

ORIGINAL ARTICLE

Hand Hygiene Compliance during COVID-19 Pandemic among Neonatal Nurses in a Federal University Teaching Hospital in Nigeria

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ABSTRACT

Introduction: Compliance with Hand hygiene (HH) has been considered as a simple and the most efficient strategy to reduce hospital-acquired infections (HAIs). Compliance with this practice is not often assessed in Nigeria and thus posed a significant risk to the quality of care and patient safety and especially in this era of the COVID-19 pandemic. The study aimed to assess neonatal nurses' compliance to "my five moments for HH". **Method:** A cross-sectional observational study was carried out in a Nigerian federal hospital, using an adapted version of a standardized observational WHO tool of "my five moments of HH". A Chi-square test was employed to examine the relationship of HH compliance across units, shifts, and "my five moments for HH" opportunities. **Results:** The observer recorded 425 HH opportunities and the total HH compliance rate was (62.8%). There was no association between the units, working shifts, and nurses' HH compliance. Compliance to HH was dependent on the five moments of HH ($p < 0.000$), better compliance was seen after body fluid exposure (100%), followed by after newborn contact (86.3%), and after contact with newborn surroundings (63.4%), while compliance before newborn contact (28.5%), and before an aseptic procedure (9.1%) were poor. **Conclusion:** The findings of this study showed a significant gap with the HH compliance among neonatal nurses, suggesting multiple opportunities for neonatal infections despite the current awareness of HH in the Covid-19 pandemic. Hence, there is a need to intensify infection control practices in Nigeria, especially on HH practice.

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INTRODUCTION

Patient safety has received great attention from the World Health Organization (WHO) Alliance with a considerable goal towards decreasing the episodes of HAIs (1). Patient safety is geared at avoiding the preventable risks arising from the practice of healthcare workers. HAIs represent a double public health concern as these are preventable risks in healthcare facilities (2, 3). In order to improve patient's safety, several projects have been launched both at the national and international levels (4). The worldwide estimates, showed that HAIs affect over 1.4 million hospitalized patients with a substantial hospital burden and resultant death of 5,000 and 80,000 in the United Kingdom and

the United States (4, 5).

Hand hygiene (HH) is a simpler measure which is considered the most significant measure to limit antimicrobial-resistant pathogens transmission and subsequently the prevention of HAIs (6). This procedure is an important preventive strategy, especially during the COVID-19 pandemic. The result from the observation of healthcare workers HH compliance has been suboptimal and unacceptably poor over the years (7).

WHO has developed "my five moments for HH" guideline to ensure acceptable HH compliance by citing the critical moments when HH was required by the healthcare workers (HCWs) (2, 8). The guideline emphasized HH procedure before contact with a patient (moment 1), before performing an aseptic task (moment 2), after contact with patient body fluid (moment 3), after contact with the patient (moment 4), and after having contact with the patients care environment (moment

5). This method stipulates HCWs to clean their hands during clinical care to effectively interrupt the spread of HAIs (8). The “my five moments for HH” have been well defined by WHO as the opportunities to which HCWs must comply and the indication of HH is necessary at a given moment (8). A recent review on HH compliance in intensive care units showed a mean HH compliance rate of 59.6% with the neonatal unit having a compliance rate of 67.0% while in low-income countries the compliance rate was as low as 9.1% (9). However, observed rates of HH compliance have remained below the expected standard among healthcare providers (10). There was an element of ignorance among the HCWs despite the substantial evidence of HH effectiveness in reducing the spread of infection (11-12).

In developing countries, the problem of HAIs is unacceptably high (13) with Nigeria having the highest rate of neonatal mortality in Africa and the world (14-15). According to the report from the United Nations International Children’s Emergency Fund (UNICEF) 2015, regarding the state of the world’s children health, the infant and neonatal mortality rate in Nigeria are 74 and 37 per 1000 deaths, respectively. HH is a simple measure to curb the spread of HAIs including the current Covid-19 pandemic which has evidence of nosocomial infection spread (16). Therefore, improving healthcare workers (HCWs) HH compliance during patient care is urgently needed to reduce these deaths and ensure patients’ safety.

In most health care institutions in Nigeria, assessment of HH compliance practice among HCWs is not often monitored (17). Especially in the area of those caring for the vulnerable population such as neonates where the deaths are almost three times higher than the global target of 12 per 1000 (18). An intervention study in Nigeria (17) found that a post-intervention HH compliance rate was 65.3% while another found a lower compliance rate of 31% (19). Most studies from Nigeria have failed to look at this phenomenon despite following the WHO HH recommendation (20-21). To capture all the “my five moments for HH” indications and to allow for feedback at the point of an occurrence, direct HH observation has been recognised as a standardized tool of surveillance (22).

There has been no recent study in the country assessing compliance with the “my five moments for HH” during the COVID-19 pandemic among the nurses in Nigeria. Thus, the objectives of the study were to compare the perceived and observed compliance among nurses based on the survey result and the researcher’s observation. Finally, to observe the compliance to the “my five moments for HH” and to assess the relationship between observed compliance with the units involved, type of shifts and “my five moments for HH.”

MATERIALS AND METHODS

Study design

A cross-sectional observational research design was employed starting from 23rd November to 4th of December 2020.

Study area

The study took place in a tertiary hospital located in South-Eastern Nigeria, which has a capacity of over 720 patients and over 4,000 staff. The area of the study involved was the neonatal unit of this hospital, which has an intensive care unit (NICU) and a newborn unit. The neonatal intensive care unit has 5 incubators and 12 cots while the newborn unit has 11 incubators and 20 cots with a maximum capacity of 21-30 respectively during the peak period. During the study period, the bed capacity in NICU was exceeded with more than one neonate in one cot. The newborn unit has 477 while NICU has 325 hospitalized neonates per annum, respectively.

Hand hygiene resources

In this study centre, the newborn unit is made up of two halls with each having one sink with a hand wash located at the nurses’ station, while the neonatal intensive care unit is made up of one large hall with one sink and soap at the entrance. Based on the researcher’s observations, alcohol-based hand rub (ABHR) was available in both units. This was kept at a central place near the nurses’ table in NICU and not at the neonates’ bedside. Soap, running water, and ABHR were available throughout the period of the data collection, but no hand drying facilities were seen.

Sample size determination

A single mean proportion formula $N = (Z)^2(1-P)/\Delta^2$ was used to determine the study’s sample size for the perceived compliance. The required sample size is N , while the standard normal distribution Z is $= 1.96$, then $P =$ the proportion complying to HH, $1-P$ expected proportion who do not comply to HH, Δ degree of precision (0.05). Based on this formula the study estimated sample size for perceived compliance was 196 participants. Since the calculated sample size was larger than the population (35) of nurses working in these units, finite population correction factor was employed to achieve a statistically significant result. Therefore, the sample size was 30 nurses. The sample size for the observation was the percentages (%) of all HH observed based on WHO sample size determination. The study estimated a sample of 200 opportunities according to previous research (25-26) and WHO recommendation (25).

Inclusion/exclusion criteria

Participants included were registered neonatal nurses

who were stationed in NICU and newborn unit, with full-time employment and had spent a minimum of six months in neonatal units. We excluded students and internship nurses from the study.

Ethical approval

The study gained ethical approval from the federal university teaching hospital in Nigeria Human Research and Ethics Committee (REC/17/06/2020-20/08/2020) and the Universiti in Malaysia (USM/JEPeM/20070359).

Instrument for data collection

A pretested self-administered observation tool adapted from the WHO which was reworded to make the questions active with a five-point Likert scale was used with permission to collect data on nurses' perceived compliance to "my five moments for HH". The questionnaire had a good reliability with a Cronbach alpha of 0.93. The validity was determined by experts. The questionnaire comprises two sections: the sociodemographic section and the HH compliance section. The participants were asked to rate their HH practice ranging from always (5) to never (1). Observation of compliance to "my five moments for HH" was done using a standardized WHO's direct HH observation tool. Before conducting the observation, the researcher (CC) had undergone a WHO training module on healthcare-acquired infections and HH for HCWs (26). This was to standardize the researcher on the appropriate sequence when hands decontamination should be performed during the patients' care.

Data collection method

Before the data collection began, several visits were made by the researcher to the study site for over 3 weeks period to allow research participants familiarity with the presence of the researcher. This was performed to reduce the 'Hawthorn' effect. The researcher has been the clinical instructor from a local university, hence her acquaintance with the nurses. The researcher informed all the nurses in the neonatal unit about the study and invited them to participate. Nurses who agreed to participate were selected from a total population of 35 nurses using a convenient sampling method. The participants were given the information and consent form, which explained the study procedure. The HH observation questionnaires were distributed to nurses when the researcher felt the participants were less busy since the questionnaire needed to be completed and returned immediately. The researcher (CC) made herself available in the unit as an information provider and helped the participants to complete the questionnaire. The maximum time for each participant to complete the task was between 10-15 minutes.

HH practice by the nurses was observed using the WHO observational tool by the researcher during their direct contact with the neonates and their surroundings. The two wards were located on different floors whereby

NICU was located on the first floor while the newborn unit was on the third floor. The researcher performed the field observation of the nurses' HH activities and opportunities in each unit continuously for 5 days commencing from 8 am to 5 pm for both morning and afternoon shifts. All the opportunities observed were classified according to the five moments. Nurses' compliance and non-compliance to these moments of HH were recorded on the observation sheet. This study also differentiated between performing HH using (ABHR) or the use of traditional soap and water technique or a combination of both.

Statistical analysis

The researcher used SPSS version 26 (IBM SPSS Statistics) for data entry, cleaning, and analysis. The observed compliance was calculated in percentage, using the opportunity as the denominator i.e. to estimate the overall observed compliance rate this was done by calculating the number of times a HH action was done divided by the overall opportunities for HH that occurred during the observation multiplied by 100/1 based on the WHO tool (2). Descriptive statistics (frequency and percentages) was used to present nurses' perceived compliance, and to determine the overall compliance, compliance across units, shifts (morning and afternoon), and 'my five moments for HH". To determine if there was a relationship between observed compliance with the units involved, type of shifts, and "my five moments for HH" Chi-square test was employed.

RESULTS

The sociodemographic variables of nurses working in the neonatal units are shown in Table I. A response rate of 100% was received as all the 30 nurses who participated in the study filled and returned the questionnaire. The result showed that the participants had a mean age of 41.13 (7.673), the majority of the nurses were females (93.3%), and had completed a bachelor's degree (73.3%). The majority of the participants had less than 10 years of experience (50.0%) and (36.7%) had between 11-20 years of experience. Almost all the participants (96.7%) had a HH education and most of them had it during mandatory continuous professional development programme (MCPDP) (60.0%) while approximately one-fourth (23%) had it at the point of care. Among the participants, 40.0% had completed HH education in the past one year, (26.7%) in the past three years and (23.3%) in the past six months. All the participants (100%) agreed with the need for frequent HH education in the neonatal unit.

Table II presents the nurses perceived compliance with "my five moments for HH". Only the first responses were considered as compliance by the researchers (always 5), according to Infection Control Practices Advisory Committee (HICPAC) which states that HH should always be performed at the critical five moments (27).

Table I: Sociodemographic variables of participants (n=30)

Variables	Mean (SD)	n (%)
Age	41.13 (7.673)	
Sex		
Male		2 (6.7)
Female		28 (93.3)
Nursing category		
NO-SNO		16 (53.3)
PNO-ACNO		11 (36.7)
CNO-DNS		3 (10.0)
Highest level of education		
OND		8 (26.7)
BNSc		22 (73.3)
Years of experience		
1-10years		15 (50.0)
11-20years		11 (36.7)
>20years		4 (13.3)
Training on HH		
Yes		29 (96.7)
No		1 (3.3)
Types of HH education		
Point of care		7 (23.3)
MCPDP		18 (60.0)
Others		5 (13.3)
Last HH education		
Past six months		7 (23.3)
Past one year		12 (40.0)
Past three years		8 (26.7)
No HH		3 (10.0)

NO; nursing officer. SNO; senior nursing officer. PNO; principal nursing officer. CNO; chief nursing officer. DNS; director of the nursing service. OND; Ordinary National diploma. MCPDP; mandatory continuous professional development program

Table II: Self-reported compliance to “My five moments for HH” among nurses (n=30)

Variables	Compliance		Non-compliance	
	n	%	n	%
I wash my hands before patient contact	15	50.0%	15	50.0%
I wash my hands before an aseptic procedure	24	80.0%	6	20.0%
I wash my hands after body fluid contact	28	93.3%	2	6.7%
I wash my after contact with patient	25	83.3%	5	16.7%
I wash my hands after contact with patient care environment	20	66.7%	10	33.3%
I apply ABHR before patient contact	11	36.7%	19	63.3%
I apply ABHR before an aseptic procedure	16	53.3%	14	46.7
I apply ABHR after contact with patient	21	70.0%	9	30.0%
I apply ABHR after contact with patient care environment	20	66.7%	10	33.3%

ABHR: alcohol-based hand rub

Remarkably only 50.0% and 36.7% of the participants performed HH with soap and water or the application ABHR before patient care, respectively. Perceived compliance before an aseptic procedure with the use of soap and water or the application of ABHR were 80.0% and 53.3%, respectively. Perceived compliance was higher after body fluid exposure (93.3%). Nurses perceived compliance after contact with patients with the use of water and soap or the application of ABHR was 83.3% and 70.0 respectively, while perceived compliance of the nurses after contact with the patients' care environment were similar for HH with soap and water or the application of ABHR (66.7%).

A total of 425 hand opportunities were collected from 35 nurses working in neonatal units. This consisted of 202 and 223 opportunities for NICU and the newborn unit, respectively as shown in table III. The overall HH compliance among nurses in NICU and newborn was (62.8%). The newborn unit had a slightly higher compliance rate (64.6%) compared to the neonatal intensive care unit (NICU) (60.9%). Although this increase was not significant statistically ($p = 0.433$). For compliance according to working shifts, also showed some increased rate during the afternoon shift (65.9%) than the morning shift (60.8%) with a p-value of 0.287 which was not significant statistically. However, nurse's HH compliance was significantly associated with the moments of HH ($p = 0.000$), after body fluid exposure (100%) after newborn contact (86.3%), and after contact with surrounding (63.4%) while lower compliance was found before an aseptic procedure (9.1%), and before newborn contact (28.5%). Hand washing was done in 176 (41.41%) out of 267 HH actions while hand rub was performed in 79 (18.59%) of the HH actions (Figure 1). It was also observed that some nurses performed double actions where soap and water were used for HH and the subsequent application of alcohol-based hand rub (ABHR) (n=12 (2.82%).

Table III: Level of HH compliance among the opportunities presented to nurses

Variables	No of opportunities n (%)	Compliance n (%)	p-value*
Overall	425	267 (62.8%)	
Unit			.247
NICU	202 (47.5%)	123 (60.9%)	
Newborn	223 (52.5%)	144 (64.6%)	
Shift			.287
Morning	255 (60.0%)	155 (60.8%)	
Afternoon	170 (40.0%)	112 (65.9%)	
My five moments for HH			<.000
Before the newborn contact	137 (32.2%)	39 (28.5%)	
Before an aseptic procedure	22 (5.2%)	2 (9.1%)	
After body fluid contact	43 (10.1%)	43 (100%)	
After the newborn contact	182 (42.8%)	157 (86.3%)	
After contact with the newborn surrounding	41 (9.6%)	26 (63.4%)	

* χ^2 – test of difference in proportions of opportunities compiled across the level of variables.

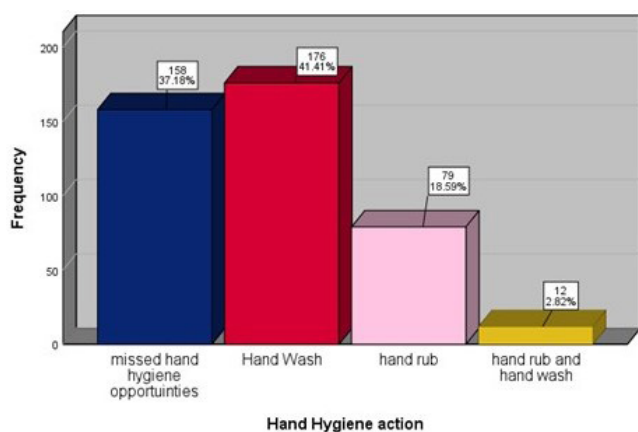


Figure 1: Hand hygiene compliance according to types

DISCUSSION

This study is the first study in Nigeria to report on HH opportunities and compliance in the neonatal department using “my five moments for HH”. The study aimed to determine HH compliance to “my five moments for HH” among nurses working in neonatal units. The newborn unit is divided into two sections, the inbound unit, and the outbound unit, both newborn and NICU each had a sink with continuous water supply flowing from the tap located behind the nurse’s stations and at the entrance to the unit, respectively. Besides, the taps in these units were hand-operated taps despite the current recommendation to use automated taps or elbow-sensor-operated taps. Through this hand-operated taps, there is an evidence of increased risk of cross-transmission resulting from contamination and recontamination of the hands (26). A similar finding was reported in northern Nigeria (19) and India (28).

In each unit, alcohol-based hand rub (ABHR) was kept on the nurses’ table and a poster on “my five moments for HH” and the techniques for performing HH were seen posted on the wall beside the HH points in both units. There were no disposable towels or single-use towels or automated hand dryers in these units for the hand drying procedure, as opposed to the guidelines and recommendation from (5). However, the participants in this study were seen drying their hands using either gauze, fan, or their uniform, while some allowed their hands to dry naturally. A similar study in Nigeria (19) also found unavailability of these facilities instead reusable towels were used. These practices have given room for bacteria contamination and recontamination (5). The lack of ABHR at the neonate’s bedside and lack of hand drying resources as observed in the studied facility could prevent HCWs from complying with HH. These restraints could be the reason for nurses’ noncompliance behaviours.

Survey of nurses perceived compliance and direct observation of nurses HH practice was employed in this study. Direct monitoring of HH has several advantages,

it provides quantitative and qualitative information about failures in HH and distinguishes HH practice by different HCWs (29). It also provides evidence regarding HH before and after the use of glove, it further determines if hand hygiene has been done correctly and captures all the five moments of HH (30). The direct observation method has several disadvantages. First, 100% compliance may not be reported as it is not possible to capture all the opportunities by direct HH observation (29). Secondly, Hawthorne effect/observer bias is an additional disadvantage with direct observation (29). While self-reported compliance surveys are prone to false results since healthcare workers tend to inflate their hand hygiene compliance (31). Research has shown that such disadvantages can be overcome by the use of automated surveillance systems (32). However, studies have shown that the cost of installation of the automated surveillance system is high and the system is unable to capture moments 2 and 3 (before the aseptic procedure and after contact with body fluid) respectively (33). Some researchers (33) suggested the combination of automated surveillance system and direct observation. However, Nigeria is a developing country with low resources that lack such surveillance method, hence the utilization of direct observation and survey in this study. Comparing the perceived and observed compliance to “My five moments for HH”, the nurses seemed more aware of their compliance in these moments. But these were not significant finding as in table II and III. However, there were some elements of ignorance among HCWs regarding their own HH practice in another study (34). Many researchers (33,36,43) have contended that HCWs usually inflate HH compliance practice than the actual practice, the perceived and observed compliance rates were relatively the same in this present study except for moments before an aseptic procedure and before patient contact. Both practices were poor similar to previous findings (37).

Only compliance obtained from the researcher’s direct observation was discussed in detailed in line with WHO guideline which stipulated that direct observation remained the gold standard for HH compliance monitoring (1). The overall observed HH compliance rate was 62.8% and this was moderately higher compared to the compliance rate reported in similar studies conducted in the Northern part of Nigeria (31%) (19) and other developing countries like Kuwait (33.4%) (35), Ethiopia (22%) (23) and Kenya (22.0%) (38). The study’s findings were comparable with other studies (9,17) but even surprisingly due to the ongoing pandemic, where HH should be actively practised. The increase in the compliance rate could be because of the increased HH education and awareness due to the recent pandemic which is one of the WHO multimodal HH improvement strategy. Most of the participants (96.7%) indicated that they have had HH education, aware of the placement of “my five moments for HH” poster at the hand washing stations of each unit and understood

the provision of ABHR, although this was not available at the point of care and was kept at a central place in the units. The evidence from literature suggested that the HH education, use of the poster and the availability of ABHR, have significantly improved HH compliance rate (13,38).

This study showed no statistical difference in the HH compliance rates between newborn unit, NICU, and working shifts (morning/evening). This may be because each unit has the same ward arrangement and HH orientation. A higher level of HH compliance was expected to be seen in these neonatal units due to the intensive care activities, premature immune response of the neonates (40) and the current COVID 19 pandemic. Compliance with the simple HH measure was poor in this study, despite knowing the country's neonatal mortality rate which was three times higher than the SDG global target of 12% per 1000 (18). Recent reviews on HH compliance in intensive care units also found lower levels of HH compliance rate in ICUs as compared to other units (9,10). This was an alarming result since intensive care unit patients were susceptible to infection especially the multi-drug resistance microorganisms. In contrast to this, another study contended that being a member of ICU was one of the determinants for HH compliance (41).

A large variation with the compliance rate was also seen across all "my five moments for HH". Compliance to HH among nurses was better after neonate contact (86.3%), after body fluid exposure (100%) and after contact with the neonate's environment (63.4%). Nurses were less likely to perform HH before contact with the neonate (28.5%) and before an aseptic task (9.1%). All the moments after neonates' contact showed a better HH compliance rate compared to the moments proceeding any nursing task. The researchers believed part of the reasons were related to the location of the ABHR which were not accessible at the bedside, invisible hand washing points behind the nurses' station, the preference of nurses to use gloves which were easily seen in each cot, and nurses' behaviours of preferring to wear glove instead of performing HH. This finding was comparable to the result from Nigeria (19) and (38) Kenya where HCWs assumed that gloves use was reliably replacing HH.

This practice contradicted WHO recommendation for the use of gloves, whereby gloves should not be used to replace HH (30). Future studies should determine HH before glove use as this was not assessed in this study. HH compliance could be difficult to practice since most nurses preferred to perform HH using soap and water in our context. The lack of hand drying facilities before donning gloves might also be the reason for non-compliance to HH behaviour before the patient's care. HH compliance after the patient's care, fluid exposure, or contact with the patients' care environment are the

factors responsible for HCWs self-protection rather than protecting the neonates from HAIs, as supported by several literature (25,37,41). The participated HCWs were more conscious of the HH action that protects them from contracting the infection rather than protecting neonates from HAIs. Despite the studies promoting HH as the preventive measure against HAIs for HCWs, the compliance to HH is still below the expected standard for patient safety and quality of care. The availability of HH resources, the ABHR on the nurse's table, and the handwashing point could influence the behaviour outcome (2,38).

Alcohol-based hand rub (18.59%) was not commonly used by nurses, rather soap and water (41.41%) were the preferred choice of action taken by most nurses in our study and sometimes double actions were performed especially after the contact with neonates. The application of ABHR has been suggested as the gold standard to overcome constraints in clinical situations regarding the "my five moments for HH", especially in resource-constrained settings except for body fluid exposure (13). Nurses were aware of these practices, especially those preceding bodily fluid exposures as the HH compliance rate was recorded as 100%. Various other studies (25,45), revealed that hand washing was a preferred choice by HCWs, though ABHR was not available in the clinical settings where these studies were conducted. These findings were different from other studies (13,46-47) where the HCWs performed HH more with ABHR. Double action has not been reported anywhere in literature, but this was documented in our study especially after patients' care. We suspect that these nurses were aware of contamination and recontamination of the hand-operated taps which led to this finding.

This is one of the first studies assessing compliance to "my five moments for HH" in a neonatal department in Nigeria, and secondly according to WHO recommendation, feedback on the compliance was relayed to the head of each unit. Since the study's duration was consistent in the five days observation period in each ward over 8 hours each day, it would be impossible for the result to be influenced by the Hawthorn effect. However, the observations were done on weekdays excluding weekends, and only one observer conducted the observation, these might have posed some limitations. Besides, the effect of the performance feedback given at the unit level was not assessed in this study. We recommend continuous HH observation to assess the effect of performance feedback according to WHO recommendations.

CONCLUSION

The findings of this study showed a significant gap with the HH compliance among neonatal nurses, suggesting multiple opportunities for neonatal infections despite

the current awareness of HH in the Covid-19 pandemic. The current HH practice was relatively low despite the Covid-19 pandemic and being in ICU set up. The high rates of neonatal mortality in Nigeria and the Covid-19 pandemic which evidence shows it has become a nosocomial infection and necessitates intensified infection control practices among caregivers of this fragile population.

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