



## Predictors of Compliance with The ‘Five Key Moments’ For Hand Hygiene among Healthcare Providers in Public Healthcare Settings in South-South Nigeria

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### ABSTRACT

**Background:** Despite the well-recognized role of hand hygiene in the prevention of healthcare associated infections, the rate of compliance with hand hygiene among healthcare providers remains poor in Nigeria. **Objective:** To assess the predictors of compliance with hand hygiene among healthcare providers in south-south Nigeria. **Methods:** A cross-sectional study design with prospective covert observation of compliance with hand hygiene was employed to assess the hand hygiene compliance among 565 healthcare providers. Data was collected using a self-administered semi-structured questionnaire and an observation checklist. Descriptive and inferential analyses of data collected were carried out using the IBM SPSS version 22 software. **Results:** The covertly observed and self-reported compliance rates were 18.6% and 16.9% respectively. The rates of compliance with hand hygiene observed for ‘after blood and body fluids exposure’ (50.7 %) and ‘before aseptic procedures’ (30.7%) were relatively higher than compliance rates observed for the other moments for hand hygiene. Adequate knowledge of hand hygiene (AOR = 2.70; 95% CI: 1.60 – 4.58), in-service training on IPC (AOR = 2.31; 95% CI: 1.45 – 3.67) and good perception of the risk of acquiring HCAs (AOR = 1.69; 95% CI: 1.04 – 2.77) were predictors of compliance with hand hygiene. **Conclusion:** The study brings to the fore the low rates of covertly observed and self-reported compliance with hand hygiene among the study participants. There is need for the management of the selected health facilities to stimulate and motivate healthcare providers to improve their compliance with hand hygiene.

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### INTRODUCTION

Persons with infections or carriers of pathogenic microorganisms admitted to hospital are the potential sources of health care associated infections (HCAIs) for other patients and healthcare providers.<sup>1</sup> In sub-Saharan Africa, an estimated 40 % of HCAIs are said to be caused by hand contamination;<sup>2</sup> while

in Nigeria, the estimates reported from studies ranges from 12.3 % to 45.8 %.<sup>3</sup> Approximately 20–30 % of HCAIs are considered to be preventable by intensive hand hygiene practice.<sup>4</sup> Evidence from a clinical study has revealed that the rates of HCAI were halved when compliance with hand hygiene among healthcare providers reached 70%.<sup>5</sup> The World Health

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Organization (WHO) has continued to emphasize the importance of hand hygiene practices among healthcare providers as a way of preventing HCAs and has recommended five key moments in which hand hygiene is to be observed by healthcare providers.<sup>4</sup> Despite the well-recognized role of hand hygiene in the prevention of HCAs, the rates of compliance with hand hygiene among healthcare providers remains poor in Nigeria.<sup>6,7</sup> A good understanding of the predictors of compliance with the WHO's recommended five key moments for hand hygiene among healthcare providers will guide the establishment of an infection prevention and control programme to improve healthcare providers' compliance with hand hygiene during patients care. This study was conducted to assess the predictors of compliance with hand hygiene among healthcare providers in south-south Nigeria.

## METHOD

The study was carried out from June 2015 to January 2016 and in three randomly selected public health facilities providing specialist healthcare situated in Warri north, Sapele and Ethiope west local government areas (LGAs) respectively in Delta State, south-south Nigeria.

The study employed a cross-sectional study design with prospective covert observation of compliance with hand hygiene among 565 healthcare providers (doctors, nurses/midwives, health assistants, and final year medical and nursing students).

A suitable sample size calculation formula for cross-sectional study was used to determine the minimum sample size based on the compliance rate of 57.0% for hand hygiene reported among healthcare providers from a previous study,<sup>8</sup> an error margin (precision corresponding to effect size) of 5 % and standard normal variate at 95% confidence level (5 % type 1 error i.e.,  $P < 0.05$ ). The determined minimum sample size was 318; however, 565 participants were selected for the study to increase the validity of findings.

A multi-stage sampling technique (three stages) was employed in this study. In the first stage, a simple random sampling technique (balloting) was used to randomly select three public health facilities (Central hospital, Warri; Central Hospital, Sapele; and Delta State University Teaching Hospital, Oghara) from a sample frame of six public health facilities (two

tertiary and four secondary) providing specialist health care in Delta State. The Central hospital, Warri and Central Hospital, Sapele situated in Warri north and Sapele LGAs respectively are secondary health facilities; while the Delta State University Teaching Hospital, Oghara situated in Ethiope west LGA is a tertiary health facility.

In the second stage, health care providers in the three selected public health facilities were proportionately allocated into different strata by professional category and in the third stage a simple random sampling technique using a table of random numbers was used to select study participants from a list of healthcare providers in each stratum.

Data was collected using a pre-tested self-administered semi-structured questionnaire adapted from the WHO hand hygiene guide and an observation checklist. The questionnaire comprised of 4 sections which elicited information on socio-demographic characteristics, knowledge (key moments, steps and standard time for hand washing), self-reported compliance with hand hygiene practices, and perception of the risk of acquiring HCAs. The observation checklist was used for the prospective covert observations of healthcare providers' compliance with hand hygiene during the process of patient care in the wards (surgical, medical, paediatrics, and gynaecology), accident and emergency units and out-patient clinics in the three randomly selected public health facilities. The healthcare providers were covertly observed with regards to their compliance with the five key moments for hand hygiene/washing recommended by WHO viz:- (i) before patient contact (ii) before an aseptic procedure (iii) following exposure to blood and body fluid (iv) after patient contact and (v) after contact with patient surroundings. The covert observations were carried out daily (morning sessions between 8.30 hours and 10.30 hours; and evening sessions between 17.00 hours and 19.00 hours) by six doctors trained for the study (not considered intrusive and largely ignored) over a period of twelve weeks.

The primary outcome variable was compliance with hand hygiene (self-reported and covertly observed). Self-reported compliance with the five key moments for hand hygiene was assessed with 5 questions on a 4-Likert scale (never, only if obviously contaminated, sometimes, always). Each correct response (always)

was scored one and every wrong response (never, only if obviously contaminated, sometimes) was scored zero. There was therefore a maximum of 5 points on the compliance with hand hygiene. A score of 4 to 5 points was categorised as good compliance, while a score of 0 to 3 points was categorised as poor compliance.

The secondary outcome variables were (i) in-service training status on infection prevention and control (IPC), (ii) knowledge of hand hygiene and (iii) perception of the risk of acquiring HCAs.

The infection prevention and control (IPC) training status was recorded using a binary scale (yes, no); while the knowledge of hand hygiene/washing was assessed with 10 questions on a 3-Likert scale (yes, no, not sure). Each correct response was scored one and every wrong response was scored zero. There was therefore a maximum of 10 points on the knowledge of hand hygiene/washing. A score of 7 to 10 points was categorised as adequate knowledge, while a score of 0 to 6 points was categorised as inadequate knowledge. The perception of the risk of HCAs via hands was assessed with two (2) questions on a 3-Likert scale (agree, disagree, indifferent). Each correct response was scored one and every wrong response was scored zero. There was therefore a maximum of 2 points on the perception of the risk of risk of acquiring HCAs via hands. A score of 2 points was categorised as good perception, while a score of 0 to 1 point was categorised as poor perception.

### Statistical analyses

Descriptive and inferential analysis of data collected was carried out using the IBM SPSS version 22 software. Continuous variables were summarized as means ( $\pm$  standard deviation) while categorical variables were summarized as frequencies and percentages (summarized data were presented in tables and figures). Bivariate and multivariate analysis using Pearson's chi-square and binary logistic regression respectively was carried out. The 95 % confidence intervals (CI) and p-values obtained was reported in two tail form and statistical significance determined at p-value less than 0.05. The binary logistic regression was performed to identify predictors of the outcome variable of interest (occupational exposures to blood and body fluids). All variables significant during bivariate analysis using Pearson's chi-square at a p-value  $<$  0.2 were

introduced in the regression model to obtain the

**Table 1: Socio-demographic characteristics of the study participants**

Variables	Categories	Frequency (%) N=565
Age (years)	21-30	231 (40.9)
	31-40	219 (38.8)
	41-50	89 (15.8)
	51-60	26 (4.6)
Sex	Male	208 (36.8)
	Female	357 (63.2)
Marital status	Married	305(54.0)
	Not married	260 (46.0)
	Doctors	211 (37.3)
Profession	Nurses/Midwives	165 (29.2)
	Others	189 (33.5)
Department	Surgical	225 (39.8)
	Non-surgical	340 (60.2)
Years of experience	< 6	314 (55.5)
	6-10	119 (21.1)
	>10	132 (23.4)

Mean age = 33.0  $\pm$  7.7; Mean years of experience= 7.5  $\pm$  5.7; \*Others (health assistants, and final year medical and nursing students)

adjusted odds ratio (AOR) of each factor on the outcome variable at 95 % confidence interval.

## RESULTS

The socio-demographic characteristics of the study participants reveal that 208 (36.8%) were males and 357 (63.2%) were females. The age range of the study participants was 20 to 65 years with mean age of 33.0  $\pm$  7.7 years. The highest proportion of study participants across the different categories reveal that 231 (40.9%) were in the age category 31-40 years, 305 (54.0%) were married, 211 (37.3 %) were doctors, 340 (60.2%) worked in a non-surgical unit and 314 (55.5%) had less than 6 years of working experience. The mean years of working experience among the study participants was 7.5  $\pm$  5.7 years (Table 1).

A total of 5218 opportunities for hand hygiene during patient care were covertly observed (Table 2). The covertly observed compliance rate was comparable with the self-reported rates of compliance with hand hygiene (Figure 1). The covertly observed rates of compliance with hand hygiene for 'after blood and body fluids exposure' (50.7 %) and 'before aseptic procedures' (30.7 %) were relatively higher than the

observed rates of compliance with hand hygiene for  
**Table 2: Covert observation of compliance with hand hygiene among the study population**

Variables	Categories	No. of opportunities	Yes (%)
Key moments for hand hygiene	Before patient contact	1833	90 (4.9)
	Before an aseptic procedure	374	115 (30.7)
	After exposure to blood and body fluids	416	211 (50.7)
	After patient contact	1966	521 (26.5)
	After contact with patient surroundings	629	34 (5.4)
	Total	5218	971 (18.6)
Mode of hand hygiene	Water only	5218	1159 (22.2)
	Water and soap	5218	3960 (75.9)
	Alcohol-based hand rub	5218	99 (1.9)

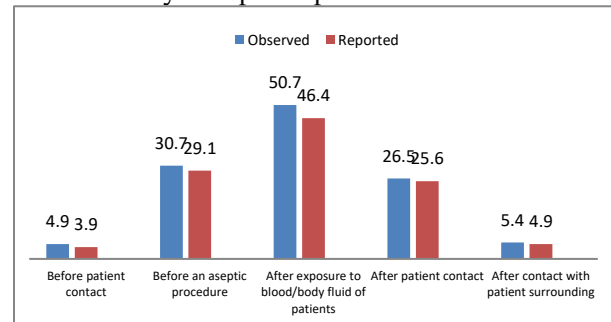
**Table 3: Self-reported compliance with hand hygiene and training status on infection prevention and control (IPC) among the study population**

Variables	Categories	Frequency (%) (N=565)
Key moments for hand hygiene	Before patient contact	220 (3.9)
	Before an aseptic procedure	165 (29.1)
	After exposure to blood and body fluids	262 (46.4)
	After patient contact	145 (25.6)
	After contact with patient surroundings	28 (4.9)
*Status of self-reported compliance with hand hygiene	Good compliance	96 (16.9)
	Poor compliance	469 (83.1)
In-service training on IPC	Yes	202 (35.8)
	No	363 (64.2)

\*Composite compliance

‘after contact with patient surroundings’ (5.4 %) and ‘before patient contact’ (4.9 %). The mode of hand hygiene reveals that in 1.9 %, 22.2 % and 75.9 % of the covertly observed opportunities for hand hygiene,

the study participants used alcohol



**Figure 1: Covertly observed and self-reported compliance with hand hygiene**

hand rub, water only, and soap and water respectively. The overall self-reported rate of compliance with hand hygiene among the study participants was 16.9 % (Table 3). Nurses had the highest rate of self-reported compliance with hand hygiene (32.7 %) while the rates of self-reported compliance with hand hygiene among doctors and other health providers were 13.3% and 7.4 % respectively (Table 6).

The bivariate analysis revealed a significant association ( $p < 0.05$ ) of profession, years of experience, knowledge of hand hygiene, in-service training on IPC and perception of the risk of acquiring HCAs with self-reported compliance with hand hygiene (Table 6). The multivariate analysis revealed that the study participants with adequate knowledge of hand hygiene (AOR = 2.70; 95 % CI: 1.60 - 4.58) had a three-fold higher likelihood of being compliant with hand hygiene (Table 6); while those who had received in-service training on IPC (AOR = 2.31; 95 % CI: 1.45 - 3.67), and had good perception of the risk of acquiring HCAs (AOR = 1.69; 95 % CI: 1.04 - 2.77) had two-fold higher likelihood respectively of being compliant with hand hygiene (Table 6).

**DISCUSSION**

Providing healthcare for patients consist of series of activities during which the hands of healthcare providers touch their patients, patients’ blood or body fluids and things in patients’ surroundings. Each contact is a potential source of contamination for the healthcare providers' hands.<sup>1</sup> Hand hygiene is therefore a fundamental action that prevents the transmission of healthcare associated pathogens from healthcare providers to their patients, themselves or other healthcare providers.<sup>9-11</sup>

The self-reported and covertly observed compliance rate with hand hygiene among the study participants was low. These compliance rates were comparatively lower than the reported rates of compliance with hand hygiene from previous studies conducted in Nigeria (22.9 %-51.5 %),<sup>12</sup> Ghana (9.2 % to 57.0 %),<sup>8</sup>

Indonesia (20.0 %),<sup>13</sup> Kuwait (33.4 %),<sup>14</sup> and Saudi Arabia (50.3 %).<sup>15</sup> The difference in the rates of compliance with hand hygiene recorded in this study compared to the previous studies may be linked to the level of knowledge and attitude of the participants, their level of training and the implementation of

**Table 4: Knowledge related to hand washing among the study population**

Variables	Categories	Frequency (%) (N=565)
Knowledge of the action to be perform during the different steps in hand washing	Action performed during the first step	162 (28.7)
	Action performed during the second step	118 (20.9)
	Action performed during the third step	109 (19.3)
	Action performed during the fourth step	116 (20.5)
	Action performed during the fifth step	121 (21.4)
	Action performed during the sixth step	118 (20.9)
Knowledge of the recommended duration for hand washing	Yes	134 (23.7)
	No	431 (76.3)
Knowledge of the five key moments recommended for hand washing	Yes	139 (24.6)
	No	426 (75.4)
Knowledge that the tip and pulp of fingers are most frequently missed in hand washing	Yes	54 (9.6)
	No	511 (90.4)
Knowledge that alcohol hand gel should not be used during outbreaks of vomiting and diarrhoea	Yes	118 (20.9)
	No	447 (79.1)
Knowledge that alcohol hand gel are only effective on visibly clean hands	Yes	348 (61.6)
	No	217 (38.4)
*Level of knowledge related to hand washing	Adequate	99 (17.5)
	Inadequate	466 (82.5)

*\*Composite knowledge*

infection prevention and control policy in the study locations. The rates of compliance with hand hygiene observed for 'after blood and body fluids exposure' and 'before aseptic procedures' were relatively higher than the rates of compliance with hand hygiene observed for 'after contact with patient surroundings' and 'before patient contact'. This observation is in keeping with findings from previous studies among healthcare providers.<sup>16,17</sup> The rate of compliance with hand hygiene observed for 'after patient contact' was relatively higher than the rate of compliance with hand hygiene observed for 'before patient contact'. This observation is also in keeping with findings from

previous studies conducted in Uganda, Germany and Indonesia which have reported relatively lower rates of compliance with hand hygiene observed for 'before patient contact' among healthcare providers.<sup>10,17-19</sup> Despite the WHO recommendations on alcohol based hand rubs for hand antisepsis based on its intrinsic advantages of fast acting and broad spectrum microbicidal activity,<sup>20</sup> the practice of hand hygiene using alcohol hand rub in this study was poor. The practice of hand hygiene using only water observed among the study participants in over a fifth of the opportunities for hand hygiene is also a worrisome development considering the fact that evidence from

studies have shown that the hands of healthcare providers are a potent vehicle for the transmission of healthcare associated pathogens in the healthcare setting.<sup>1</sup> An inadequate level of knowledge with regards to hand hygiene, poor perception of the risk of acquiring HCAs and a poor status of in-service training on infection prevention and control were respectively observed among the study participants. Adequate knowledge and regular in-service training on infection prevention and control had been strongly linked with higher compliance with hand hygiene among health-care providers in the health care setting.<sup>17,19,20</sup> In addition, studies have shown that compliance with hand hygiene among healthcare providers improved moderately after hand hygiene interventions.<sup>6,7,21</sup> Analysis of the study variables revealed that adequate level of knowledge with regards to hand hygiene and good perception of the risk of acquiring HCAs were the predictors of

compliance with hand hygiene among the study participants.

**Table 5: Perception of the risk of health care associated infections (HCAs) via hand among the study population**

Variables	Categories	Frequency (%) (N=565)
Your hands could likely be a vehicle for the transmission of HCAs to patients	Agree	92 (16.3)
	Disagree	179 (31.7)
	Indifferent	271 (48.0)
You can likely acquire HCAs via your hands	Agree	90 (15.9)
	Disagree	166 (29.4)
	Indifferent	309 (54.7)
*Perception of risk HCAs	Good	88 (15.6)
	Poor	477 (84.4)

\*Composite perception

**Table 6: Predictors of self-reported compliance with hand hygiene**

Variables	Categories	Compliance with HH (N=565)		Bivariate Analysis $\chi^2$ (p value)	Regression Analysis AOR (95% C.I.)
		Yes (%) n=96 (16.9)	No (%) n=469 (83.1)		
Age (years)	21-30	37 (16.0)	194 (84.0)	2.147 (0.542)	-
	31-40	43 (19.6)	176 (80.4)		
	41-50	13 (14.6)	76 (85.4)		
	51-60	3 (11.5)	23 (88.5)		
Sex	Male	31 (14.9)	177 (85.1)	1.017 (0.313)	-
	Female	65 (18.2)	292 (81.8)		
Marital status	Married	50 (16.4)	255 (83.6)	0.317 (0.576)	-
	Not married	46(17.7)	214 (82.3)		
Profession	Doctors	28 (13.3)	183 (86.7)	42.631 (< 0.001)	0.672 (0.334 - 1.412)
	Nurses/Midwives	54 (32.7)	111 (67.3)		0.546 (0.323 - 1.123)
	*Others	14 (7.4)	175 (92.6)		1
Department	Surgical	43 (19.1)	182 (80.1)	1.194 (0.275)	-
	Non-surgical	53 (15.6)	287 (84.4)		
Years of experience	< 6	49 (15.6)	265 (84.4)	6.423 (0.034)	0.824 (0.424 - 1.633)
	6-10	30 (25.2)	89 (74.8)		0.564 (0.324 - 1.442)
	>10	17 (12.9)	115 (87.1)		1
Training on IPC	Yes	45 (22.3)	157 (77.7)	6.2 (0.013)	2.313 (1.532 - 3.714)
	No	51 (10.9)	312 (89.1)		1
Knowledge of HH	Adequate	43 (43.4)	56 (56.6)	21.610 (< 0.001)	2.701 (1.623 - 4.624)
	Inadequate	53 (11.4)	413 (88.6)		1
Perception of risk HCAI	Good	30 (34.1)	58 (65.9)	3.216 (0.050)	1.691 (1.014 - 2.834)
	Poor	66 (13.8)	411(86.2)		1

\*Others (health assistants, and final year medical and nursing students)

## CONCLUSION

This study brings to the fore the low rates of covertly observed and self-reported compliance with hand

hygiene among the study participants. There is need to stimulate and motivate them to improve their compliance with hand hygiene practices. The benefits of hand hygiene in the prevention of HCAs needs to

be re-emphasized to all healthcare providers and appropriate enforcement steps should be taken in the selected health facilities. This can be achieved by the management of the selected health facilities via the institution of an IPC program to provide initial and continuing education for healthcare providers on the WHO's recommended key moments for hand hygiene in the healthcare setting.

### **Ethical considerations**

Ethical approval for the study was obtained from the Health Research and Ethics committee of the Delta State University Teaching Hospital, Oghara. Institutional consent was also obtained from the management of the three selected public health facilities where the study was conducted. Written informed consent was obtained from all the study participants prior to the administration of the study questionnaire and they were assured of the confidentiality of any information obtained from them. Participation was voluntary and the right of individuals to refuse participation in the study was duly respected.

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### **Conflict of interest**

The authors declare that there is no conflict of interest

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### **Authors' contributions**

The conception, design, drafting of the research work, analysis and interpretation of the data were done by PGO; while NSA, MTO and EA were involved in the training of data collectors, data collection and analysis. PGO wrote the initial draft of the manuscript and all the authors participated in its finalization. All authors read and approved the final manuscript.

### **REFERENCES**

1. Pittet D, Donaldson L. Clean care is safer care: the first global challenge of the WHO world alliance for patient safety. *Infect Control Hosp Epidemiol.* 2005; 26 (11):891-894
2. Khan HA, Ahmad A, Mehboob R. Nosocomial infections and their control strategies. *Asian Pacific Journal of Tropical Biomedicine,* 2015; 5: 509-514.
3. Kesah CN, Egri-Okwaji MT, Iroha E, Odugbemi TO. Aerobic bacterial nosocomial infections in paediatric surgical patients at a tertiary health institution in Lagos, Nigeria. *Niger Postgrad Med J.* 2004; 11: 4-9
4. WHO guidelines on hand hygiene in health care. World Health Organization, Geneva. Available at: <https://www.who.int/gpsc/5may/tools/9789241597906/en/>. Accessed June 15, 2017
5. Tacconelli E, MA Cataldo, De Angelis G, Falcone M, Frank U, Kahlmeter G et al. ESCMID guidelines for the management of the infection control measures to reduce transmission of multidrug-resistant Gram-negative bacteria in hospitalized patients. *Clinical Microbiology and Infection,* 2014; 20 (1s): 1-55.
6. Uneke CJ, Ndukwe CD, Oyibo PG, Nwakpu KO, Nnabu RC, & Prasopa-Plaizier N. Assessment of Health Workers' Knowledge, Perception and Compliance Following a World Health Organisation Multimodal Hand Hygiene Intervention Campaign in a Nigerian Teaching Hospital. *African Journal of Tropical Medicine and Biomedical Research,* 2012; 1 (4): 18-28
7. Uneke CJ, Ndukwe CD, Oyibo PG, Nwakpua KO, Nnabub RC, Prasopa-Plaizier N. Promotion of hand hygiene strengthening initiative in a Nigerian teaching hospital: implication for improved patient safety in low-income health facilities. *Brazilian Journal of Infectious Diseases,* 2014; 18 (1): 21-27
8. Yawson AE, Hesse AA. Hand hygiene practices and resources in a teaching hospital in Ghana. *J Infect Dev Ctries,* 2013; 7: 338 - 347
9. Pittet D, Hugonnet S, Harbarth S, Mourouga P, Sauvan V, Touveneau S. Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. *Infection Control Programme. Lancet,* 2000; 356 (9238): 1307-1312.
10. Pittet D. Improving compliance with hand hygiene in hospitals. *Infect Control Hosp Epidemiol,* 2000; 21: 381-6
11. Harris AD, Samore MH, Nafziger R, Dirosario K, Roghmann MC, Carmeli Y. A survey on hand washing practices and opinions of healthcare workers. *J Hosp Infect,* 2000; 45:318-21
12. Brisbane SFA, Ordinioha B, Gbeneolol PK. Knowledge, attitude and infection control practices of two tertiary hospitals in Port Harcourt, Nigeria. *Nigerian Journal of Clinical Practice,* 2014; 17 (6): 691-695
13. Marjaedi B, McLaws ML. Hand hygiene in rural Indonesian health care workers: barriers beyond sinks, handrubs and in-service training. *J Hosp Infect,* 2010; 76 (3):256-260
14. Al-wazzan B, Salmeen Y, Al-Amiri E, Abul A, Bouhaimed M, Al Taiar A. Hand hygiene practices among nursing staff in public secondary care hospitals in Kuwait: self-report and direct observation. *Med Princ Pract,* 2011; 20 (4): 326-331

15. Bukhari SZ, Hussain WM, Banjar A, Almainani WH, Karima TM, Fatani MI. Hand hygiene compliance rate among health care professionals. *Saudi Med J*, 2011; 32 (5): 515-519
16. Randle J, Arthur A, Vaughan N, Twenty-four-hour observational study of hospital hand hygiene compliance. *J Hosp Infect*, 2010; 76 (3): 252-255
17. Sethi AK, Acher CW, Kirenga B, Mead S, Donskey CJ, Katamba A. Infection control knowledge, attitudes, and practices among healthcare workers at Mulago Hospital, Kampala, Uganda. *Infect Control Hosp Epidemiol*, 2012; 33 (9): 917-923
18. Scheithauer S, Oberrohrmann A, Haefner H, Kopp R, Schurholz T, Engels A, Lemmen SW. Compliance with hand hygiene in patients with methicillin-resistant *Staphylococcus aureus* and extended-spectrum B-lactamase-producing enterobacteria. *J Hosp Infect*, 2010; 76 (4): 320-323
19. Peter W, Christine KN, Esther B, Sheba NG, Patrick A, Fred N. Implementation of infection control in health facilities in Arua district, Uganda: a cross-sectional study. *BMC Infect Dis*. 2015; 15: 268.
20. Veena M, Navin CMk, Vijay KR, Sanjay KG, Amod B, Rituja K. A study to assess knowledge and attitude regarding hand hygiene amongst residents and nursing staff in a tertiary health care setting of Bhopal City. *J Clin Diagn Res*. 2014; 8 (8): DCo4-DCo7
21. Kingston L, O'Connell N H, Dunne C P. Hand hygiene-related clinical trials reported since 2010: a systematic review. *Journal of Hospital Infection*, 2016; 92 (4): 309-320.

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