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Original Article

Knowledge, attitude, and practice of hand washing among healthcare workers in a tertiary health facility in northwest Nigeria

ABSTRACT

Background: Healthcare-associated infections (HAIs) affect 1.7 million patients at any time worldwide, causing important morbidity and mortality. Up to 40% of all HAIs are thought to be transmitted by the hands of healthcare workers (HCWs). Hand washing is the most effective way of preventing the spread of infectious diseases in healthcare settings. This study assessed knowledge and practice hand washing among HCWs in Ahmadu Bello University Teaching Hospital, a tertiary healthcare center in Zaria, Kaduna State, northwestern Nigeria. **Methods:** A cross-sectional descriptive study was carried out among 116 HCWs selected using stratified sampling technique. Data were collected using interviewer-administered semistructured questionnaire and observation checklist using Epi Info mobile version 7.2.0.1 (United States Centres for Disease Control and Prevention (CDC), February 2018). Data were analyzed using SPSS software version 23. **Results:** Respondents of the study were nurses (37.9%), doctors (31.9%), and laboratory (18.1%) and supportive (12.1%) staff. About three-quarter (72.4%) of the HCWs had good knowledge and 62.0% exhibited positive attitude toward hand washing technique, based on the World Health Organization recommendations. Overall, good adherence to proper hand washing was found among 55.2% of the respondents. Respondents' professional cadre and unit of work, and their level of knowledge and attitude toward proper hand washing practices were shown to be significantly associated with their adherence to the practice ($P < 0.05$). **Conclusion:** Individual and institution-level factors were found to influence adherence to proper hand washing practices among the respondents.

Keywords: Hand washing, healthcare workers, knowledge, practices

BACKGROUND

Healthcare-associated infections (HAIs) are important cause of significant morbidity and mortality. These infections affect patients' safety, health outcome, cost of care, and the loss of labor force among healthcare workers (HCWs).[1] An estimated 1.7 million cases occur annually resulting in 99,000 deaths worldwide, 25 million extra days of hospital stay, and economic burden of €13 to 24 billion per year in Europe alone.[1,2] The burden of HAIs is as twice in developing countries like Nigeria as what obtains in developed countries, put at 15% to 31% as against 5% to 15%, respectively.[1] Half of all HAIs are transmitted by contaminated hands of HCWs.[3] Methods used for the prevention and control of HAIs include cleaning, disinfection, sterilization, asepsis, hand hygiene, patient isolation, and epidemiological surveillance.[2] Proper hand washing works by breaking the chain of cross-contamination of the infectious agents.

Although proper hand washing is shown to be a single important, very easy, and cost-effective procedure of preventing the spread of infectious diseases in the healthcare settings, its practice by HCWs is observed to

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be universally low.[4] Even in countries with robust national and institutional protocols and training opportunities, about a half of the HCWs fail to comply with the set standards of proper hand washing. However, few studies conducted in tertiary hospitals in Nigeria documented high adherence to hand washing practices among HCWs. A high knowledge level was found among majority of respondents in Calabar, Kano, and Lagos. The levels of good adherence reported range from 69.9% in Lagos, 70.3% in Calabar, to 73.4% in Kano.[5-7] Up to three-quarters of the respondents in Kano have had training on hand hygiene practices. Using observation checklist, researchers in a teaching hospital and a faith-based health facility in Jos, North Central Nigeria, reported an adherence level of 56.8%.[8] After observing 406 hand hygiene opportunities, another study in Jos documented a lower adherence level of 31.0% ranging from 21.0% before touching a patient, through 23.0% before performing invasive procedure to 63.0% after body fluids contact.[9] Multicenter studies demonstrate that adherence to hand washing is highest among nurses, high among HCWs in intensive care units (ICUs) and those who had training on proper hand washing, and least among physicians.[1,4-6] Evidence shows that in addition to institutional factors, individual factors among HCWs also strongly influence their adoption of proper hand washing.[5] There are varying reports by different studies on the relationship between knowledge of the benefits of hand washing and its practice. Some studies demonstrate that good knowledge of proper hand washing significantly influence adherence with hand washing standards. Conversely, other studies document that adherence with hand washing standards is significantly influenced by the HCWs attitude irrespective of the level of knowledge of what constitutes proper hand washing.[5] Other important determinants of adherence to hand washing are the type and availability of facilities and equipment in the hospitals, understaffing, and crowding.[5-7]

Despite the public health importance of HAIs in developing countries, both national and institutional capacities on HAIs prevention and control and implementation capacities in these countries remain weak.[2] There has been a growing international focus on preventing HAIs through hand hygiene in the last decade, and level of adherence to the guidelines by individual practitioners is becoming particularly important in developing countries of sub-Saharan Africa because of re-emergence epidemics of viral hemorrhagic fevers in epidemic proportions in recent years.[5] Notably, these diseases such as Ebola virus disease and Lassa fever are spread secondarily in the healthcare setting. Despite this, few studies assessed adherence of HCWs to hand washing practices in these settings. This study assessed knowledge and practice of hand washing among HCWs in Ahmadu Bello University Teaching Hospital in Zaria, Kaduna State, northwest Nigeria.

MATERIALS AND METHODS

Study setting

This cross-sectional descriptive study was conducted among HCWs of Ahmadu Bello University Teaching Hospital Zaria, one of the major referral tertiary facilities in northwest Nigeria. The hospital is a 1000-bedded center, with an annual patient turnover of over 10,000 patients, seen in 17 wards and units. The hospital has a total workforce of 1869 consisting of 624 doctors, 714 nurses, 44 pharmacists, 160 laboratory staff, and 327 health assistants. The hospital has an infection control committee established in 2003, whose functions include, among other things, promoting hand hygiene among HCWs.

Study population

One hundred sixteen HCWs directly involved in patient care and who had spent at least 6 months in the service of the hospital were included in the study.

Sample size determination

A sample size of 116 was computed using formula for descriptive studies at 0.05 degree of precision and a proportion of respondents with good knowledge of the components of proper hand washing (91.8%) in a previous study.[5]

Sampling technique

Two-stage stratified sampling technique was used to select respondents for the study. First, eight wards and units of the hospital were selected. These included intensive care and special baby care units; accident and emergency; pediatrics; medicine; surgery; obstetrics and gynecology; as well as laboratory and support services with staff populations of 46, 78, 84, 104, 171, 168, and 171, respectively. Equal number of respondents was allocated from the selected wards/units. Second, clinical professional groups were each taken as a stratum and proportionate method of allocation was used. In each unit, respondents were selected across professional cadre using simple random sampling by balloting, the staff list in the unit served as the sampling frame. Therefore, a total of 44 nurses, 37 doctors, and 35 laboratory and other staff were selected.

Data collection tools

Data were collected using semistructured interviewer-administered questionnaire and observation checklist adapted from the previous studies.[10,11]

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Data collection technique

Data were collected by three trained research assistants (RAs) over 3 weeks using Epi mobile-enabled smartphones. Data were collected in 3 days in each unit; two RAs conducted the interview, whereas the other RA documented the observations using the checklist.

Measurement of variables

The primary dependent variable measured was level of adherence, whereas independent variables measured were age, cadre, level of education, level of knowledge of proper hand washing, presence of hand washing guidelines/protocols, training opportunities in workstation, and institutional supervisory mechanism on hand washing practices. There were 30 items on the knowledge of hand washing, which included, among other things, the World Health Organization's five moments of hand hygiene: before touching a patient, before aseptic procedure, after body fluid exposure risk, after touching a patient, and after touching patient surrounding.[12] Each correct response was given a score 1, and nonresponse and incorrect response were scored zero. This was then converted into percentage and graded as good knowledge (≥60%), fair (40%–59%), and poor (0%–39%). Respondents attitude toward hand washing was assessed by 16 questions and each scored 1 point. An average score of 8 or better was regarded as positive attitude whereas a score of 0 to 7 was negative attitude. Frequency of hand washing was assessed as always, sometimes, and not at all. The level of practice was assessed by observing adherence to the 12 steps of hand hygiene: wet hands with water, apply enough soap to cover all hand surfaces, rub hands palm to palm, right palm over the back of the other hand with interlaced fingers and vice versa, palm to palm with fingers interlaced, backs of fingers to opposing palms with fingers interlocked, rotational rubbing of left thumb clasped in right palm and vice versa, rotational rubbing backward and forward and forward with clasped fingers of right hand in left palm and vice versa, rinse hands with water, allow the hands to air dry, use elbow to turn off tap, and steps 3 to 8 should take at least 15 seconds.[13] Hand washing practice is adjudged as completed if the participant followed all the 12 steps, partial for 1 to 11, and none for zero.

Statistical analyses

Data were analyzed using IBM SPSS version 20. Bivariate analysis to assess significant statistical association between dependent and independent variables was conducted using χ^2 at 0.05 alpha level of significance.

Ethical consideration

Ethical approval from Ethics and scientific Committee of the hospital and permission from various unit heads were obtained. Informed written consent was obtained from individual participants, voluntariness of participation, and confidentiality were ensured. Data collected were deidentified, coded, and stored in an encrypted and password-protected personal computer.

Limitations

One major limitation of the study lies with self-reporting of practice of hand washing; this was partly addressed by observation using a checklist. Hawthorne effect was minimized because although participants were aware that the study involved observation, they were not informed while the observation was taking place.

RESULTS

A total of 116 questionnaires were distributed and all were returned, giving a response rate of 100%. The mean age of the respondents in this study was 38.03 ± 8.6 years, with majority (80.3%) of them within a range of 25 to 49 years. Females constituted 56.9% of the respondents, giving a male-to-female ratio of 1:1.4. The respondents were made up of nurses (37.9%), doctors (31.9%), laboratory (18.1%), and supportive staff (12.1%) as shown in Table 1.

About three-quarters (72.4%) of the respondents exhibited good knowledge of hand hygiene, with only more than a quarter (27.6%) having poor knowledge [Figure 1]. Majority of respondents were aware of the World Health Organization's five moments of hand washing,

Table 1: Socio-demographic characteristics of respondents

Characteristics	Frequency (n)	Percent (%)
Age(years)		
≤ 29	25	21.6
30-34	22	18.9
35-39	25	21.6
40-49	22	18.9
45-49	9	7.8
≥ 50	13	11.2
Total	116	100.0
Mean ± sd	38.3 ± 8.6	
Sex		
Male	48	41.1
Female	68	56.9
Total	116	100.0
Male: female ratio	1: 1.4	
Cadre		
Nurses	44	37.9
Doctors	37	31.9
Laboratory scientists	21	18.1
Support staff	14	12.1
Total	116	100.0

sd, standard deviation.

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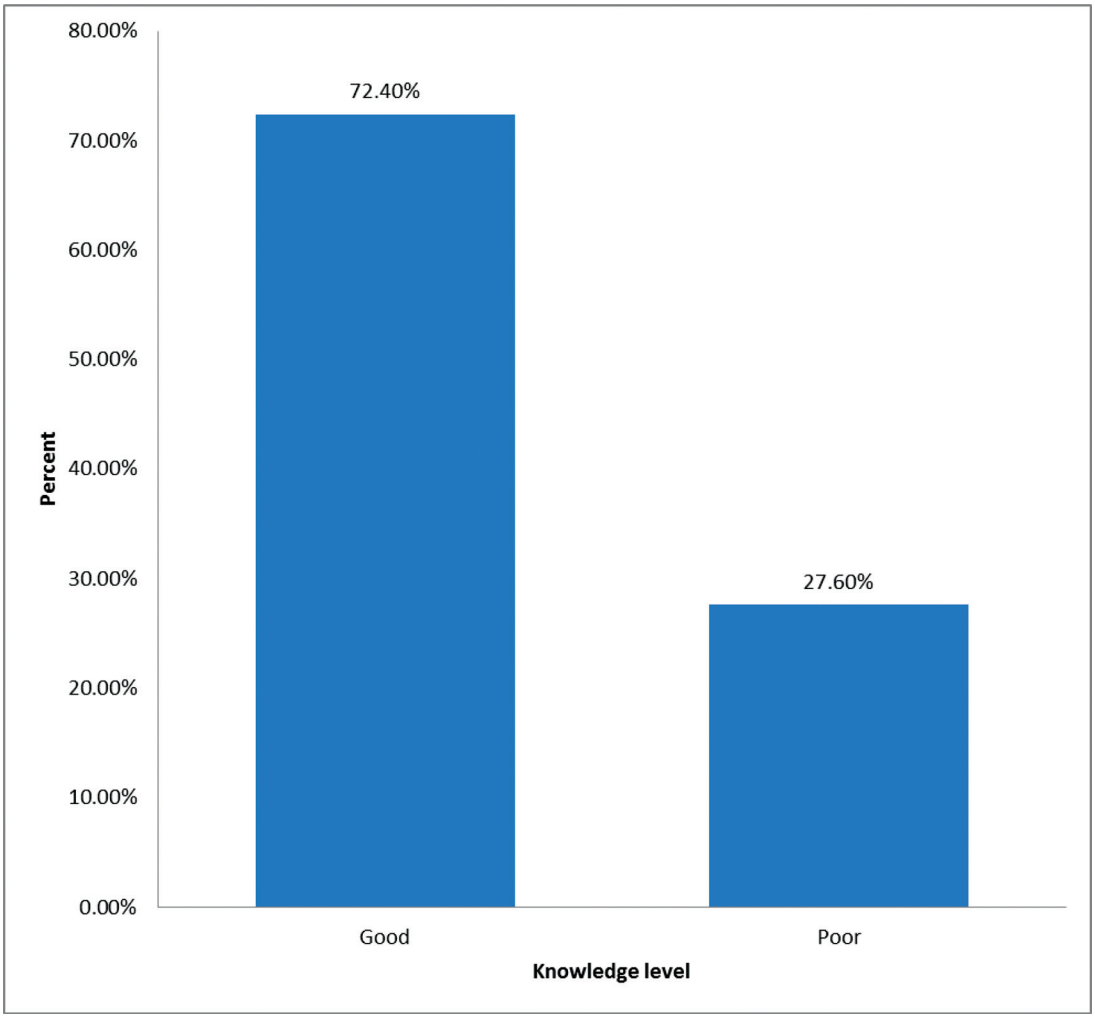

Figure 1: Respondents' knowledge of hand washing.

ranging from 80% of the respondents who stated that one needs to wash his/her hands before touching a patient to 88.8% who mentioned need for hand washing after touching a patient.

All the doctors (100%) and 90.5% of nurses had good knowledge of hand hygiene, compared to 20.0% each of support staff and laboratory technologists, respectively. Respondents from pediatric, surgical, and those in ICU and special baby care baby unit had better knowledge of hand hygiene, whereas staff working in emergency units (57.7%), obstetrics and gynecology, as well as medical (76.9%) wards had lower knowledge level. Additionally, the results show that staff working in units with higher availability of hand washing materials had better knowledge of hand washing. The association between respondents' knowledge of hand washing with their professional cadre ($P < 0.0001$) and workstation ($P = 0.002$) was found to be statistically significant [Table 2]. Majority of respondents (62.0%) were also shown to have positive attitude toward hand washing [Figure 2].

Table 2: Factors associated with respondents' knowledge of hand washing

Factors	Level of knowledge of hand washing (n =116)		FET*	*P* value
	Good	Poor		
Professional cadre				
Doctors	37(100.0)	0 (0.0)	69.34	< 0.0001
Nurses	38 (90.5)	6 (9.5)		
Laboratory technologists	4 (19.1)	17 (80.9)		
Support staff	2 (14.3)	12 (85.7)		
Work station				
Medical wards	10 (76.9)	3 (23.1)	20.48	0.002
Paediatrics wards	8 (100.0)	0 (0.0)		
Surgical wards	20 (100.0)	0 (0.0)		
Emergency units	15 (57.7)	11 (42.3)		
ICU and SCBU	16 (100.0)	0 (0.0)		
Obstetrics and gynecology	10 (76.9)	3 (23.1)		
Laboratory	16 (80.0)	4 (20.0)		

*Fischer's exact test. ICU, intensive care unit; SCBU, special baby care baby unit.

More than half (55.2%) of the respondents had good adherence to proper hand washing practices [Table 3]. Concerning

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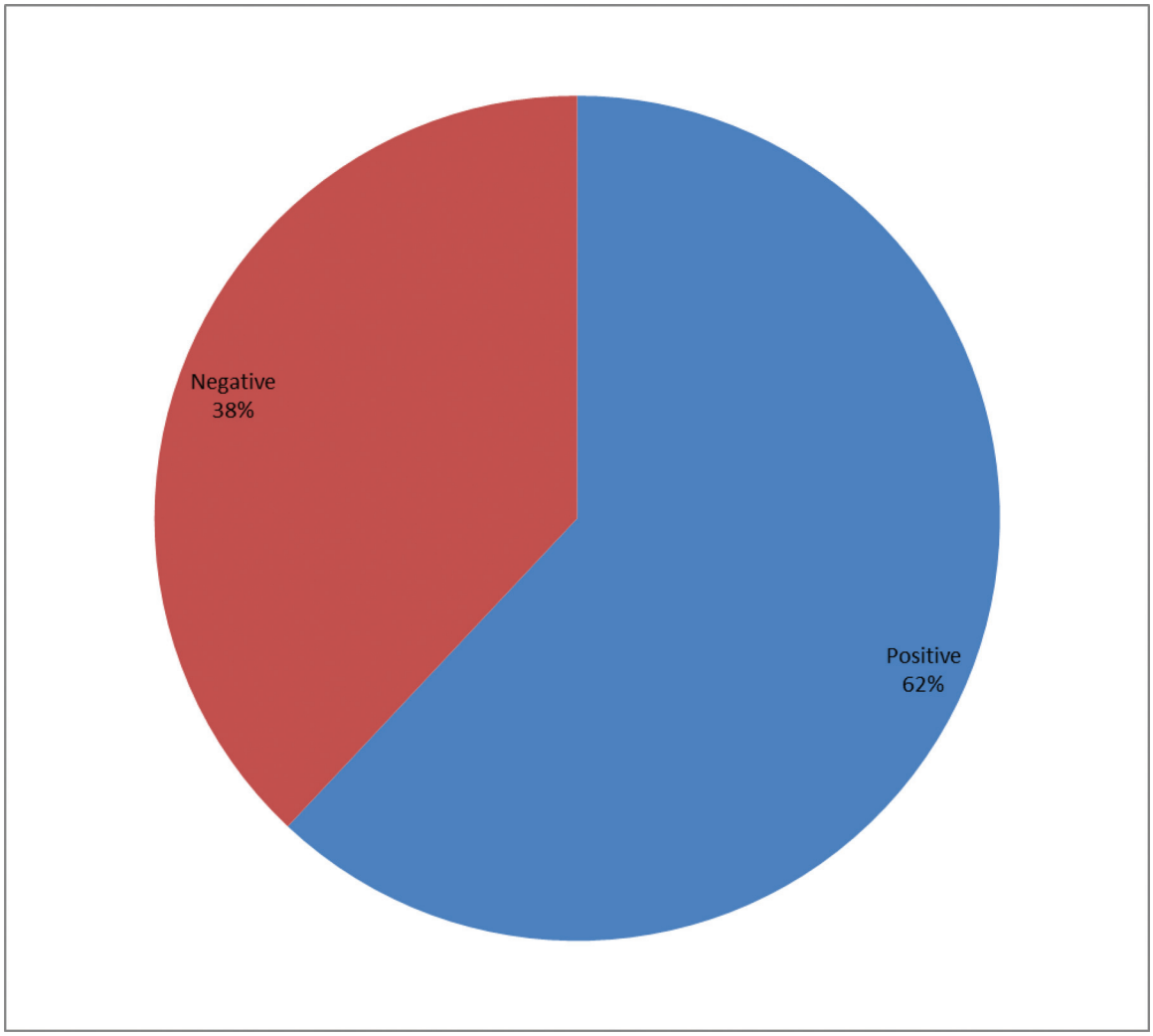

Figure 2: Respondents' attitudes towards hand washing.

Table 3: Respondents' adherence to proper hand washing practices

Adherence level	Frequency	Percent (%)
Poor	52	44.8
Good	64	55.2
Total	116	100.0

frequency of practice of hand hygiene during the various recommended moments for hand washing, majority of the respondents (85.0%) reported that they always practice hand hygiene on exposure to body fluids from patients 100 (86.2%) and after using the toilet 84 (85.0%), respectively [Table 4].

Asked to rate availability of hand hygiene materials, 62 (53.4%) of respondents indicated availability of a running tap being always available in their department/workstation whereas 84 (72.4%), 40 (34.5%), and 39 (33.6%) of the respondents indicated that hand hygiene standard operating procedures, dryer/disposable tissue, and posters/flyers on hand hygiene are not available at their department/workstation, respectively. Direct observation in the wards, however, reveals that the availability of running tap, soap, or alcohol-based hand rub was largely partial and infrequent [Table 5]. Furthermore, except for a short period during the Ebola epidemic in Nigeria and shortly after, supervisory activities on hand washing were not practiced in the hospital. More than half (55.0%) of the respondents reported ever having a structured training on proper hand washing within a year preceding the study [Figure 3].

Factors found to be significantly associated with level of adherence to hand washing were respondents' professional cadre ($P < 0.0001$), knowledge of what constitute proper hand washing ($P < 0.0001$), and their attitude toward hand washing practices ($P < 0.0001$) as shown in Table 6.

DISCUSSION

Hand washing has been considered to be a cost-effective tool in the control of HAIs and is accepted throughout the

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Table 4: Frequency of practice of hand washing among the respondents

Hand washing moments	Frequency of practice			
	Always	Sometimes	Rarely	Never
Before touching patient	19 (16.4)	65 (56.0)	31(26.7)	1 (0.9)
After body fluid exposure riskwith patients	100 (86.2)	16 (13.8)	0 (0.0)	0 (0.0)
After touching patient surrounding	27 (23.3)	68 (58.6)	21 (18.1)	0 (0.0)
Before handling food	34 (29.3)	77 (66.3)	5 (0.4)	0 (0.0)
Before gloving	9 (7.8)	39 (36.6)	67 (57.8)	1 (0.9)
After gloving	32 (27.6)	71 (61.2)	13 (11.2)	0 (0.0)
After using the toilet	84 972.4)	32 (27.6)	0 (0.0)	0 (0.0)

*Multiple response allowed.

Table 5: Availability of hand hygiene materials in the hospital

Hand washing materials	Frequency (Percent %)*			
	Availability			
	Always	Most times	Some times	Not available
Running tap	62 (53.4)	50 (43.1)	4 (3.4)	0 (0.0)
Soap	49 (42.2)	59 (50.9)	8 (6.9)	0 (0.0)
Alcohol based hand rub	19 (16.4)	63 (54.3)	34 (29.3)	0 (0.0)
Dryer/disposable tissue	0 (0.0)	14 (12.1)	62 (53.4)	40 (34. 5)
Hand hygiene SOPs	0 (0.0)	8 (6.9)	24 (20.7)	84 (72.4)
Posters/flyer on hand hygiene	1 (0.9)	5 (4.3)	71 (61.2)	39 (33.6)

*Multiple response allowed. SOPs, standard operating procedures.

health community as a basic clinical procedure essential for safety of patients and HCWs alike.[9,10] But different studies report varying levels of appreciation of its benefits and adherence to standard hand washing practices.[1-5]

More than half of the respondents in this study exhibited good adherence to proper hand washing practices. This finding is consistent with the adherence levels reported globally and the levels observed in Jos, north-central Nigeria.[8] The result is, however, lower than what was reported by earlier works in other tertiary institutions in Lagos, Calabar, and Kano, Nigeria.[5-7] This is, however, higher than the levels observed in the other study conducted in Jos, north-central Nigeria.[9] This may be because this study and the latter study in Jos employed observation as a means of assessing adherence to hand washing practices as against in the other studies.

This study also documented high knowledge and positive attitude toward hand washing, among majority of the respondents. This also follows the same trend of comparison with existing evidence, which reported good-to-excellent knowledge of hand washing among health workers.[5-8]

It was also found that professional cadre of the respondents was strongly associated with their adherence to hand washing practices, with nurses performing better than doctors and the two better than laboratory scientists and support staff. Similarly, staff working in surgery, obstetrics and gynecology, ICU, and special baby care baby unit had better knowledge than those in medicine and family medicine/outpatients. This is also in keeping with findings of other studies of differential knowledge of hand washing across professional groups and by workstation.[1,2,4,7] The possible explanation for these findings is that having contact with patients and their body fluids including performing clinical procedures is linked their perception of risk of HAIs among HCWs and thus their level of interest and knowledge on hand hygiene.[8,9,14] Although respondents reported absence of any supervisory mechanism on hand hygiene practices in the facility, more than half of the respondents have had special training on hand washing in the year preceding the study. This contrasts with the results of the study in Calabar, south-south Nigeria, where less than half had attended any training on hand washing in the last 10 years prior to the survey.[6]

Although shown to be significantly associated, respondents' adherence to hand washing practices did not keep pace with the level of knowledge and positive attitude they demonstrated toward hand washing. This brings to effect the contribution of institutional factors found to be also significantly associated with the HCWs actual performance of these otherwise simple but effective procedures.[14] One of such factors found to be significantly associated with adherence to hand washing in this

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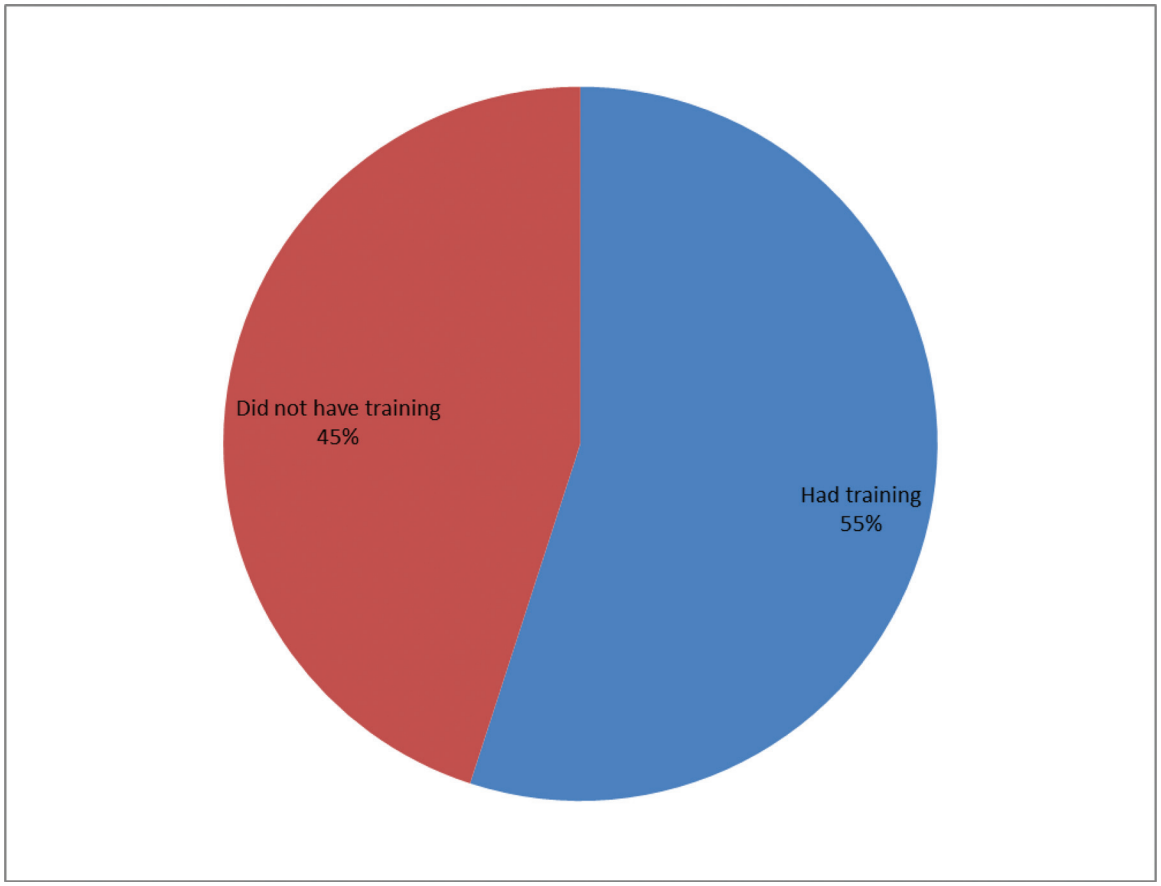

Figure 3: Proportion of the respondents who had training on hand washing.

Table 6: Factors associated with respondents' adherence to proper hand washing practices

Factors	Adherence level (n =116)			
	Good	Poor	χ^2	*P* value
Professional cadre				
Doctors	31 (48.4)	6 (11.5)	41.51	< 0.0001
Nurses	28 (43.8)	16 (30.8)		
Laboratory technologists	0 (0.0)	21 (40.4)		
Support staff	5 (7.8)	9 (17.3)		
Knowledge of hand washing				
Good	60 (93.8)	24 (46.2)	32.54	< 0.0001
Poor	4 (6.2)	28 (53.8)		
Attitude towards hand washing				
Positive	50 (78.1)	22 (42.3)	15.63	< 0.0001
Negative	14 (21.9)	30 (57.7)		
Availability of hand washing facilities				
Full	14 (21.9)	6 (11.5)	3.04	0.22
Partial	15 (23.4)	18 (34.6)		
None	35 (54.9)	28 (53.9)		

*Fischer's exact test.

study was availability of hand washing facilities in the workstation. This level of low compliance to hand washing practices owing to lack of needed essential facilities is reported in several low and middle-income countries.[15-21] One reason for concern is that majority of these results come from tertiary centers, which are expected to be centers of excellence. It is therefore highly probable that what obtains in the lower tiers of the healthcare centers, which serve the vast majority of the populace, is much lower. The implications of this institutional weakness in infection control measures could be seen in the HCWs inability to protect themselves even in event of crises, despite their good knowledge of what to do and willingness to

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do. This was demonstrated in the high morbidity and mortality recorded in the recent outbreaks of viral hemorrhagic fevers in West Africa such as Ebola virus and Lassa fever diseases, among HCWs and the general population.[22]

One major limitation of this and many similar studies was reliance on HCWs to report their own performance with regard to their adherence to hand washing practices. Despite the theoretical concern of over reporting in these circumstances, comparison with direct observation by HCWs actual practices reveals only a small variation and the adherence levels remain generally low.[6-9] Counting hand washing opportunities and observing practitioners practice is a method that could give a more precise adherence level and show the true gap between reported and observed hand hygiene practices.

CONCLUSION

Good adherence to hand washing practices was found only among about half of HCWs. Availability of hand washing materials and institutional support were found to be significantly associated with adherence level. Promoting HCWs safety at work such as improving availability of hand washing material, training opportunities, and supervisory mechanism are recommended.

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Conflicts of interest
There are no conflicts of interest.

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