern and PHCs should undertake regular water quality testing according to national standards. To improve the quality of water, water treatment facilities should be provided in the PHCs. Safe water is required by healthcare facility staff and patients for administering medicines and for drinking purposes. Consumption of water from questionable sources could slow down healing processes or increase the reoccurrence of water-related ailments in patients. Reoccurring water-related ailments can increase the exposure of healthcare facility staff and patients, thereby contributing significantly to the global disease burden.

The absence of toilet facilities in four rural PHCs, and the absence of handwash stations in two urban PHCs indicates the need for improvements in the status of WASH in PHCs for SDGs to be achieved. Failure at speedily improving the status of WASH facilities will translate to poor water quality and sanitation practices, thereby exposing health staff and patients to HAIs. Improvement in the status of WASH can be achieved through the implementation of the existing technical guide for WASH in PHC in Nigeria, published by the NPHCDA. Although as stated in the publication, compliance is premised on the collective responsibility of key stakeholders in the WASH sector as it relates to PHCs.

The current COVID-19 global crisis has brought to the fore the fact that countries cannot over-prepare for a pandemic. The outbreak of the virus has brought world powers to their knees and has further increased the need for more attention to be paid to the health sector. If WASH provision in PHCs is still an illusion with SDG 2030 deadline a few years away, the preparedness to deal with disease outbreaks by these PHCs leaves a big question. COVID-19 has shown that as far as healthcare is concerned, it can no longer be business as usual. Developing nations like Nigeria must wake up to the responsibility that every one of her citizens has a right to effective and affordable healthcare if SDG 2030 is the target.

This study further recommends the construction of water sources and toilet facilities, provision of water treatment facilities and the training of staff and patients on the significance of handwashing practices and monitoring of handwashing behaviour in PHCs, at least, yearly.

ACKNOWLEDGEMENTS

This study was part of a project funded by the Federal Government of Nigeria through the National Economic Empowerment and Development Strategy (NEEDS). Parts of the outcome have been presented at two international conferences, the 2019 CO-WASH Symposium at the University of Colorado, Boulder, USA, and the 2019 Water and Health Conference, University of North Carolina, Chapel Hill, USA. The authors also acknowledge WaterStep, a donor organization based in Louisville, Kentucky, USA, for their donation of a bleach maker which contributed as a follow-up tool to this project. The support of the Safe Environment group, Ogun State, Nigeria, is equally acknowledged for providing frontline manpower in the distribution of bleach and the sensitization of health workers.

CONFLICT OF INTEREST

The authors declare that they have no potential conflict of interest.

ETHICAL ISSUES

The data collected did not involve any interaction with patients and was strictly based on physical assessment of healthcare facilities in the respective PHCs and therefore did not require obtaining any form of ethical approval.

DATA AVAILABILITY STATEMENT

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

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First received 14 April 2021; accepted in revised form 1 September 2021. Available online 21 September 2021