

Knowledge, attitude and practice of hand hygiene among healthcare providers in semi-urban communities of Sokoto State, Nigeria

ABSTRACT

Introduction: Healthcare providers have been identified as the most common vehicle for transmission of HAIs from patient to patient and within the healthcare environment. A large proportion of the infections acquired in the hospital is attributed to cross contamination and transmission of microbes from hands of HCPs to patients. Hand hygiene has been identified as the single most important, simplest and least expensive means of preventing HAIs. This study aimed to determine the knowledge, attitude and practice of hand hygiene among healthcare providers in semi-urban communities of Sokoto State, Nigeria

Methods: A cross-sectional study was conducted among 144 healthcare providers selected by a multistage sampling technique. Data was collected with a set of pretested **self-administered**, semi-structured questionnaire. Data were analyzed using IBM SPSS version 20 statistical package.

Results: The mean age of the respondents was 32.1 ± 7.4 years, and majority of them were aged 20 – 39 years (81.2%), females (59.0%) and married (65.3%). Most of the respondents (71.5%) were community health extension workers (CHEWs) and nurses/midwives. One hundred and thirty-two (91.7%) of the 144 respondents had good knowledge of hand hygiene; but about a third of respondents (31.9%) had the misconception that hand washing should be done before touching patients' files. Most of the respondents demonstrated positive attitude to hand hygiene. Most of them would attend workshop/training on hand hygiene (95.1%), and would advise their colleagues to do so (94.4%). One hundred and thirty-nine (96.5%) of the 144 respondents reported observing hand hygiene practices; of these, only two-thirds, 97 (69.8%) do so consistently. The main reasons cited for not observing hand hygiene practices consistently were unavailability of soap (88.1%) and irregular water supply (51.0%).

Conclusion: Although, knowledge, attitude and practice of hand hygiene were good among the respondents in this study, unavailability of soap and lack of constant water supply remain major constraints. Government and other stakeholders should provide adequate water, and materials for sanitation and hygiene in the healthcare facilities.

Keywords: Knowledge, attitude, practice, hand hygiene, healthcare providers

1. INTRODUCTION

Considering the tremendous advancement in medical care in the past few decades, it is strange that the health-care settings still remain unsafe for patients worldwide, principally as a result of hospital acquired infections (HAIs)[1]. Healthcare providers have been identified

as the most common vehicle for transmission of HAIs from patient to patient and within the healthcare environment [2]. A large proportion of the infections acquired in the hospital is attributed to cross contamination and transmission of microbes from hands of HCPs to patients [3]. Numerous infections are still acquired from both patients and HCPs through poor hand hygiene, unsafe use of injections, medical devices and blood products, inadequate surgical procedures and deficiencies in medical waste disposal [4]. In addition to these factors, an unfavorable social background and population largely affected by malnutrition and other types of infection and/or disease contribute to the increased risk of HAIs in developing countries [5].

Multidrug- Resistant pathogens are commonly involved in such infections and render effective treatment difficult [6]. Prevalence studies of HAIs in developing countries have reported higher rates than developed countries [7]. The total number of hand exposures in a hospital may range from several tens to thousands per day [7]. With each hand-to-surface exposure, a two directional exchange of microorganisms occurs between hands and the touched object and the transient hand-carried flora is thus continuously changing [8]. It has also been found that a substantial proportion of the healthcare workers' hand flora gradually gets replaced by pathogenic microorganisms, which can spread throughout a health care environment in a short span of time [8].

Hospital acquired infections poses a very real and serious threat to all who are admitted in hospitals [9]. According to the World Health Organization (WHO), HAI affects an estimated 1.4 million patients at any time worldwide [10]. Hand hygiene has been identified as the single most important, simplest and least expensive means of preventing HAIs [6]. It is the practice which keeps the hands free from pathogens, or decreases the quantity of pathogen, prior to any procedure or touching the patient [11].

Evidence from studies has shown that improved hand hygiene has substantially reduced noso-comial infections and cross-contamination of multi resistant infection in hospitals [3]. It has also been shown to be associated with significant decrease in overall rates of HAIs and respiratory infections in particular [12]. Hand hygiene in the health care setting has been encouraged for generations and is recommended as the single most important procedure for preventing the transmission of infection [8]. Specifically, hand washing is recommended before and after every contact with patient to break the chain of infection [13]. Even though evidenced based guidelines for HCPs hand hygiene practices exist in many healthcare facilities, compliance with these are internationally low [14]; hand hygiene compliance rates among HCPs rarely exceeds 50% [9].

While lack of awareness and scientific knowledge regarding hand hygiene is believed to be a significant factor that could lead to inappropriate hand hygiene practices [15], misconceptions regarding hand hygiene are believed to contribute to low compliance; for instance, when gloves are used as an alternative to hand hygiene, or the notion that skin irritation arises from frequent hand hygiene practice [16]. Other factors that have been found to contribute to poor hand hygiene practices in the healthcare settings include increased workloads due to under-staffing, lack of organizational commitment to good hand hygiene practices, and inadequate or lack of hand hygiene products and facilities such as running water, sinks, antiseptic or non-antiseptic soaps, alcohol hand-rubs and hand paper towels [17]. It has been found that most wards in Nigerian hospitals lack adequate facilities for effective hand hygiene and use the bucket and bowl method as an alternative to running water [18].

Variations in the practice of hand hygiene across hospital wards and among different cadres of HCPs have been found have direct associated with good knowledge of hand hygiene [19]. Also, while previous studies across the globe including Nigeria and Egypt reported positive attitude towards hand hygiene by an overwhelming majority of healthcare providers [12,20], widely varied and lower proportions of healthcare providers showed good knowledge of hand hygiene [21,22], and/or engaged in appropriate hand hygiene practices [13,23]. In the developing countries of sub-Saharan Africa, while a larger proportion of the populations

reside in the semi-urban and rural areas, the healthcare facilities and manpower are concentrated in the urban areas [24]. The disproportionately high workload in the poorly equipped healthcare facilities in the semi-urban and rural areas therefore make full compliance with hand hygiene practices the only feasible means of preventing nosocomial transmission of infections in these facilities. Worse of all, although several studies regarding knowledge, attitude and practice of hand hygiene have been conducted among healthcare workers in Nigeria, most of them were isolated studies conducted in the tertiary healthcare facilities which are majorly situated in the urban cities across the country [12,21,25,26]; and there is dearth of literature on the knowledge, attitude and practice of hand hygiene among healthcare workers in the lower levels of care obtainable in the semi-urban and rural areas of the country. This study was conducted to assess the knowledge, attitude and practice of hand hygiene among healthcare providers in semi-urban communities of Sokoto State, Nigeria. The findings would be invaluable in designing strategies for promoting compliance with appropriate hand hygiene practices among healthcare providers; and in preventing HAIs in the healthcare facilities.

2. MATERIAL AND METHODS

This cross-sectional descriptive study was carried out among health care providers in health facilities in Wamakko Local Government Area (LGA) of Sokoto state, Nigeria in November and December 2016. All healthcare providers in the government owned health facilities in Wamakko LGA were considered eligible for enrollment into the study. The sample size was estimated at 144 using the Fisher's formula for calculating the sample size for descriptive studies [27], a 90.0% prevalence of compliance with WHO guideline regarding practice of hand washing with soap and water from a previous study [28], precision level of 5%, and an anticipated 95% response rate. The eligible participants were selected by a 2-stage sampling technique. At the first stage, one health facility was selected from each of the 11 political wards in Wamakko LGA by simple random sampling using the balloting option. At the second stage, eligible participants were selected in each of the selected health facilities (in direct proportion to the number of staff in the respective health facilities) by systematic sampling technique using the staff list in the respective health facilities to constitute the sampling frame.

A semi-structured, self-administered questionnaire was developed and used to obtain information on respondent's socio-demographic characteristics, knowledge, attitude and practice of hand hygiene. The questionnaire was reviewed by senior researchers in the department to ascertain content validity. It was then pretested among 15 healthcare providers at Yar-Akija Primary Healthcare Centre, Sokoto South LGA of Sokoto. Some questions were rephrased for clarity based on the observations made during the pretesting. Four final year medical students and two medical records staff assisted in questionnaire administration after pre-training on conduct of survey research, the objectives, and questionnaire administration. Ethical clearance was obtained from the Ethical committee of Sokoto State Ministry of Health, Sokoto, Nigeria. Permission to conduct the study was obtained from the administration of Wamakko LGA, while informed written consent was also obtained from the participants before data collection.

Data was analyzed using the IBM Statistical Package for Social Sciences (SPSS) version 20. Respondents' knowledge of hand hygiene was scored and graded on a 13-point scale. One point was awarded for a correct response, while a wrong response or a non-response received no points. This gives a minimum score of '0' and a maximum score of '13' points. Those that scored greater than 50% of the maximum knowledge score (i.e., ≥ 7 of 13 points) were considered as having 'good' knowledge, while those that scored less than 50% of the maximum knowledge score (i.e., < 7 of 13 points) were graded as having 'poor' knowledge [29]. Frequency runs were done for further editing and cleansing of the e-data. Frequency

distribution tables were constructed; and cross tabulations were done to examine relationship between categorical variables. Chi-square and Fisher's exact tests of independent association was used to test for relationship between categorical variables. All levels of significance were set at $p < 0.05$.

3. RESULTS

3.1 Socio-demographic characteristics of respondents

All the 144 questionnaires administered were retrieved and analyzed. The ages of the respondents ranged from 18 to 57 years (mean = 32.1 ± 7.4 years), and majority of them were aged 20 – 39 years (81.2%), females (59.0%) and married (65.3%). Most of the respondents were Muslims (77.1%), community health extension workers (CHEWs) and nurses/midwives (71.5%), and majority of respondents have practiced for 5 years and above (55.6%) as shown in Table 1.

3.2 Respondents' knowledge of hand hygiene

One hundred and thirty-two (91.7%) of the 144 respondents had good knowledge of hand hygiene. A majority of the respondents (74.3%) knew hand hygiene to mean washing hand with soap and water or sanitizer before and after touching a patient; and most of them (89.6%) knew that it should be done consistently. Majority of respondents knew the materials needed for hand hygiene and the moments to observe it. However, about a third of respondents (31.9%) had the misconception that hand washing should be done before touching patients' files. Most of the respondents also knew the hazards of a contaminated hand (93.1%) and the benefits of observing proper hand hygiene (97.9%) as shown in Table 2. There was no association between good knowledge of hand hygiene and any of the respondents' socio-demographic variables.

3.3 Respondents' attitude to hand hygiene

Most of the respondents demonstrated positive attitude to hand hygiene. Most of them would attend workshop/training on hand hygiene (95.1%), and would advise their colleagues to do so (94.4%). Most of them believed it is important to observe hand hygiene before and after touching a patient (93.1%), and would advise their colleagues to observe same (93.1%). Majority of respondents (65.3%) believed there is need to wash hand with soap and water even if one has used a sanitizer (Table 3).

3.4 Respondents' hand hygiene practices

One hundred and thirty-nine (96.5%) of the 144 respondents reported observing hand hygiene practices; of these, only two-thirds, 97 (69.8%) do so consistently. Majority of respondents (87.8%) reported observing hand hygiene practices before and after attending to patients; and the most commonly used materials were soap, water and sanitizers (71.3%). Although, less than a half of the respondents (44.6%) observe hand hygiene practices before putting on gloves, most of them (93.5%) do so after removing gloves (Table 4). The main reasons cited for not observing hand hygiene practices consistently were unavailability of soap (88.1%) and irregular water supply (51.0%) as shown in Table 5.

4. DISCUSSION

The respondents in this study were of a relatively young population with a mean age of 32.1 ± 7.4 years, and majority of them (81.2%) were between the ages of 20 and 39 years. This could be due to the fact that close to half of them (44.4%) were newly recruited and have spent less than 5 years in service. While this compares well with the age distribution of respondents in another study conducted in Nigeria [12], in which majority of respondents were aged 25 to 34 years with a mean age of 31.3 ± 6.8 years, it differs from the finding in another study conducted in Ghana, that reported a much younger population, with majority of respondents between the ages of 20 and 29 years [23].

Majority of the respondents in this study (59.0%) were females, this could be due to the fact that community health extension workers (CHEW), and nurses/midwives constitute a majority of respondents (71.5%), and these professions are generally considered to be women professions. Most of the respondents in this study (91.7%) demonstrated good knowledge of hand hygiene. This finding is in consonance with the findings in studies conducted in tertiary healthcare facilities situated in urban areas including Lagos University Teaching Hospital, Lagos, Nigeria [12], and a Multispecialty Hospital in India [22] that reported 83.0% and 90.0% prevalence of good knowledge of hand hygiene respectively. The good knowledge of hand hygiene among most of the respondents in this study and other studies conducted in different populations across Nigeria could be due to the mass awareness campaign on hand hygiene that was carried out across the country following the recent outbreak of Ebola Virus Disease. Reports from studies conducted in different populations across Nigeria showed significant improvement in knowledge and practice of hand hygiene after the outbreak as compared to before the outbreak [30,31].

Most of the respondents in this study showed positive attitude towards hand hygiene as they were willing to attend training workshop on hand hygiene (95.1%), and also encourage their colleagues to do so (94.4%). They also considered observing hand hygiene before and after touching a patient to be important (93.1%) and would advise their colleagues to do so (93.1%). These findings compare well with the findings in studies conducted in Nigeria, Egypt and Italy, that reported 96.7%, 96.0% and 86.2% prevalence of positive attitude towards hand hygiene respectively [10,12,20].

Although, an overwhelming majority of the respondents in this study (96.5%) observed hand hygiene practices, only about two-thirds (69.8%) do so consistently; and this is similar to the 67% prevalence of compliance with hand hygiene practices reported in another study conducted in Ghana [23]. The barriers to compliance with good hand hygiene practices included unavailability of soap (88.1%), and lack of constant water supply (51.0%). Similar obstacles to the practice of hand hygiene were also reported in the study conducted in Ghana [23]. These findings corroborate the submission by the World Health Organization on the appalling state of water, sanitation and hygiene (WASH) services in health care facilities in low- and middle income countries [32], and they re-emphasizes the need for governments and other stakeholders to make provision of adequate water and materials for sanitation and hygiene in the health care facilities a top priority.

5. Limitation of the study

The main limitation in this study is deliberate misinformation by the study subjects regarding their hand hygiene practices, as the data obtained was based on self-reported practices instead of direct observation.

229 6. Conclusion

230 Although, knowledge, attitude and practice of hand hygiene was good among the
231 respondents in this study, unavailability of soap and lack of constant water supply remain
232 major constraints. Government and other stakeholders should provide adequate water, and
233 materials for sanitation and hygiene in the healthcare facilities.
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235 236 COMPETING INTERESTS

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238 Authors have declared that no competing interests exist.
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240 REFERENCES

- 241 1. World Health Organization (WHO). WHO Guidelines on Hand Hygiene in Health
242 Care. Geneva, Switzerland: WHO 2009. Available at:
243 https://www.who.int/publications/2009/978924159797906_eng.pdf
244
- 245 2. Allegranzi B, Pittet D. Role of hand hygiene in health care associated Infection
246 prevention. J Hosp Infect 2009; 73(4): 305-15.
247
- 248 3. Mathai AS, George SE, Abraham J. Efficacy of multi-model interventional strategy in
249 improving hand hygiene compliance in tertiary level intensive care unit. Indian J
250 Critical Care Med 2011; 15(1): 6-15.
- 251 4. Pittet D, Allegranzi B, Storr J, Bagheri NS, Dziekan G, Leotsakos A, et al. Infection
252 control as a major WHO priority for developing countries. J Hosp Infect 2008;
253 68(4):285-92.
- 254 5. Dumpis U, Balode A, Vigante D, Narbutė I, Valinteliene R, Pirags V, et al.
255 Prevalence of nosocomial infection in two Latvian hospital. Euro Surveill 2003; 8(3):
256 73-78.
- 257 6. Tschudin SS, Pargger H, Widmer AF. Hand hygiene in the intensive care unit. Crit
258 Care Med 2010; 38(8 Suppl): S299-305.
- 259 7. Azzam R, Dramaix M. A one day prevalence survey of hospital-acquired infections
260 in Lebanon. J Hosp Infect 2001; 49(1): 74-78.
- 261 8. Ansari SK, Gupta P, Jais M, Nangia S, Gogo S, Satia S et al. Assessment of
262 knowledge, attitude and practices regarding hand hygiene amongst the health care
263 workers in a tertiary health care centre. Int J Pharm Res Health Sci 2015; 3(3): 720-
264 726.
- 265 9. Gilbert K, Stafford C, Crosby K, Fleming E, Gaynes R. Does hand hygiene
266 compliance among health care workers change when patients are in contact
267 precaution rooms in ICUs? . Am J Infect Control 2010; 38(7): 515-7.
- 268 10. Nobile CG, Mantuori P, Diaco E, Villari P. Healthcare personnel and hand
269 decontamination in intensive care units: knowledge, attitude and behavior in Italy. J
270 Hosp Infect 2002; 51(3): 226-32.
- 271 11. Pittet D. Improving adherence to hand hygiene practice: a multidisciplinary
272 approach. Emerg Infect Dis 2011; 7(2): 234-40.
- 273 12. Ekwere TA, Okafor IP. Hand hygiene knowledge and practices among health care
274 providers in a tertiary hospital, South-west Nigeria. Int J Infect Control 2011; 9(4): 1-
275 10.
- 276 13. Rumgay S, Macdonald S, Robertson CE. Hand washing pattern and infection control
277 in the accident/emergency department. Arch Emerg Med 1984; 1(3): 157-159.
- 278 14. Gould DJ, Moralejo D, Drey N, Chudleigh JH. Interventions to improve hand hygiene
279 compliance in patient care. Cochrane Database Syst Rev 2010;(9): CD005186.

- 280 15. Shinde MB, Mohita V. A study to assess knowledge, attitude and practices of five
281 moments of hand hygiene among nursing staff and students at a tertiary care
282 hospital at Karad. *Intl J Sci Res* 2014; 3(2): 311-321.
- 283 16. Karabay O, Sencan I, Sahin I, Alpteker H, Ozcan A, Oksuz S. Compliance and
284 efficacy of hand-rubbing during in-hospital practice. *Med Prin Pract* 2005; 14(5):
285 313-317.
- 286 17. Akyol AD. Hand hygiene among nurses in Turkey: opinions and practices. *J Clin*
287 *Nurs* 2007; 16(3): 431-437.
- 288 18. Ogunsola FT, Adesiji YO. Comparison of four methods of hand washing in situations
289 of inadequate water supply. *W Afr J Med* 2008; 27(1): 24-28.
- 290 19. Hugonnet S, Perneger TV, Pittet D. Alcohol – based hand rub improves compliance
291 with hand hygiene in intensive care units. *Arch Intern Med* 2002; 162(9): 1037-43.
- 292 20. Abd Elaziz KM, Bakr IM. Assessment of knowledge attitude and practice of hand-
293 washing among healthcare workers in Ain Shams University hospitals Cairo. *J Prev*
294 *Med Hyg* 2009; 50(1): 19-25.
- 295 21. Alex-Hart BA, Opara PO. Hand-washing practices amongst health workers in a
296 teaching hospital. *Am J Infect Dis* 2011; 7(1): 8-15.
- 297 22. Sharma R, Sharma M, Koushal V. Hand washing compliance among healthcare
298 staff in intensive care unit of a Multispecialty hospital of north India. *J Hosp Adm*
299 2012; 1(2):27- 33.
- 300 23. Amissah I, Salia S, Craymah JP. A study to assess hand hygiene knowledge and
301 practice among health care workers in a teaching hospital in Ghana. *Intl J Sci Res*
302 2006; 5(8): 301-307.
- 303 24. Okojie C, Shimeles A. Inequality in sub-Saharan Africa: a synthesis of recent
304 research on the levels, trends, effects and determinants of inequality in its different
305 dimensions. London, UK: The Inter-Regional Inequality Facility; 2006. Available at:
306 <https://www.equintafrica.org/>
- 307 25. Tobi KU, Enyi-Nwafor K. Hand washing practices and compliance among healthcare
308 workers in the intensive care unit of a teaching hospital in Nigeria. *Nig Med Pract*
309 2013; 63(4). Available at: <https://www.ajol.info/index.php/nmp/article/view/93830>
- 310 26. Bello S, Effa EE, Okokon EO, Oduwole OA. Hand washing practice among
311 healthcare providers in a teaching hospital in southern Nigeria. *Int J Infect Control*
312 2013; 9(4): 1-7.
- 313 27. Ibrahim T. Research methodology and dissertation writing for the health and allied
314 health professionals. Abuja: Cress Global links Ltd; 2009.
- 315 28. Anargh V, Singh H, Kulkarni A, Kotwal A, Mahen H. Hand hygiene practices among
316 healthcare workers (HCWs) in a tertiary care facility in Pune. *Med J Armed Forces*
317 *India* 2013; 69(1): 54-56.
- 318 29. Besha B, Gyche H, Chare D, Amare A, Kassahun A, Kebede E et al. Assessment of
319 hand washing practices and its associated factors among First Cycle Primary School
320 children in Arba Minch town, Ethiopia, 2015. *Epidemiology (Sunnyvale)* 2016; 6:
321 247. Doi: 10.4172/2161-1165.1000247.
- 322 30. Ilesanmi OS, Ajele FO. The effect of Ebola Virus Disease outbreak on hand washing
323 among secondary school students in Ondo State, Nigeria, October 2014. *Pan Afr*
324 *Med J* 2015; 22(Suppl1): 24.doi: 10.11694/pamj.supp2015.22.1.6614.
- 325 31. CPPA. Study on the Ebola Virus Disease (EVD): knowledge, attitudes and practices
326 of Nigerians in Lagos State. Lagos, Nigeria: Center for Public Policy Alternatives;
327 2014. Available at: [https://www.cpparesearch.org/wp-](https://www.cpparesearch.org/wp-content/uploads/2015/01/Knowledge-Attitude-Practice-of-Nigerians-on-the-EVD-Survey-Report-2014.pdf)
328 [content/uploads/2015/01/Knowledge-Attitude-Practice-of-Nigerians-on-the-](https://www.cpparesearch.org/wp-content/uploads/2015/01/Knowledge-Attitude-Practice-of-Nigerians-on-the-EVD-Survey-Report-2014.pdf)
329 [EVD Survey-Report 2014.pdf](https://www.cpparesearch.org/wp-content/uploads/2015/01/Knowledge-Attitude-Practice-of-Nigerians-on-the-EVD-Survey-Report-2014.pdf)
- 330 32. World Health Organization / United Nations' Children's Fund. Water, sanitation and
331 hygiene in healthcare facilities: status in low- and middle income countries and the
332 way forward. Geneva, Switzerland: WHO/UNICEF 2017. Available at:

333 [https://www.who.int/water_sanitation_health/publications/wash-health-care-](https://www.who.int/water_sanitation_health/publications/wash-health-care-facilities/en/)
334 [facilities/en/](https://www.who.int/water_sanitation_health/publications/wash-health-care-facilities/en/)
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338 **Tables**

339 Table 1 : Socio-demographic characteristics of respondents

340 Table 2 : Respondents' knowledge of hand hygiene

341 Table 3 : Respondents' attitude to hand hygiene

342 Table 4 : Respondents' hand hygiene practices

343 Table 5 : Reasons for not observing hand hygiene practices consistently
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352 **Table 1: Socio-demographic characteristics of respondents**

Variables	Frequency (%) (n = 144)
Age group (in years)	
Below 20	3 (2.1)
20 -29	53 (36.8)
30-39	64 (44.4)
40-49	20 (13.9)
50 and above	4 (2.8)
Sex	
Male	59 (41.0)
Female	85 (59.0)
Marital status	
Single	41 (28.5)
Married	94 (65.3)
Separated	5 (3.5)
Widowed	4 (2.8)
Religion	
Islam	111 (77.1)
Christianity	33 (22.9)
Cadre	
Doctor	19 (13.2)
Nurse/Midwife	49 (34.0)
Laboratory scientist	14 (9.7)
Community Health Extension Worker	54 (37.5)
Pharmacist	8 (5.6)
Working experience (in years)	
Below 5 years	64 (44.4)
5 years and above	80 (55.6)

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Table 2: Respondents' knowledge of hand hygiene

Variables	Correct response Frequency (%) (n = 144)
Meaning of hand hygiene	
Wash hand with soap and water or sanitizer before and after touching a patient	107 (74.3)
When to observe hand hygiene	
Always before and after touching a patient	129 (89.6)
Materials that are needed for hand hygiene	
Constant water supply	
Soap	95 (66.0)
Hand sanitizer	140 (97.2)
Hand gloves	123 (85.4)
	124 (86.1)
Moments to observe hand washing	
Before touching a patient	131 (91.0)
After body fluid exposure risk	131 (91.0)
After touching a patient	135 (93.8)
Before touching patient files	46 (31.9)
After touching patient surrounding	137 (95.1)
Contaminated hand can be a vehicle for transmitting infection between healthcare providers to patients	134 (93.1)
Proper hand hygiene can protect both the healthcare provider and the patient from contracting disease	141 (97.9)
Knowledge grade	
Good	132 (91.7)
Poor	12 (8.3)

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370 **Table 3: Respondents' attitude to hand hygiene**

Variables	Frequency (%) (n = 144)
Would attend a workshop/training on hand hygiene if invited	137 (95.1)
Would advise colleagues to attend workshop/training on hand hygiene if invited	136 (94.4)
Believed it is important to observe hand hygiene before and after touching a patient	134 (93.1)
Would advise colleagues to observe hand hygiene before and after touching a patient	134 (93.1)
Believed there is need to wash hand with soap and water even if one has used a sanitizer	94 (65.3)

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407 **Table 4: Respondents' hand hygiene practices**

Variables	Frequency (%)
Observe hand hygiene practices while attending to patients (n = 144)	
Yes	139 (96.5)
No	5 (3.5)
How often hand hygiene is observed (n = 139)	
Always	97 (69.8)
Occasionally	42 (30.2)
When hand hygiene is observed (n = 139)	
Before attending to patient only	8 (5.8)
After attending to patient only	9 (6.4)
Before and after attending to patient	122 (87.8)
Materials used for hand hygiene (n = 139)	
Water only	2 (1.4)
Water and soap	21 (15.1)
Hand sanitizer only	17 (12.2)
Water, soap and sanitizer	99 (71.3)
Observe hand hygiene before putting on gloves (n = 139)	
Yes	62 (44.6)
No	77 (55.2)
Observe hand hygiene after removing gloves (n = 139)	
Yes	130 (93.5)
No	9 (6.5)

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411 **Table 5: Reasons for not observing hand hygiene practices consistently**

*Reason(s)	Frequency (%) (n = 42)
Irregular water supply	20 (51.0)
Inconveniently located sink	11 (26.2)
Unavailability of hand sanitizer	17 (40.5)
Unavailability of soap	37 (88.1)

412 *Multiple responses allowed

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