

Predictors of Compliance with Recommended Hand Hygiene Practices Among Healthcare Workers in Specialist Hospitals of Kano, Northwest Nigeria

Ibrahim UM¹, Ibrahim RJ²

ABSTRACT

Background: Compliance with recommended hand hygiene practice among healthcare providers is important in the prevention of morbidity and mortality associated with hospital acquired infections including drug resistant microorganisms. **Objective:** This study determined the predictors of compliance with recommended hand hygiene practices among healthcare workers in specialist hospitals of Kano metropolis, Northwest Nigeria. **Method:** World Health Organization recommended observation checklist for hand hygiene compliance and Key Informant Interviews involving members of Infection Prevention and Control teams of the two selected hospitals were used to collect data using two staged and purposive sampling techniques respectively. Quantitative data from the observation checklist was analyzed at univariate, bivariate and multivariate levels using SPSS version 22 while verbatim transcripts from qualitative interviews were analyzed using thematic framework analysis. **Results:** The overall compliance with hand hygiene was (42.4%). Use of alcohol based hand rub and soap and water constituted (26.7%) and (15.7%) respectively. Statistically significant association was found between type of the ward ($P<0.001$), Professional cadre ($P<0.001$), indication for hand hygiene ($P<0.001$), time of the day ($P<0.05$) and compliance with hand hygiene. Key Informant Interviews revealed lack of materials needed for hand hygiene to be associated with non-compliance. Working in medical ward and being a doctor were associated with 86% increased likelihood of compliance with recommended hand hygiene practice {AOR=0.14, 95% CI= (0.0-.4)}. Similarly, contact with patients' surrounding/environment was associated with four fold increased likelihood of compliance with hand hygiene { AOR= 3.7, 95% CI= (2.7-5.0)}, further, evening and night shifts were associated with 2 folds increased likelihood of compliance with hand hygiene than morning shift { AOR=2.0, 95% CI=(1.0-3.7)}. **Conclusion:** Compliance with recommended hand hygiene practices was not encouraging and may pose significant risk of hospital acquired infection. Therefore, Hospital management should ensure the existence of functional infection prevention and control team, regular training and re-training of healthcare workers.

Key words: Compliance, hand hygiene, practice, healthcare workers

Corresponding Author:

Dr. Ibrahim UM
Department of Community Medicine, Aminu
Kano Teaching Hospital,
PMB 3452 Kano State, Nigeria.
Email: usmanmi2000@gmail.com +2348032112497

¹Department of Community Medicine, Aminu Kano Teaching Hospital, Kano State, Nigeria.

²Department of Community Medicine, Bayero University and Aminu Kano Teaching Hospital, Kano State Nigeria.

Introduction

It was estimated that at any point in time, more than 1.4 million people worldwide suffer from infections acquired in hospitals. In developed countries, between 5% and 10% of patients acquire one or more infections and

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15%–40% of patients admitted to critical care are thought to be affected. In resource-poor settings, rates of infection can exceed 20%, and more research are needed to assess the burden of disease in developing and transitional countries.^{1,2}

Most of the infections acquired in the hospitals can be prevented through a simple precautionary measure of proper hand hygiene. Unfortunately, compliance with the hand hygiene guidelines provided by the WHO is usually poor among healthcare workers, and the materials needed for hand hygiene are not readily available.¹⁻³

In England, up to 8.2% of patients admitted to hospital develop healthcare associated infections causing 5,000 deaths and cost £930 million annually and such infections annually account for 37 000 attributable deaths in Europe.⁴⁻⁶ In the United States, an estimated 5% of patients develop health care associated infections, at a cost of 4.5 billion USD per year.^{4,5} This translates to an estimated two million cases of healthcare associated infections per annum, accounting for nearly 100,000 deaths. In Canada, an estimated 220,000 healthcare associated infections occur each year, with 8,000 related deaths. Although hand hygiene has long been regarded as the most effective preventive measure, studies over the past few decades have demonstrated that compliance with hand hygiene recommendations is poor and interventions are not effective.⁴⁻⁶

Hand hygiene is regarded as one of the most important elements of infection control, keeping hands clean is an important way to prevent the spread of infections and is a core element of patient safety for the prevention of health care associated infections and spread of antimicrobial resistance, its promotion therefore represents a challenge that requires a multimodal strategy. It is the simple, most

effective measure for preventing hospital acquired infections. However, the importance of this easy procedure is not sufficiently acknowledged by healthcare workers, i.e. doctors, nurses and other medical professionals.^{7,8} Poor compliance have been repeatedly documented far below expected and the problem signifies that promotion and practice of hand hygiene within hospitals is lacking.⁷⁻⁹

Assessment of hand hygiene technique is rarely incorporated into research studies and often poorly supervised by assigned members of Infection Prevention and Control Teams to ensure compliance.^{10,11} To be effective, efforts should be put in place to improve compliance with hand hygiene guidelines and these must be multifaceted incorporating cognitive, emotional and behavioral aspects and should include increasing the availability and accessibility of all the necessary facilities.¹⁰⁻¹² In order to provide health care workers, hospital administrators and health authorities with the best scientific evidence and recommendations to improve practices and reduce health care-associated infections, WHO has developed Guidelines on Hand Hygiene in Health Care and recommended that all hospitals should have infection surveillance and control programs including hand hygiene by employees and visitors, which should be acknowledged by the federal government and hospital accrediting organizations.¹⁰⁻¹³

There is paucity of data on compliance of healthcare workers with recommended hand hygiene practices globally including, Northwestern Nigeria with no available literature on studies that assessed hand hygiene compliance among healthcare workers and therefore conducting this study can provide information on the level of



compliance with recommended hand hygiene practices among healthcare workers and also identify the facilitators and barriers associated with hand hygiene practices. Data obtained can be used by policy makers in addressing the barriers and possibly coming up with policy and legislations that can promote compliance with recommended hand hygiene practices. This can also serve as a foundation for future interventional studies to improve hand hygiene compliance there by reducing the burden of nosocomial infections.

Materials and Methods

Study area

Murtala Muhammad Specialist Hospital(MMSH) located within the ancient city walls of Kano, was established in 1927, with a capacity of 16 beds at that time. As at November 2017, there were 800 medical professionals working at the hospital, this number include all health workers and exclude the non-health workers that are administrative staff, cleaners and attendants. The Hospital currently has 250 beds and has 20 departments, the largest being the department of medicine. There is high patients turn over far exceeding the required healthcare providers to patient ratio. This is partly because MMSH serves as a referral center not only for the state but also for some parts of Northern Nigeria and neighboring Niger republic.

Hasiya Bayero Paediatrics Hospital is a Paediatrics Specialist Hospital that was established in 1990 and has the following units: Immunization clinic, Antiretroviral treatment clinic, Sickle cell clinic, Paediatrics ward for in patients, Pharmaceutical unit, Pathology unit, X-ray room, Emergency Paediatrics unit and Paediatrics outpatient section with medical doctors and nurses. The clinics run from Monday to Friday and sees

an average number of patients ranging from 1357-1780 per week i.e approximately (271-356 per day).

Study design

The study used a cross-sectional descriptive study that utilized mixed methods-sequential explanatory (Quantitative and qualitative) methods of data collection. The methods complemented each other and aided data triangulation

Study population

Observation for hand hygiene

All the health care workers in Murtala Muhammad Specialist Hospital and Hasiya Bayero Pediatrics Hospital involved in the care of in-patients. However, Staff on annual and maternity leave who did not return to work throughout the period of data collection were excluded from the study.

Key Informant Interviews

Healthcare workers identified by the hospital management to be members of Infection Prevention and Control team of the hospital and not transferred out of the hospital during data collection were interviewed.

Sample size estimation

Observation for hand hygiene action

Total of 384 observations for hand hygiene actions during services delivery by healthcare workers was determined using an appropriate formula for estimating minimum sample size for descriptive studies.¹⁴

$$n = \frac{Z^2 pq}{d^2}$$

Standard normal deviate (z) 1.96 at 95% confidence interval and margin of error (d) 0.05 and prevalence (p) of 65.3% (compliance rate) from previous study conducted in Nigerian Teaching Hospital,¹⁵ a possible loss or incomplete observation form, 10% was used to compute the number of observations for hand hygiene that were used to assess hand hygiene compliance.



Key Informant Interview (KII)

Six (6) KII (Three in each of the selected hospitals) were conducted

Sampling technique

Two staged sampling technique was used for the selection of the hospitals in which, 2 out of the 8 specialist hospitals within Kano metropolis were selected.

Observation for hand hygiene

In the first stage, the list of all the Specialist Hospitals in the Metropolis was obtained from Kano Hospital Management Board from which Murtala Muhammad specialist Hospital (MMSH) and Hasiya Bayero Pediatrics Hospital (HBPH) were selected by balloting.

In the second stage, the list of all the clinical departments was obtained from each of the selected hospitals management from which the clinical departments were sorted out and 7 out of the 26 wards of MMSH were selected by balloting, however, were merged into 4 based on the specialty as (Medicine, Surgery, Pediatrics, Obstetrics and Gynecology and Accident and emergency) while 3 out of the 5 wards (Oral rehydration therapy ward, Children medical ward A and Children medical ward C) were randomly selected by balloting.

The number of hand hygiene opportunities were equally allocated to obtain 192 hand hygiene opportunities in the two selected health facilities, however, a total of 434 observations were conducted.

Hand hygiene opportunities to be observed were equally allocated across the selected wards, 28 per ward in the 7 selected wards of MMSH making up 196 hand hygiene opportunities and 65 per ward in the 3 selected wards of HBPH making up 195 opportunities, however, a total of 434 observations were conducted.

Hand hygiene actions observed in Pediatrics unit of MMSH were merged with that observed in HBPH to make up the total hand hygiene opportunities in the pediatric ward. Three categories of healthcare workers were observed (Doctors, nurses and CHEWS), differentiated by the type of their duty uniform.

They were selected for the observation, because they are the ones providing direct care to the patients in the hospitals. Hand hygiene opportunities to be observed among the three professions/cadres were proportionately allocated in the two hospitals based on total number of healthcare workers per cadre.

All the selected professional categories of healthcare workers were observed during various shifts for compliance with hand hygiene in the selected wards until the required sample was obtained.

Key Informant Interview

Six Key Informant Interviews, three in each of the two hospitals involving members of Infection Prevention and Control Team were purposively conducted.

Instrument and methods of data collection**Observation for hand hygiene action**

A pre-tested observation form adopted from World Health organization technical reference manual (WHO) was used to collect data on hand hygiene actions among the healthcare workers while providing healthcare services to the patients.¹⁶ The Observation checklist was pretested in Muhammad Abdullahi Wase Specialist Hospital Kano.

Data was collected by eight trained (both qualitative and observation/quantitative arm) medical officers working with sepsis incidence, determinants and outcome in Kano. They were trained on the objectives of the



study, how to blind the healthcare workers during observation and how to appropriately fill the WHO observation checklist. Observation was conducted without the healthcare workers' knowledge that they were being observed during provision of health care to minimize the Hawthorne effect and was based on the professional cadre. To blind the healthcare workers, the research assistants worked as healthcare workers and participated in the provision of services to the patients.

The observation form consisted of two sections: A header and the corresponding grid.

Header

This was for precise recording of location where observation for hand hygiene was conducted in terms of time and place (setting, date, session duration and the observer identification) including ward and department. Locating the observation in time allows the period of evaluation to be defined and dated.¹⁶

Indicating the time when a session begins and ends allows its duration to be defined and compliance to be evaluated in relation to the intensity of hand hygiene opportunities during a given time.¹⁶ By inserting the initials of the observer in the Observation form, indicated that it has been checked before being returned. It also enabled data to be verified and any evidence of bias on the part of the observer be identified. Each session was allocated a number to indicate that during analysis. The page number was entered if more than one form was used during a single session of observation.¹⁶

Grid

The observation grid was used for collection of data needed to measure compliance. It was divided into four columns. The first column was dedicated to doctors, the second column

was dedicated to nurses/midwives and the third column was dedicated to Community Health Extension Workers.¹⁶ Each column was independent of the other columns and the arrangement of the data was not made to be the same in each column dedicated to different professional categories. It depends on the number of opportunities observed for each professional category.¹⁶

Each column contained eight boxes. Each box corresponds to an opportunity where the indications and the positive or negative actions observed were entered. The square box in the form (\square) means that no item was exclusive (if several items applied to the opportunity, they were all marked); the circle (O) means that a single item applied to the opportunity and indicated negative hand hygiene actions (zero action) as well as information on glove use were also be recorded.¹⁶

The grid employed the following abbreviations for the five hand hygiene indications: bef pat: (before touching a patient), bef. asept (before clean/aseptic procedure), aft.b.f: (after body fluid exposure risk), aft.pat (after touching a patient) and aft.p.surr (after touching patient surroundings).

Also included were HR: hand rubbing with an alcohol-based formulation and HW: hand washing with soap and water.¹⁶ Glove use was only recorded when the health-care professional under observation was wearing gloves at the time an opportunity occurred and does not perform a hand hygiene action. Each form was checked immediately after the observation session and the end time, duration of session and signed appropriately.

Key Informant Interview Guide

Key Informant Interview guide adapted from previous study was used to collect qualitative



data from the members of Infection Prevention and Control teams of the two hospitals; ¹⁷the guide was used for the KII after collecting and analyzing data from quantitative arm of the study.

The interviews were conducted among six members of infection prevention and control teams, three members each in the two hospitals. Perception, opinion, and factors associated with compliance with recommended hand hygiene practice were explored.

The KII was conducted in English and aimed to triangulate and explain the quantitative/observation findings for hand hygiene action.

Data management and analysis

Observation for hand hygiene action

Data was analyzed using IBM SPSS Statistics for Windows; Version 22. Categorical variables were presented as frequencies and percentages. The dependent/outcome variable is compliance with recommended hand hygiene (hand rubbing/hand washing with soap and water) while the independent variables include professional cadre, department, time of the day and days of the week among others.

Compliance with Hand hygiene: Healthcare workers that washed hands with soap and water or used alcohol based hand rub for hand rubbing following any of the five WHO recommended indications for hand hygiene were considered to have positive hand hygiene actions while those that either missed to observe or used hand gloves as a substitute to hand hygiene were considered to have negative hand hygiene action. Compliance was assessed as the ratio of positive hand hygiene action to total hand hygiene opportunities observed (positive and negative hand hygiene actions) multiplied by hundred.¹⁶Chi square test was used to test for

significant association between categorical variables and compared proportions in two or more groups. A p-value of ≤ 0.05 was considered significant. Bonferroni correction was conducted to minimize type 1 error by dividing per analysis alpha rate by the number of statistical analysis performed and a p-value of 0.008 was obtained which is lower than 0.05. Logistic regression was used to adjust for confounders. The criteria for inclusion of variable into the logistic regression model were "apriori variable", variables significant on bivariate analysis, and a $p \leq 0.1$ for variables that were not significant in bivariate analysis. Adjusted Odds Ratio with 95% confidence interval was used to determine the strength of the association.

Key Informant Interview

Interviews were conducted in English. Tape recordings from the (Key Informant interviews) were transcribed verbatim including pauses and interruptions, then merged together with the field notes and analyzed. The transcripts were coded and analyzed using thematic analysis.

Cleaned and transcribed data were reviewed and each interview comments were labeled, quotes for each KII were coded and identification of emerging themes was done. Coding was done in three stages. In the first stage, codes ascribed to relevant quotes were identified (open coding). Secondly, these coded items were grouped into categories (axial coding) and then themes were identified (selective coding). All connected themes in the data were thoroughly reviewed, organized and interpreted then triangulated with results of the observation for hand hygiene compliance.

Ethical considerations

Ethical approval was obtained from Health Research Ethics Committee of Kano State



Ministry of Health with approval number of MOH/OFF/797/II/731 dated 1st June, 2018 and advocacy visit was conducted to the management of the two hospitals and the heads of the selected units. Data was collected from May, 2018 to August 2018, and the two hospitals were presented with the study protocol. All the healthcare workers were communicated including those who were temporarily away, through their respective unit heads by the hospital management after presenting the approval letter from Kano State Health Research Ethics Committee and were informed of the conduct of observation for hand hygiene without knowing that they are being observed. Healthcare workers were given one week to make decision taking into consideration that some are on different shift or leave and maybe back during data collection. In all the units, all the healthcare workers consented to be observed after which the hospitals issued a written permission to conduct the study. All the principles of research ethics were respected throughout the study.

Results

Healthcare workers' compliance with recommended hand hygiene practice
The overall compliance with recommended hand hygiene practice was found to be 184 (42.4%). About two-fifths of hand hygiene opportunities observed 170(39%) were conducted among doctors while providing healthcare to the patients. Up to one quarter 112(25.8%) of hand hygiene indications observed were before conducting aseptic procedures by the healthcare providers. More than half 258(59.5%) of the hand hygiene opportunities observed were conducted in the Pediatrics ward. Gloves were used as a substitute to hand rubbing or hand washing

by more than a quarter 141(32.7%) of the respondents as shown in table1 above.

Working in surgical ward was significantly associated (53.5%, $p<0.001$) with hand rubbing using alcohol based hand rub. Doctors were found to significantly (49.9%, $p<0.001$) practice hand rubbing when indicated than nurses or CHEWS. Hand rubbing was found to be significantly higher (61.3%, $p<0.001$) and (27.8%, $p=0.002$) after contact with body fluid and after official closing hours respectively as shown in table 2 below.

Working in medical ward and being a doctor were associated with 86% increased likelihood of compliance with recommended hand hygiene practice {AOR=0.14, 95% CI=(0.0-.4)}. Similarly, contact with patients surrounding as associated with four folds increased likelihood of compliance with hand hygiene { AOR= 3.7, 95% CI= (2.7-5.0)}, further, evening and night shifts were associated with 2 folds increased likelihood of compliance with hand hygiene than morning shift { AOR=2.0, 95% CI=(1.0-3.7)} as shown in table 3 below

Perception of Infection Prevention and Control Team members on hand hygiene
SIX KII were conducted, three each among members of Infection Prevention and Control Teams of the two hospitals. The Key Informant interviews revealed the following: All the Key Informants Interviewed narrated the importance of hand hygiene in the prevention of Hospital acquired infections and is the major reason for observing hand hygiene in the hospital. One of the informant said that " Hand hygiene is important because if not practiced, the healthcare worker can get any form of infection from patients and can transmit it to other patients in addition to his family members and co-workers"



The informants did not know the complete recommended WHO five moments of hand hygiene even though all were in agreement of observing hand hygiene after contact with body fluid and after contact with patients, a narration by one of the informants was "Touching patient's surrounding is not a necessary indication for observing hand hygiene because not all patient's environment is contaminated and so the decision to practice hand hygiene depends on if the patient's surrounding is physically soiled. In addition, not all aseptic procedures for example injection requires hand hygiene before doing by the healthcare workers"

All the key informants agreed that hand hygiene should be part of the activities of all the healthcare workers but narrated that hand hygiene should be better practiced specifically when you are managing some patients with obvious conditions that can result in the transmission of infections especially patients with open wounds.

When asked the time that compliance with recommended hand hygiene by the healthcare workers will ensure safety of the patients, all the informants agreed with hand hygiene before patient's contact and after touching patients. Information given by one of the informants was: "Ensure hand hygiene before touching a patient and dry the hands using clean towel and if no clean towel available, ensure that the hands are air dried then wear gloves, perform what you want to do and then discard the gloves appropriately and wash your hands again. Drying hands after washing with their clothes or lab coat is not good at all"

All the Key Informants narrated that hand hygiene after touching patients is the key in preventing healthcare workers from getting infected in the hospital.

While one of the informants reported using alcohol based hands rub frequently especially after seeing every patient, the others narrated that alcohol based hand rub should be used after washing hands with soap and water. The other informants narrated that "We do not have sanitizer now, we use to have two forms of sanitizer and have not been available for the past two years and therefore we use either soap and water or detergent to observe hand hygiene"

When asked to compare hand washing with soap and water and using alcohol based hand rub for hand hygiene among healthcare workers, they all agreed on the importance of all the methods and one of the informants said: "Is very important to use sanitizer because in the first place your hands will dry off quickly and has up to 90% chances of killing the microorganisms that can be transferred to another patients during services delivery"

The informants gave different responses when asked about hand hygiene practice in the situation that gloves were worn as follows:

"Hand gloves do not give 100% protection and even if you touch water while wearing gloves, you can see some water in the gloves and therefore hand should be washed after gloves removal in addition to washing before wearing the gloves and allowing it to dry up "

"After using hand gloves, there is need for hand hygiene. You need to wash your hands so as to reduce the powder and also hands should be washed before wearing gloves because you may forget that you have touched patient's card or folder"

When asked about compliance of other healthcare workers with recommended hand hygiene practice, they also responded differently as follows:



"Compliance with hand hygiene is significantly low honestly because of the healthcare worker's attitude and lack of materials required for hand hygiene"

"No materials required for hand hygiene therefore healthcare workers do not abide with hand hygiene as required"

"They use to comply with hand hygiene; you came from Emergency Pediatrics Unit and am sure you have seen them wearing gloves"

The informants reported that compliance by other healthcare workers with hand hygiene has a positive impact on them in preventing them from getting infected by the healthcare workers because of the interaction during provision of services to patients. One of them explained that:

"It helps me and gives me a lot of encouragement to observe hand hygiene because if I see a staff washing his hands will serve as a reminder for me to wash mine in case I forgot to do so"

When asked what the informants will do in situations where by other healthcare worker was seen not observing hand hygiene when indicated observing hand hygiene wrongly, the following responses were given:

"Enlighten the person on the importance of hand hygiene in the prevention of infection to himself and his family"

"Will teach him the right way to practice hand hygiene and we use to call them for hand hygiene training but the last time was more than one year ago"

"You enlighten those that forgot or did not observe hand hygiene and doing it frequently will make others not observing hand hygiene to start"

The informants reported the following opinions if surveillance system for hand hygiene is implemented in their facilities:

"It will help significantly especially if other non-governmental Organization came in but

basically is beyond providing materials required for hand hygiene"

"It will help in changing the behavior of healthcare workers but after rigorous training"

"Will help in reducing hospital acquired infections, improve working conditions and improve confidence of the patients in the services provided to them in addition to ensuring compliance by healthcare workers"

When asked to mention barriers associated with non-compliance with recommended hand hygiene practice by the healthcare workers the following were narrated:

"Healthcare workers use to forget to observe hand hygiene due to high work load, lack of water, sanitizer and poor knowledge of hand hygiene"

"Attitude is not a problem because some healthcare workers use to come with their sanitizer from home and some use to come to me and request for sanitizer or soap but because of non-availability is a serious problem"

"Poorly located wash hand basin, soap and sanitizer. If there is no wash hand basin close by, healthcare workers will forget to observe hand hygiene.

Water is available but not located in appropriate places to access and poor attitude by some healthcare workers is another problem"

The Key Informants suggested the following in addition to providing to providing materials needed for hand hygiene as methods to remove the barriers:

"Regular training especially training of trainers so that they can regularly step down the training to other healthcare workers"

"Employ more healthcare workers, training on hand hygiene because some healthcare workers do not know the benefits of hand hygiene and implications of non-compliance"



“Provision of posters on hand hygiene that will promote hand hygiene”

When asked if the Hospitals have infection prevention and control policy, all the respondents mentioned that no policy is in place but have members of infection prevention and control teams though not fully functional. One of the informants explained that:

" Infection prevention and control team was put in place in our facility in 2014 during

Ebola virus haemorrhagic fever outbreak. I am currently the only member of infection prevention and control team remaining in the hospital out of the 6 members because all the others were transferred from the hospital and the team is yet to be formed again. We have no policy on hand hygiene but selected departments had posters promoting hand hygiene pasted during Ebola epidemics"

Table 1 Variables observed for hand hygiene compliance assessment

Variables	Frequency (n=434)	Percentage (%)
Profession		
Doctors	170	39.0
Nurses	154	36.0
CHEWS	110	25.0
Ward		
Medical	49	11.3
Pediatrics	258	59.5
Surgery	43	9.9
Accident and Emergency	49	11.3
Obstetrics and Gynecology	35	8.0
Indications for hand hygiene		
Before patient contact	78	18.0
Before aseptic procedure	112	25.8
After contact with body fluid	75	17.3
After contact with patient	108	24.9
After contact with patient surrounding	61	14.0
Hand hygiene actions		
Hand rubbing(alcohol based hand rub)	116	26.7
Hand washing (soap and water)	68	15.7
Missed	108	24.9
Gloves	142	32.7



Table 2 Factors associated with compliance with recommended hand hygiene practices

Variables	Hand rubbing	Hand washing	Missed	Gloves	χ^2	p-value
Hospital						
MMSH	64(29)	39(18)	51(23)	67(30)		
HBPH	52(24.4)	29(13.6)	57(26.8)	75(35.2)	3.4	0.341
Ward						
Medical	17(34.7)	19(38.7)	9(18.4)	4(8.2)		
Pediatrics	53(20.5)	30(11.6)	76(29.5)	99(38.4)		
Surgical	23(53.5)	4(9.3)	5(11.6)	11(25.6)	69.9	0.000*
A&E	15(30.6)	14(28.6)	8(16.3)	12(24.5)		
O&G	8(22.9)	1(2.9)	10(28.5)	16(45.7)		
Profession						
Doctors	73(49.9)	14(8.2)	45(26.5)	38(22.4)		
Nurses	33(21.4)	12(7.8)	51(33.1)	58(37.7)	101.3	0.000*
CHEWS	10(9.1)	42(38.2)	12(11)	46(41.7)		
Indication						
Before patient contact	13(16.7)	2(2.6)	16(20.5)	47(60.3)		
Before aseptic procedure	12(10.7)	10(8.9)	19(17)	71(63.4)	339	0.000*
After contact with body fluid	46(61.3)	10(13.3)	5(6.7)	14(18.7)		
After patient contact	39(36.1)	4(3.7)	60(55.5)	5(4.6)		
After touching patients surrounding	6(9.8)	42(68.9)	8(13.1)	5(8.2)		
Days of the week						
Monday to Friday	55(26.8)	27(13.2)	50(24.4)	73(35.6)	2.6	0.5
Saturday to Sunday	61(26.6)	41(17.9)	58(25.4)	69(30.1)		
Time of the day						
8am-4pm	64(25.9)	38(15.4)	48(19.4)	97(39.3)		
>4pm	52(27.8)	30(16)	60(32.1)	45(24.1)	14.5	0.002*

MMSH: Murtala Muhammad specialist Hospital

* Statistically significant

HBPH: Hasiya Bayero Paediatrics Hospital



Table 3 Predictors of compliance with recommended hand hygiene practice

Variables	Compliant with hand hygiene	AOR(95%CI)	p-value
Ward			
Medical	36 (73.4)		
Pediatrics	83 (32.2)		
Surgical	27 (62.8)	0.14(0.09-0.24)	<0.001*
A&E	29 (59.2)		
O&G	9 (25.7)		
Profession			
Doctors	87 (51.2)		
Nurses	56 (36.4)	0.14(0.09-0.24)	<0.001*
CHEWS	52 (47.3)		
Indication			
Before patient contact	15 (19.2)		
Before aseptic procedure	22 (19.6)	3.7(2.7-5.0)	<0.001*
After contact with body fluid	56 (75.0)		
After patient contact	43 (39.8)		
After touching patients surrounding	48 (78.7)		
Time of the day			
8am-4pm	102 (41.3)		
>4pm	82 (44.0)	1.95(1.0-3.7)	0.014*

MMSH: Murtala Muhammad specialist Hospital

* Statistically significant

HBPH: Hasiya Bayero Paediatrics Hospital
Interval

AOR: Adjusted Odds Ratio CI: Confidence



Discussion

The overall compliance with recommended hand hygiene practice that is either hand washing with soap and water or using alcohol based hand rub in this study was found to be (42.4%) with hand rubbing and hand washing constituting (26.7%) and (15.7%) respectively. This was lower than (90%) for hand washing with soap and water and 64% for alcohol based rubs) in a study conducted in Pune.¹⁸In the same vein, lower than the overall compliance of (50.3%) obtained from a study conducted in Saudi Arabia¹⁹ and in keeping with overall less than (50%) compliance with recommended hand hygiene practice from a study conducted in Karad.²⁰ Similarly, the finding is in agreement with key informants' narratives who were unable to correctly mention the WHO recommended 5- moments of hand hygiene. These findings may be associated with hospital acquired infections due to non-compliance with recommended hand hygiene practice during in patient care and requires remarkable improvement especially link to the fact that members of infection prevention and control team should be at the forefront of hand hygiene promotional activities including training of other healthcare workers.

Barriers noted to be associated with non-compliance with hand hygiene practice in this study from the key informant interviews were non-availability of water, high workload, non-availability of soap and alcohol based hand rub necessary for hand hygiene. This was in keeping with what was obtained by previous study conducted in Pune,¹⁸these barriers needs to be properly addressed and may be the reason for the limited compliance observed in this study and other developing countries. These barriers may be the reasons for missed hand hygiene action of up to 108 (24.9%) in this

study and posed a significant risk of acquiring and transmitting hospital acquired infections in addition to using gloves in up to 142(32.7%) hand hygiene opportunities observed as a substitute to hand hygiene and is not unlikely that a set of gloves may be used for different patients unchanged. However, the Key Informants emphasized the importance of hand hygiene before and after wearing hand gloves for patient's services though emphasized less on other indications for hand hygiene.

In addition, healthcare workers in medical ward had 86% likelihood of complying with recommended hand rubbing than other departments; this might be due to availability of hand hygiene consumables. Compliance with hand rub among doctors was higher than nurses (49.9%) and (21.4%) unlike what was obtained (28.6%) and (29.6%) respectively in a study conducted in New Delhi which was also less than 50%,²¹more so, doctors were found to have 86% increased likelihood of compliance with recommended hand hygiene practice, this may be related to differences in job description and resultant hand hygiene indications frequently seen and observed by different categories of healthcare workers. Similarly, touching patients surrounding was found to be associated with higher compliance, especially hand washing with soap and water, more so, compliance with hand rubbing and hand washing after patient contact was found to be low (39.8%) in contrast with (82.5%)found in a study conducted in south India.²²this may be due to general believe that patient's environments are contaminated and the possibility of healthcare workers having negative believe that stable patients with no physical evidence of disease, wound or other contagious diseases are unlikely to transmit infections as



corroborated by narratives of the key informants that were able to mention physical soiling as an indication for hand hygiene and could not mention the surrounding and other important indications for hand hygiene based on WHO

Recommendation.

This study being a cross-sectional study, was limited by inability to assess the availability of materials required for compliance with hand hygiene like soap and water, alcohol based hand rub among others prior to commencing data collection to assess compliance. However, the findings can serve as a foundation for intervention studies.

Conclusion and Recommendations

This study found the overall compliance with recommended hand hygiene practice to be 42.4%. Type of ward, professional category, indication for hand hygiene and time of the day were found to be independent predictors of compliance with recommended hand hygiene practice

Non availability of materials needed to observe hand hygiene, high patients load, and poorly located water source, negative healthcare workers' attitude towards hand hygiene including limited hand hygiene training were some of the barriers identified to negatively affect compliance with recommended hand hygiene base on the key informants' narration.

Government and the hospital management should ensure that these identified barriers to compliance with recommended hand hygiene practice are addressed. Accordingly, periodic assessment of compliance to recommended hand hygiene practices should be regularly conducted by properly trained infection prevention and control teams of the hospitals.

Departments and individuals should be graded, those with good scores be recognized to motivate others.

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