



Assessment of the Knowledge and Practice of Handwashing among Healthcare Workers in a Tertiary Hospital in Ekiti, Southwestern Nigeria

Oluwalana Timothy Oyekale^{1,2*}, Samsudeen Adeniran Adegbile¹,
Oluwatosin Bola Ojo¹, Damilola Esther Oguntunmbi¹
and Oluwatoyin Ige Oyekale³

¹Department of Medical Microbiology and Parasitology, Federal Teaching Hospital, Ido-Ekiti, Nigeria.

²Department of Medical Microbiology and Parasitology, Afe-Babalola University, Ado-Ekiti, Nigeria.

³Department of Radiology, Federal Teaching Hospital, Ido-Ekiti, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. Author OTO designed the study, entered and analyzed the data, wrote the protocol and wrote the first draft of the manuscript. Authors SAA and OBO collected the data and managed analysis of the study. Authors DEO and OIO collected data and managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background: The most common means of transmission of Healthcare-Associated Infections (HAIs) is the contaminated hand of Healthcare Workers (HCWs), proper handwashing by HCWs is the best method of halting this transmission, however, there is poor adherence to the practice of the simple handwashing procedure in many health facilities.

Aims: To assess the knowledge and practice of proper handwashing, to identify the factors impeding adherence to its good practice among HCWs and to identify the handwashing and hand drying facilities available to these HCWs.

Study Design: This is a descriptive cross-sectional study.

Place and Duration of Study: The study was carried out at Federal Teaching Hospital, Ido-Ekiti (FETHI), Southwestern Nigeria between July 2020 and December 2020.

Methods: The study involved 328 randomly selected HCWs. Data was collected using pretested

*Corresponding author: E-mail: oluwalana75@gmail.com;

self administered questionnaires, entered into Microsoft Excel 2016 and analyzed by SPSS version 23.

Results: Only 31.10% of respondents had good knowledge of handwashing while 80.18% had good practice of handwashing. Longer stay in service and being a doctor or nurse were associated with good knowledge and good practice of handwashing. Only 16.46% of respondents had previous training on handwashing within 3 years prior to this study. Previous training on handwashing was associated with good knowledge of handwashing ($P=.001$). Up to 68.60% of respondents used stored water and soap for handwashing. The most common hand drying facility reported in the study was common towel, no respondent ever used paper towel. The most common reason given for poor adherence to handwashing practices was the busy schedule.

Conclusion: Hospital managers must prioritize the regular provision of handwashing and hand drying facilities for their centre, in addition to organizing regular hand hygiene training for HCWs, to improve their knowledge and practice of handwashing and thus reduce the rate of HAIs

Keywords: *Handwashing; Healthcare-Workers (HCWs); Healthcare-Associated Infection (HAIs); knowledge; practice.*

1. INTRODUCTION

Healthcare Associated Infections (HAIs) globally represent a major threat to hospital patient's safety; causing long term disability, worsening trend of antimicrobial resistance, increased fatality, with attendant emotional stress for patients and their families, increased healthcare cost and increased length of hospital stay [1,2].

In developed countries, up to 5-15% of hospitalized patient develop HAIs, with the rate higher (9-37%) among patients in Intensive Care Unit (ICU), while higher prevalence rates have been reported from different regions of the developing nations including 30.9% in a pediatric hospital in Nigeria, 23% in a general surgery of a Tanzania hospital and 19% in a maternity unit of a Kenya hospital. [2-6].

The contaminated hand of HCW is the most common agent of transmission of these HAIs in most settings, where the hands of HCW is contaminated with microorganisms from one patient or patient's surrounding and the contaminated hand come in direct contact with another patient or patient's surrounding [2].

Hand hygiene, through proper hand washing among HCWs, is the most important, easy and economical means of reducing transmission of these HAIs in hospitals [7]. However, adherence to the practice of this simple and economical hand washing technique is highly suboptimal (below 50%) and has been of immense challenge in prevention of HAIs [8-10]. Low compliance rate has been reported from both developed and developing countries with the

mean baseline rates ranging from 5% to 89% and an overall average of 38.7% [2].

Various reasons have been documented by earlier studies for poor adherence to hand washing including; lack of knowledge about hand washing, lack of appropriate equipment and consumables for hand washing, high work load, the time required for the procedure and casual attitudes of HCWs to biosafety issues [11].

To improve on hand hygiene compliance, guidelines for hand hygiene in health care settings were launched by World Health Organization (WHO) in 2005. The guidelines reinforces the need for continuous staff education, use of alcohol based hand rub as primary hand hygiene method, regular audits of hand hygiene practices and use of performance feedback indicators, and need for strong commitment by all stakeholders including the institution, HCWs and patients [2]. The World Health Organization (WHO) also introduced 'My five moments for hand hygiene' which stipulates the practice of hand hygiene at five (5) critical moments in hospital settings; before touching a patient, before aseptic and clean procedures, after exposure to body fluids, after touching a patient and after touching patients surrounding [12]. Also, in 2008, Global Handwashing Partnership (GHP), in conjunction with WHO, earmarked 15th October as the Global Handwashing promotion campaign day to motivate and mobilize people around the world to improve their hand washing habits.

There is dearth of studies in this hospital to assess the knowledge and practice of

handwashing and factors militating against its good practice among HCWs, thus necessitating this study. This study was carried out to assess the knowledge and practice of handwashing, to identify the handwashing and hand drying facilities available, and to identify the factors contributing to poor adherence to handwashing practices among HCWs.

2. METHODOLOGY

This was a descriptive cross sectional study conducted among doctors, nurses and ward orderlies of a tertiary health facility; FETHI, South-Western Nigeria, between July 2020 and December 2020. A total of 328 HCWs who met the inclusion criteria were selected by a simple random sampling technique and included in the study.

Healthcare workers who have worked in the unit for a minimum period of six (6) months prior to the study (who must have learnt, and be familiar with all the protocols in such unit) and work in direct contact with the patients were included in the study while those that have worked in the unit for less than 6-months prior to the study, and theatre or ICU staff (who generally are compelled to practice good handwashing), were excluded from the study.

Data were collected from the participants with the aid of a pretested, well-structured self-administered questionnaire which was delivered to the selected respondents in the wards and collected soon after.

Data entry was done by the researchers onto Microsoft Excel sheet version 2016 and analysis was done using the Statistical Package for Social Sciences (SPSS) version 23. Chi-square test $P < 0.05$ was considered as being statistically significant. Results were presented in tables and pictorial chart.

2.1 Measurement of Variables

The independent variables were the age, sex, years spent in service, profession and previous training in handwashing while the dependent variables included the knowledge and practice of handwashing.

In assessing the knowledge of participants on handwashing, 20 items were scored including the Global Handwashing day, 5 moments of handwashing, 12 steps in handwashing, advantages of handwashing, and the minimum duration for handwashing. Each correctly listed

answer was scored 1 while non-response and wrong answers were scored 0. The total score per participant was then converted into percentage and graded as good knowledge ($\geq 67\%$), fair knowledge (34%–66%), and poor knowledge (0%–33%). In assessing the practice of handwashing by participants, 11 items were scored including practice of handwashing; before touching a patient, after touching a patient, before wearing gloves, after removing gloves, after touching patient surrounding and before aseptic or clean procedure. Each positive response was scored 1, while non-response or negative response was scored 0. The total score per participant was then converted into percentage and graded as good practice ($\geq 67\%$), fair practice (34%–66%) and poor practice (0%–33%).

3. RESULTS

Of the 400 questionnaire distributed among the HCWs, only 328 (82%) were returned for analysis giving a 'non-response' rate of 18%.

3.1 Distribution of professionals recruited in the study

108 (32.93%) nurses, 98 (29.88%) doctors, and 122 (37.2%) ward orderlies were involved (Fig. 1).

3.2 Demographic Characteristics of Respondents

The age range of respondents was 19 to 56 with mean age of 34.93 ± 7.23 years. Only 16.46% received training on handwashing within the past 3 years (Table 1).

3.3 Assessment of Respondents' Knowledge of Handwashing

Only 23 (7.01%) of the participants were aware of the Global handwashing day, of which, only 6 (1.83%) were able to list correctly the exact date. Also, only 129 (39.33%) and 62 (18.90%) respectively were able to list correctly; the 5 moments of handwashing, and the correct steps in handwashing. Overall, only 102 (31.10%) respondents had good knowledge of handwashing (Table 2).

3.4 Effect of Demographic Factors on Handwashing Knowledge

39.39% and 33.33% of those who have spent 11-20 years and >20 years respectively in

service had good knowledge of handwashing while only 25.26% of those who have spent 1-10 years in service had good knowledge ($\chi^2=7.27$, $df=2$, $P=.03$, this is statistically significant), also 45.37% of nurses, 44.90% of doctors, and only 7.38% of ward orderlies had good knowledge of handwashing. (χ^2 -value=51.02, $df=2$, $P<.001$, this is statistically significant (Table 3).

3.5 Assessment of Handwashing Practice

All (100%) respondents wash hands before aseptic or clean procedure, .84.76% and 99.39% respectively wash hands before and after touching patient. Only 49.39% wash hands before wearing gloves (Table 4).

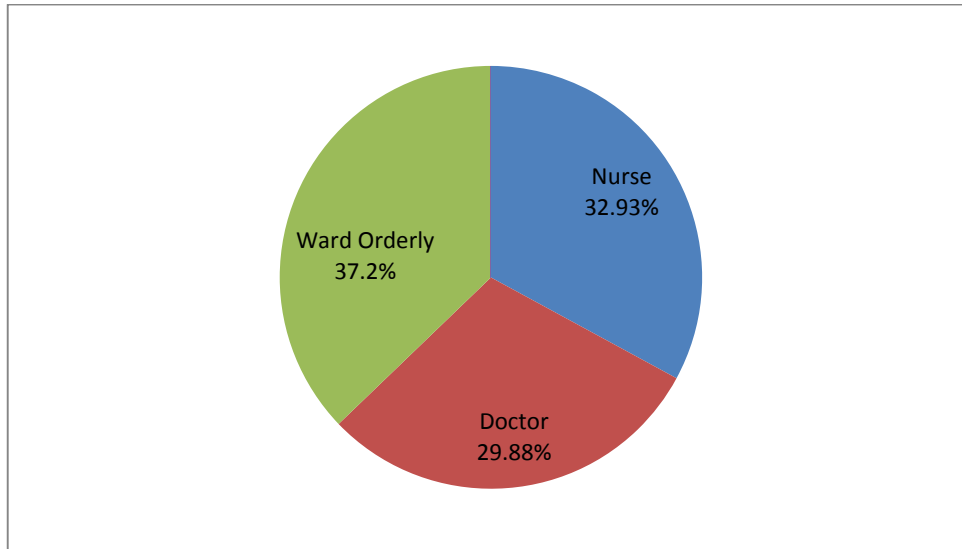


Fig. 1. Pie chart representing the distribution of professionals recruited in the study

Table 1. Respondents profession versus demographic factors

Factor	Nurse n (%)	Doctorn (%)	Ward orderly n(%)	Total n(%)
Age				
18-24	1 (11.11)	0 (0.00)	8 (88.89)	9 (2.74)
25-34	58 (34.73)	47 (28.14)	62 (37.13)	167 (50.91)
35-44	40 (31.75)	38 (30.16)	48 (38.09)	126 (38.41)
45-60	9 (34.62)	13 (50.00)	4 (15.38)	26 (7.93)
Total n(%)	108 (32.93)	98 (29.88)	122 (37.20)	328 (100.00)
Sex				
Male	15 (14.85)	62 (61.39)	24 (23.76)	101 (30.79)
Female	93 (40.97)	36 (15.86)	98 (43.17)	227 (69.21)
Total n(%)	108 (32.93)	98 (29.88)	122 (37.20)	328 (100.00)
Years of service				
1-10	61 (32.11)	53 (27.89)	76 (40.00)	190 (57.93)
11-20	42 (31.82)	45 (34.09)	45 (34.09)	132 (40.24)
>20	5 (83.33)	0 (0.00)	1 (16.67)	6 (1.83)
Total n(%)	108 (32.93)	98 (29.88)	98 (29.88)	328 (100.00)
Received training on handwashing within the past 3 years				
Yes	25 (46.30)	23 (42.59)	6 (11.11)	54 (16.46)
No	83 (30.29)	75 (27.37)	116 (42.34)	274 (83.54)
Total n(%)	108 (32.93)	98 (29.88)	122 (37.20)	328 (100.00)

NB: Mean age = 34.931, Variance = 52.83, Standard deviation = 7.268

Table 2. Knowledge of Respondents on Handwashing

Knowledge question	Yes /Correct n(%)	No/Incorrect n(%)	Indifferent n(%)	I don't know n(%)	Total n(%)
Ever heard of WHO Global hand washing day?	23 (7.01)	290 (88.41)	0 (0.00)	15 (4.57)	328(100)
Mention the correct date of WHO Global hand washing day	6 (1.83)	11 (3.35)	307 (93.60)	4 (1.22)	328 (100.00)
Hand washing greatly reduce risk of transmission of hospital infections	298 (90.85)	0 (0.00)	16 (4.88)	14 (4.27)	328 (100.00)
List the 5 moments of hand washing	129 (39.33)	145 (44.21)	31 (9.45)	23 (7.01)	328 (100.00)
List the steps in hand washing	62 (18.90)	175 (53.35)	0 (0.00)	91 (27.74)	328 (100.00)
What is the minimum duration of proper hand washing?	226 (68.90)	102 (31.10)	0 (0.00)	0 (0.00)	328 (100.00)
Overall Knowledge	Good (n%)	Fair (n%)	Poor (n%)	Total (n%)	
Respondent n(%)	102 (31.10)	142 (43.29)	84 (25.61)	328 (100.00)	

Table 3. Overall knowledge of hand washing by respondents versus demographic characteristics

Knowledge	Good n(%)	Fair n(%)	Poor n(%)	Total n(%)	χ^2 -value	P-value
Age						
18-24	3 (33.33)	3 (33.33)	3 (33.33)	9 (2.74)		
25-34	42 (25.15)	77 (46.11)	48 (28.74)	167 (50.91)		
35-44	47 (37.30)	52 (41.27)	27 (21.43)	126 (38.41)		
45-60	10 (38.46)	10 (38.46)	6 (23.08)	26 (7.93)		
Total n (%)	102 (31.10)	142 (43.29)	84 (25.61)	328 (100.00)	5.70	.13
Sex						
Male	38 (37.62)	34 (33.66)	29 (28.71)	101 (30.79)		
Female	64 (28.19)	108 (47.58)	55 (24.23)	227 (69.21)		
Total n (%)	102 (31.10)	142 (43.29)	84 (25.61)	328 (100.00)	2.90	.09
Years in service						
1-10	48 (25.26)	74 (38.95)	68 (35.79)	190 (57.93)		
11-20	52 (39.39)	65 (49.24)	15 (11.36)	132 (40.24)		
>20	2 (33.33)	3 (50.00)	1 (16.67)	6 (1.83)		
Total n (%)	102 (31.10)	142 (43.29)	84 (25.61)	328 (100.00)	7.27	.03
Profession						
Nurse	49 (45.37)	43 (39.81)	16 (14.81)	108 (100.00)		
Doctor	44 (44.90)	41 (41.84)	13 (13.27)	98 (100.00)		
Ward Ord	9 (7.38)	58 (47.54)	55 (45.08)	122 (100.00)		
Total n (%)	102 (31.10)	142 (43.29)	84 (25.61)	328 (100.00)	51.02	<.001

Table 4. Practice of handwashing by respondents

Practice question	Yes n(%)	No n(%)	Indifferent n(%)	Total n(%)
Hand washing before touching patient	278 (84.76)	45 (13.72)	5 (1.52)	328 (100.00)
Hand washing after touching patient	326 (99.39)	0 (0.00)	2 (0.61)	328 (100.00)
Hand washing before wearing glove	162 (49.39)	154 (46.95)	12 (3.66)	328 (100.00)
Hand washing after removing glove	291(88.72)	37 (11.28)	0 (0.00)	328 (100.00)
Hand washing after touch patient's surrounding	192 (58.54)	105 (32.01)	31 (9.45)	328 (100.00)
Hand washing before aseptic or clean procedure	328 (100.00)	0 (0.00)	0 (0.00)	328 (100.00)

Overall practice	Good (n%)	Fair (n%)	Poor (n%)	Total (n%)
Respondent n(%)	263 (80.18)	57 (17.38)	8 (2.44)	328 (100.00)

3.6 Effects of Demography on Handwashing Practices

93.65% and 80.77% respectively of those in age-range 35-44years and 45-60 years had good practice of hand washing while only 55.56% and 71.26% respectively of those 18-24 years and 25-34 years had good practice of hand washing ($\chi^2=26.20$, $df=3$, $P<.001$, this is statistically significant), 87.13 of male and 77.02% of female respondents had good practice of hand washing ($\chi^2=4.43$, $OR=2.01$, $P=.04$, this is statistically significant), 83.88% and 87.88% respectively of those who have spent >20 years and 11-20 years in service had good practice of hand washing while only 74.74% of those who have spent 1-10 years in service had good practice of hand washing ($\chi^2=8.50$, $df=2$, $P=.01$, this is statistically significant) and 88.89% of nurses, 90.82% of doctors and 63.93% of ward orderlies had good practice of hand washing ($\chi^2=32.40$, $df=2$, $P<.001$, this is statistically significant). (Table 5).

3.6 Assessing the Effects of Previous Training on Handwashing Knowledge

Only 54 (16.46%) of the total respondents had training on handwashing within 3 years prior to this study. 15 (27.78%) and 8 (2.92%) respectively of respondents with and without previous training have heard of Global Handwashing day in the past ($\chi^2=42.75$, $OR=12.79$ $P<.001$, this is statistically significant), all (100%) and 244 (89.05%) respectively of respondents with and without previous training

knew that hand washing greatly reduces the risk of transmission of hospital infections ($\chi^2=5.26$, $P=0.01$, this is statistically significant), 28 (51.85%) and 101 (36.86%) respectively of respondents with and without previous training were able to list the 5 moments of handwashing ($\chi^2=4.25$, $OR=1.84$, $P=.04$, this is statistically significant), while 44 (81.48%) and 182 (66.42%) respectively of respondents with and without previous training knew the minimum duration of proper handwashing ($\chi^2 =4.77$, $OR=2.22$, $P=.03$, this is statistically significant).

Overall, 32 (59.26%) of those with previous training and 70 (25.55%) of those without previous training had good knowledge of handwashing ($\chi^2= 23.93$, $OR=4.24$, $P=.001$), this is statistically significant. (Table 6)

3.7 Assessing the Effects of Previous Training on Handwashing Practices

Fifty-one (94.44%) and 227 (82.85%) respectively of those with and without previous training wash their hands before touching patient ($\chi^2=4$, $OR=3.52$, $P=.03$, this is statistically significant), 50 (92.59) and 112 (40.88%) respectively of those with and those without previous training wash hands before wearing glove ($\chi^2=48.27$, $OR=18.08$, $P<.001$, this is statistically significant), while 51(94.44%) and 141(51.46%) respectively of those with and those without previous training wash hands after touching patient's surrounding ($\chi^2=34.34$, $OR=16.04$, $P<.001$, this is statistically significant). (Table 7).

3.8 Handwashing and Hand Drying Facilities

The most common handwashing facility reported were running water and soap {279= 85.06% respondents), up to 225 (68.60%) respondents also reported the use of stored water and soap.

On the accessible hand drying facilities, 283 (86.28%) respondents reported the use of common towel. No respondents ever used disposable paper towel for hand drying purpose.

The most common reason given by the respondents for poor adherence to hand washing practices was the busy work schedule (207=63.11%) (Table 8).

4. DISCUSSION

This study showed that the respondents' knowledge on handwashing was poor as evident by their poor knowledge of Global handwashing day, the 5 moments of handwashing and steps in handwashing. Similar reports were made in previous studies; a study in Kano, Nigeria reported that only 4.3% of doctors and 12.9% of nurses knew the 5 moments of handwashing, and only 25.7% of total participants were able to correctly list the steps of handwashing, but a

moderate proportion (64.3%) of respondents were aware of the Global handwashing day and up to 15% knew the exact date, also, the report from study in Port Harcourt, Nigeria showed that only 44.6% of HCWs studied had good knowledge of hand washing [13,14].

Contrasting reports were made in studies from Zaria, Nigeria and Lagos, Nigeria where 72.4% and 91.2% of respondents respectively had good knowledge of hand washing [15,16]. This contrasting report from Zaria and Lagos was due to good Infection Control program and the attendant regular hand hygiene training for HCWs in those centre. The findings in this study, like those studies with similar findings, is definitely an outcome of irregular Infection Control training in the centre, evident by a low proportion of respondents (16.46%) who had such training within 3 years prior to this study. Also, commemoration of Global handwashing day is unknown in this centre. Regular Infection Control training with emphasis on handwashing, and yearly commemoration of Global handwashing day within the facility are of paramount importance in improving the knowledge of HCWs on handwashing.

Table 5. Overall practice of hand washing by respondents versus demographic characteristics

Practice	Good n(%)	Fair n(%)	Poor n(%)	Total n(%)	χ^2 -value	p-value
Age						
18-24	5 (55.56)	3 (33.33)	1 (11.11)	9 (2.74)		
25-34	119 (71.26)	44 (26.35)	4 (2.40)	167 (50.91)		
35-44	118 (93.65)	6 (4.76)	2 (1.59)	126 (38.41)		
45-60	21 (80.77)	4 (15.38)	1 (3.85)	26 (7.93)		
Total n(%)	263 (80.18)	57 (17.38)	8 (2.44)	328 (100.00)	26.20	<.001
Sex						
Male	88 (87.13)	11 (10.89)	2 (1.98)	101 (30.79)		
Female	175 (77.02)	46 (20.26)	6 (2.64)	227 (69.21)		
Total n(%)	263 (80.18)	57 (17.38)	8 (2.44)	328 (100.00)	4.43	.04
Years of service						
1-10	142 (74.74)	42 (22.11)	6 (3.16)	190 (57.93)		
11-20	116 (87.88)	14 (10.61)	2 (1.52)	132 (40.24)		
>20	5 (83.88)	1 (16.67)	0 (0.00)	6 (1.83)		
Total n(%)	263 (80.18)	57 (17.38)	8 (2.44)	328 (100.00)	8.50	.01
Profession						
Nurse	96 (88.89)	11 (10.19)	1 (0.93)	108 (32.93)		
Doctor	89 (90.82)	8 (8.16)	1 (1.02)	98 (29.88)		
Ward Ord	78 (63.93)	38 (31.15)	6 (4.92)	122 (37.20)		
Total n(%)	263 (80.18)	57 (17.38)	8 (2.44)	328 (100.00)	32.40	<.001

Table 6. Previous training on handwashing versus knowledge of handwashing

Response	Previous training n(%)	No previous training n(%)	Total n(%)	χ^2 -value	P-value
1) Ever Heard of Global Hand washing day?					
YES	15 (27.78)	8 (2.92)	23 (7.01)		
NO	37 (68.52)	253 (92.34)	290 (88.41)		
I don't know	0 (0.00)	0 (0.00)	0 (0.00)		
Indifferent	2 (3.70)	13 (4.74)	15 (4.57)		
Total n (%)	54 (16.46)	274 (88.54)	328 (100.00)	42.75	<.001
2) Listing correct date of Global handwashing day					
Correct	3 (5.56)	3 (1.09)	6 (1.83)		
Incorrect	7 (12.96)	4 (1.46)	11 (3.35)		
I don't know	3 (5.56)	1 (0.36)	4 (1.22)		
Indifferent	41 (75.93)	266 (97.08)	307 (93.60)		
Total n (%)	54 (16.46)	274 (88.54)	328 (100.00)	2.82	.058
3) Hand washing greatly reduces the risk of transmission of hospital infections?					
YES	54 (100.00)	244 (89.05)	298 (90.85)		
NO	0 (0.00)	0 (0.00)	0 (0.00)		
I don't know	0 (0.00)	16 (5.84)	16 (4.88)		
Indifferent	0 (0.00)	14 (5.11)	14 (4.27)		
Total n (%)	54 (16.46)	274 (88.54)	328 (100.00)	5.26	.01
4) List the 5 moments of handwashing					
Correct	28 (51.85)	101 (36.86)	129 (39.33)		
Incorrect	21 (38.89)	124 (45.26)	145 (44.21)		
I don't know	3 (5.56)	28 (10.22)	31 (9.45)		
Indifferent	2 (3.70)	21 (7.66)	23 (7.01)		
Total n (%)	54 (16.46)	274 (88.54)	328 (100.00)	4.26	.04
5) List the steps in handwashing					
Correct	10 (18.52)	52 (18.98)	62 (18.90)		
Incorrect	39 (72.22)	136 (49.64)	175 (53.35)		
I don't know	0 (0.00)	0 (0.00)	0 (0.00)		
Indifferent	5 (9.26)	86 (31.39)	91 (27.74)		
Total n (%)	54 (16.46)	274 (88.54)	328 (100.00)	0.01	.94
6) Duration of proper handwashing?					
<20 seconds	4 (7.41)	40 (14.60)	44 (13.41)		
20-40 secs	44 (81.48)	182 (66.42)	226 (68.90)		
>40 secs	6 (11.11)	52 (18.98)	58 (17.68)		
I don't know	0 (0.00)	0 (0.00)	0 (0.00)		
Indifferent	0 (0.00)	0 (0.00)	0 (0.00)		
Total n (%)	54 (16.46)	274 (88.54)	328 (100.00)	4.77	.03

Overall Knowledge among trained and untrained respondents

Respondents	Good	Fair	Poor	Total	χ^2 -value	p-value
Previous training	32 (59.26)	20 (37.04)	2 (3.70)	54 (16.46)		
No previous training	70 (25.55)	122 (44.53)	82 (29.93)	274 (88.54)		
Total n (%)	102 (31.10)	142 (43.29)	84 (25.61)	328 (100.00)	23.93	<.001

It is commendable however, that a good proportion of respondents knew the minimum duration of proper handwashing (68.9%), similar to the finding in Lagos, Nigeria (67%) [16]. Majority (90.85%) of respondents in this study knew that hand washing greatly reduce the risk of transmission of hospital infections, similar findings have been reported from Kano, Nigeria and Pune, India where 99.3% and 85% of HCWs respectively knew that hand washing

greatly reduce the risk of transmission of hospital infections. [13,17] The findings in this study may not be unrelated to scattered seminars and sensitization talks within the facility on Lassa fever outbreaks which presents yearly at the peak of dry season and very recently the COVID-19 infection. These seminars always emphasized the hands of HCWs as major carrier of infectious agents.

Table 7. Previous training versus practice of handwashing

Response	Previous Training n (%)	No previous Training n (%)	Total n (%)	χ^2 -value	p-value
1) Handwashing before touching patient					
Yes	51 (94.44)	227 (82.85)	278 (84.76)	4.7	.03
No	1 (1.85)	44 (16.06)	45 (13.72)		
Indifferent	2 (3.70)	3 (1.09)	5 (1.52)		
Total n (%)	54 (16.46)	274 (83.54)	328 (100.00)		
2) Handwashing after touching patient					
Yes	54 (100.00)	272 (99.27)	326 (99.39)	0.4	1.0
No	0 (0.00)	0 (0.00)	0 (0.00)		
Indifferent	0 (0.00)	2 (0.74)	2 (0.61)		
Total n (%)	54 (16.46)	274 (83.54)	328 (100.00)		
3) Handwashing before wearing glove					
Yes	50 (92.59)	112 (40.88)	162 (49.39)	48.27	<.001
No	1 (1.85)	153 (55.84)	154 (46.95)		
Indifferent	3 (5.56)	9 (3.28)	12 (3.66)		
Total n (%)	54 (16.46)	274 (83.54)	328 (100.00)		
4) Handwashing after removing glove					
Yes	48 (88.89)	243 (88.69)	291 (88.92)	0.00	1.02
No	6 (11.11)	31 (11.31)	37 (11.28)		
Indifferent	0 (0.00)	0 (0.00)	0 (0.00)		
Total n (%)	54 (16.46)	274 (83.54)	328 (100.00)		
5) Handwashing after touching patient's surrounding					
Yes	51 (94.44)	141 (51.46)	192 (58.54)	34.34	<.001
No	1 (1.85)	104 (37.96)	105 (32.01)		
Indifferent	2 (3.70)	29 (10.58)	31 (9.54)		
Total n (%)	54 (16.46)	274 (83.54)	328 (100.00)		
6) Handwashing before aseptic or clean procedure					
Yes	54 (100.00)	274 (100.00)	328 (100.00)	0.0	1.0
No	0 (0.00)	0 (0.00)	0 (0.00)		
Indifferent	0 (0.00)	0 (0.00)	0 (0.00)		
Total n (%)	54 (16.46)	274 (83.54)	328 (100.00)		

Overall Practice among trained and untrained respondents

Respondents	Good n(%)	Fair n (%)	Poor n(%)	Total n(%)	χ^2 -value	p-value
Previous training	46 (85.19)	7 (12.96)	1 (1.85)	54 (16.46)	1.02	0.31
No previous training	217 (79.20)	50 (18.25)	7 (2.55)	274 (83.54)		
Total n (%)	263 (80.18)	57 (17.38)	8 (2.44)	328 (100.00)		

Table 8. Available Handwashing and hand drying facilities and reasons for poor adherence to handwashing practices

Variable	Nurse n=108 (%)	Doctor n=98 (%)	Ward orderly n=122 (%)	Total n=328 (%)
Handwashing facilities				
Running tap water only	58 (53.70)	32 (32.65)	76 (62.30)	166 (50.51)
Running tap +soap	98 (90.74)	89 (90.82)	92 (75.41)	279 (85.06)
Water +antiseptic soap	52 (48.15)	42 (42.86)	24 (19.67)	118 (35.98)
Water +liquid soap	53 (49.07)	51 (52.04)	32 (26.23)	136 (41.63)
Stored water +soap	63 (58.33)	61 (62.24)	32 (26.23)	225 (68.60)
Alcoholic hand rub	11 (10.19)	8(8.16)	32 (26.23)	21(6.40)
I don't know	0(0.00)	0(0.00)	0 (0.00)	0(0.00)
Indifferent	0 (0.00)	0(0.00)	2 (1.64)	2(0.61)
Hand drying facilities				
Common towel	86 (79.63)	85 (86.73)	112(91.80)	283 (86.28)
Personal handkerchief	12 (11.11)	7 (7.14)	0 (0.00)	19 (5.79)
Disposable paper towel	0(0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Allow hand to air-dry	12 (11.11)	22 (22.45)	16 (13.11)	50 (15.24)
Hand drier	12 (11.11)	8 (8.16)	10 (8.20)	30 (9.15)
I don't know	0 (0.00)	0 (0.00)	0(0.00)	0 (0.00)
Indifferent	0 (0.00)	0(0.00)	12 (9.84)	12 (3.66)
Reason for poor adherence to hand washing practices				
Lack of running tap water	52 (48.15)	46 (46.94)	52 (42.62)	150 (45.73)
Unavailable soap	38 (35.19)	24 (24.49)	47 (38.52)	109 (33.23)
Busy work schedule	98 (90.74)	71 (72.45)	38 (31.15)	207 (63.11)
Occasionally forget	12 (11.11)	11 (11.22)	42 (34.43)	65 (19.82)
Glove already protect me	16 (14.81)	8 (8.16)	78 (63.93)	102 (31.10)
Facility not easily accessible	21 (19.44)	21 (21.43)	29 (23.77)	71 (21.65)
I don't know	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Indifferent	4 (3.70)	1 (1.02)	11 (9.02)	15 (4.57)

NB: Multiple answers were given by respondents

Majority of respondents in this study had good practice of handwashing despite a generally poor knowledge shown; however, a previous study by Joshi et al. [18] which refuted the association of good knowledge or previous training with practice of handwashing supported our findings [18].

Majority of respondents tend to wash hands before and after touching patient, after removing gloves and before carrying out aseptic or clean procedure, but only 49.39% and 58.54% of respondents respectively wash hands before wearing gloves and after touching patients' surrounding. This finding is similar to other teaching hospitals' studies in Lagos, Calabar and Kano but higher than finding from Jos, all in Nigeria [16,19-21]. Numerous factors other than knowledge or training may affect the practice including the institutional factors which may account for good practice in this study. The centre is a tertiary health centre where specialists practice their job, there are different

Standard Operating Procedures (SOPs) that must be followed in carrying out different procedures including hand hygiene, and thus, HCWs may carry out some procedural steps even without good knowledge of the steps. Also, hand hygiene facilities are readily available and staff may have no excuse not to follow the SOP.

Being a doctor or a nurse, previous training on handwashing and longer time spent in service were associated with good knowledge and practice of handwashing in this study. Also, older age, male HCW tend to have better practice of handwashing. A study in Zaria, Nigeria, found similar association between profession of HCWs and their knowledge of handwashing, where 100% of doctors and 90.5% of nurses as opposed to only 19.1% laboratory technologist and 14.3% of support staff had good knowledge of handwashing, [15] However, other studies in Lagos and Kano did not find any association between profession and good knowledge of handwashing mainly because only doctors and

nurses were recruited and compared in those studies [13,16]. Previous studies have also documented an association between previous training and good practice of handwashing, while a report from Juba, South Sudan refuted such association [16,22-24]. The fundamental training of doctors and nurses put them in a better position to understand and practice some infection prevention protocols, including hand hygiene, better than the support staff, some of whom may not have had any formal training on infection prevention before employment. Doctors and nurses will learn infection prevention protocol faster and better when in service. Also, the longer a HCWs stay on their job, the more and better they learn and practice the routines, this also suffices for the age of HCWs who tends to get better in their knowledge and practices of routines as they grow older. All these may explain the findings in this study. The role of regular infection control training and retraining in equipping HCWs with better knowledge to practice handwashing has been earlier discussed.

Most respondents in this study used running water and soap for handwashing, but a large proportion also claimed to use water 'stored' in container with soap. The WHO has recommended soap and tap water (ideally drinkable) for the purpose of handwashing when hands are visibly dirty or visibly soiled with blood or other body fluids, and after exposure to a potential spore-forming pathogen including *Clostridium difficile*. When tap water is not available, water "flowing" from a pre-filled container with a tap is preferable to still-standing water in a basin. Alcohol-based hand rub is recommended for routine hand antisepsis if hands are not visibly soiled [2]. The use of 'stored' water seen in this study may encourage introduction of microorganisms and encourage transmission of HAIs.

Hand drying practice in this study like other previous studies was poor as the use of common towels predominated, while some used personal handkerchief [14-16]. The common cloth towel and handkerchief readily become damped, become easily contaminated with microorganisms, thus serving as reservoir for infectious agents. Use of common cloth towel as hand drying facilities has been documented in a previous study as a sure barrier to good hand hygiene practices by HCWs since it may negate the intended reason for handwashing [25]. The role of hand drying in hand hygiene practices

have been well documented, however, such role in infection control has been widely overlooked [26,27]. A wet skin is more likely to transmit bacteria than a dry skin, thus, proper hand drying should be an integral part of the hand hygiene process in health care. Comparison studies of various hand drying technique reported varying results, while some reported paper towel as the most effective, a study reported hot-air dryer as superior to paper towel, while some reported no significant difference in effectiveness of all methods, however, paper towel causes less contamination of washroom environment and thus recommended for hospitals and clinics [28]. The management needs to prioritize the provision of disposable paper towels to all care units and increase the number of available hot-air driers in all units. Also, regular training on hand hygiene must include training on proper hand drying techniques for HCWs.

Busy work schedule, as seen in this study had also been reported in previous studies as the most common reason for poor adherence to handwashing practices [16,29]. There is a dearth of health personnel in the country, thus, those available HCWs tend to be overworked with tendencies towards reduced practice of handwashing at critical times, thus, recruitment of more HCWs in areas of need is desirable. Institutional deficiencies exemplified by lack of running tap water and unavailability of soap were also reported as reasons for poor adherence to hand hygiene in this study. These problems must be tackled headlong, and regular supply of running water and soaps to all care units must be seen as essential component of Hospital Infection Control Program. Regular infection control training will erase the erroneous belief, by some respondents in this study, that 'handwashing is not needed again since glove is already worn'. The use of gloves does not replace the need for hand hygiene by either hand rubbing or handwashing [2].

5. CONCLUSION

Handwashing practices of HCWs in this study were good despite their poor knowledge of handwashing. Hospital managers need to prioritize the regular provision of handwashing and hand drying facilities for their centre, in addition to regular hand hygiene training for HCWs, to improve their knowledge and practice of handwashing and thus reduce the rate of HAIs.

CONSENT AND ETHICAL APPROVAL

Ethical approval (Protocol number: ERC/2020/10/14/429A) for the study was obtained from the Ethics and Research Committee of the hospital. Written and oral informed consents were obtained from each participant prior to administration of questionnaire.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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