

ORIGINAL ARTICLE



The impact of multimodal interventions on the appropriate use of hand sanitizer among Nurses in a Nigerian tertiary hospital

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Abstract

Introduction: Appropriate use of hand sanitizer among nurses is essential in reducing the risk of hospital-acquired infections.

Objective: This study aims to evaluate the impact of multimodal interventions on the appropriate use of hand sanitizer among nurses in a tertiary hospital in Nigeria.

Method: It was a prospective observational study conducted over 10 weeks among nurses of Usmanu Danfodiyo University Teaching Hospital, Sokoto. A total of 65 nurses on duty were selected to receive multimodal interventions (i.e., practical demonstration of the appropriate use of hand sanitizers and distribution of the WHO's chart on the appropriate use of hand sanitizer for self-learning) to improve the practice of hand hygiene using hand sanitizer. Participants subsequently demonstrated the use after observation, and they were scored using a checklist adapted from the WHO chart. Post-intervention assessments were conducted after four weeks where participants again demonstrated the use of hand sanitizer. A paired sample t-test was used to determine the mean differences between the pre- and post-intervention scores. Data analysis was done using SPSS version 20.0 and the p-value was set at $p < 0.05$.

Results: The mean age of the participants was 37.3 ± 9.5 years. Most (42.4%) participants had Basic Nursing and 57.6% had a previous seminar on infectious disease control (IDC). The participants' pre-intervention score was 54.8% but increased significantly by 33.5% after intervention ($p < 0.001$). The seventh step of hand hygiene was the most improved practice, increasing from a baseline of 13.6% to 75.8% post-intervention. The demographic or professional characteristics of the participants did not affect the practice of the use of hand sanitizer.

Conclusions: Practical demonstration of appropriate use and enhancement of self-directed learning solely resulted in significant improvement in the appropriateness of the use of hand sanitizer among nurses in this study as evidenced by improved scores and increased completion of critical steps.

Keywords: Hand Sanitizer, Hand hygiene, Hospital-acquired infections, Interventions, Nurses

Introduction

According to the World Health Organization (WHO), infectious diseases caused 12.3 million deaths globally, accounting for 21 percent of the 56.8 million

deaths in 2008.¹ A significant proportion of these infections were acquired within healthcare settings and are known causes of increased morbidity and mortality among hospitalized patients.² It was estimated that hundreds of

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millions of people worldwide suffer from infections acquired in hospitals.³ Hospital-acquired infections result in excess deaths, length of hospital stays, and healthcare costs. About 5,000,000 cases of HAIs occur annually in Europe, contributing to 50,000–135,000 additional deaths, and excess healthcare costs of €13–24 billion.⁴

The hands of healthcare providers (HCPs) are major pathways for the transmission of infections during healthcare. Transmission occurs through direct contact, mainly when the hands of HCPs transfer microorganisms between individuals and between individuals and environmental reservoirs.⁵ Hand hygiene is, therefore, the most important measure to avoid the transmission of harmful germs and prevent healthcare-associated infections.⁶ It is of utmost importance because hands are easily contaminated by airborne or surface-bound microorganisms.⁶ During the COVID-19 pandemic outbreak, hand hygiene proved to be crucial to interrupt the transmission chain of the virus.⁷

The WHO recommends washing hands with soap and running water for 30 seconds or running water for 30 seconds or using alcohol-based sanitizers as a means of hand hygiene. The former is preferred when hands are visibly dirty or visibly soiled with blood or other body fluids while the latter is the preferred means for routine hygienic hand antisepsis if hands are not visibly soiled.^{8,9} However, health facilities in low- and middle-income countries have challenges with basic water supplies as about 1-in-4 healthcare facilities do not have basic water services and approximately 700 million facilities lack running water.¹⁰ Hand sanitizers could thus complement the inadequate water supply in these countries to ensure hand hygiene. Hand sanitizers are often packaged in portable containers and could be invaluable at point-of-care, especially in settings where hand-washing facilities are not available. The use of alcohol-based hand sanitizer is faster and equally effective.¹¹ In a previous interventional study, appropriate use of the hand sanitizer effectively reduced nosocomial infection in pediatric and surgical departments.¹²

The WHO recommended a series of steps on how to perform hand hygiene with sanitizer, which is crucial to ensure the effectiveness of hand hygiene. Nursing care constitutes a significant part of care received during the hospital stay and point-of-care use of hand sanitizer by nurses could be vital to infection prevention and control within hospital settings. Interventions geared towards improving the practice of the use of hand sanitizers among nursing staff could thus be pivotal to the control of healthcare-associated infections. Hence this study was conducted to evaluate the impact of a series of practice-improving interventions on the appropriate use of hand sanitizer among nurses in a Nigerian tertiary hospital.

Methods

Study Design and Setting

This is a prospective interventional study conducted over 10 weeks (1st June 2023 – 9th August 2023). It was conducted among nurses working at Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto State. The Usmanu Danfodiyo University Teaching Hospital is a tertiary healthcare facility located in Sokoto state, Northwestern Nigeria. The hospital has 900 beds and over 20 wards. It provides healthcare services to the people of Sokoto, Kebbi and Zamfara states and in neighbouring

countries of Niger and Benin Republic.

Study population.

The Nurses who are staff of the UDUTH constituted the study population. Those on duty at any shift on the day of study recruitment were considered eligible to participate in the study. One hundred (100) nurses were on morning duty in the Hospital on the day of study recruitment. The sample size (65) was estimated using the formula for the estimation proportion of a population with a confidence interval of 95% and a margin of error of 5%.¹³ Allowing for a non-response rate of 10%, the minimum sample for the study was thus 72 nurses. Nurses who declined consent to participate in the study were excluded.

Data Collection Instrument

A well-structured questionnaire was used to collect information from the study participants. The questionnaire consists of two sections. The first section consists of questions relating to the sociodemographic and professional characteristics of the participants including age, gender, education level, working experience, and ward. The second section comprises of series of questions to assess the practice of the nurses on the appropriate use of hand sanitizer. These questions were adapted from the WHO guide on how to use hand rub and they pertain to the steps involved in the appropriate use of hand sanitizer.⁸ The practice assessment was carried out at baseline and after the practice-improving interventions after 10 weeks.

Intervention

The study deployed two (2) interventions.

1. Practical demonstration of the use of hand sanitizer, this was done one-on-one with each of the participants at their respective wards to avoid interruption of services.
2. Enhancement of self-directed learning through the distribution of a printed copy of the WHO guideline on the steps to performing hand hygiene using hand sanitizer. Participants were followed up through phone calls to ensure they went through the guidelines.

Data Collection Procedure

During the pre-intervention phase of the study which spans four (4) weeks (1st June 2023 – 28th June 2023), data on the socio-demographic and professional characteristics data of the participants were collected and recorded in the questionnaire. The participants were contacted in their respective wards. Each participant was given hand sanitizer and was asked to perform hand hygiene while being observed. We observed each participant as they demonstrated the use of hand sanitizer. The steps correctly performed were recorded on the data collection form as “yes”, while omitted or wrongly performed steps were recorded as “no”. After the demonstration, the researchers demonstrated the use of hand sanitizer to each participant on the spot with the aid of the WHO guidelines. Special emphasis was placed on the wrongly performed steps. Subsequently, a printed copy of the WHO guideline on the appropriate steps to perform hand hygiene with the use of hand sanitizer was given to the participants and they were asked to study and practice over two weeks.

Post-intervention, participants were contacted to

demonstrate the use of hand sanitizer once again while they were observed and scored according to the hand-washing guidelines. The scores were recorded in the study questionnaire like the pre-intervention records. The post-intervention data was then collected over four weeks (13th July 2023 – 9th August 2023).

Research instrument scoring.

There are 9 steps involved in the use of hand sanitizer. A score of '1' was assigned if a step was correctly performed (i.e., 'yes') while an omitted or wrongly performed step (i.e., 'no') was assigned a score of '0'. Hence, a maximum of 9 was achievable.

The scores were converted into percentages as shown below.

$$\text{Score (\%)} = \frac{\text{Score obtained}}{9} \times 100$$

Percentage scores (pre- and post-intervention) were categorized into two; (a) Good (50% and above) (b) Poor (<50%)

Data Analysis

The data collected was sorted, coded, and analyzed using SPSS version 20 for Windows. Descriptive statistics including frequencies, percentages, means, and standard deviations were used to summarize the respondent's qualifications, years of working experience, and previous attendance of hand hygiene seminars. A Paired sample *t*-test was used to determine the mean differences between the pre-and post-intervention scores. Pearson's Chi-square was used to test for the association between the respondents' professional characteristics and the level of appropriateness in the use of hand sanitizer. *P*<0.05 was considered significant throughout the study.

Results

Of the estimated 72 participants in the study, six nurses declined consent. A total of 66 nurses thus completed the pre-and post-intervention survey giving a response rate of 100%.

Demographic and professional characteristics of the respondents

The mean age of the participants was 37.30±9.5

Table 1. Demographic and professional characteristics of the respondents

Variables	n (%)
Mean Age (Years)	37.3±9.5
Gender	
Male	19(28.8)
Female	47(71.2)
Qualification	
Basic Nursing	28(42.4)
Post Basic	24(36.4)
BSc. Nursing	14(21.2)
Years of experience	
<5yrs	16(25.2)
>5yrs	50(75.8)
Total	66(100)
Previous seminar on IDC	
Yes	38(57.6)
No	28(42.4)
Wards	
Emergency/high dependency ward	13(19.7)
Non-emergency wards	53(80.3)
Total	66(100)

IDC – Infectious Disease Control, Emergency wards – ICU, EPU, A&E, Gynecology emergency, newborn unit

Table 2: Participants' Scores of Steps in Appropriate Use of Hand Sanitizer Before and After the Intervention s

Steps	Action Performed	Observation		t-test	p-value
		Pre-I Yes n(%)	Post-I Yes n(%)		
Step 1	Apply a palm -full of the product in a cupped hand, covering all surfaces	46(69.7)	66(100)	0.303	<0.001
Step 2	Rub hands palm to palm	66(100)	66(100)	-	
Step 3	Right palm over left dorsum with interlaced fingers and vice versa	29(43.9)	60(90.9)	0.470	<0.001
Step 4	Palm to palm with fingers interlaced	58(87.9)	65(98.5)	0.106	0.018
Step 5	Backs of fingers to opposing palms with fingers interlaced	12(18.2)	37(56.1)	0.379	<0.001
Step 6	Rotational rubbing of left thumb clasped in right palm and vice versa	22(33.3)	50(75.8)	0.424	<0.001
Step 7	Rotational rubbing backwards and forward with clasped fingers of the right hand in the left and vice versa	9(13.6)	50(75.8)	0.621	<0.001
Step 8	Allow your hands to dry	58(87.9)	65(98.5)	0.106	0.018
Step 9	Duration of 20-30 seconds	26(39.4)	65(98.5)	0.591	<0.001
	Mean Scores ± SD %	54.8±14.6	88.3±11.1	14.726	<0.001

MD=Mean Difference, Pre-I = Pre-intervention, post-I = post-intervention

Table 3: Participants' demographic/Professional Characteristics and the practice of the Use of Hand Sanitizer

Participants' characteristic	Level of the appropriateness of use N=66		P-value
	poor n=31(%)	Good n=35 (%)	
Gender			
Male	11(16.6)	27(40.9)	0.09
female	20(30.3)	8(12.1)	
Age			
<25yrs	1(1.5)	4(6.1)	0.262
>25yrs	17(27.6)	44(66.7)	
Years of experience			
<5yrs	6(9.1)	10(15.1)	0.302
>5yrs	25(37.9)	25(37.9)	
Qualification			
Basic nursing	15(22.7)	13(19.6)	0.307
Post basic	12(18.1)	12(18.2)	
BSc. Nursing	4(6.0)	10(15.1)	
Previous seminar on IDC			
Yes	20(30.3)	18(27.2)	0.30
No	11(16.6)	17(25.7)	
Ward			
Emergency/high dependency	10(15.2)	5(7.6)	0.42
Non-emergency	21(31.8)	30(45.5)	

years and they were mostly females (71.2%). Also, about one-fifth (21.2%) of the respondents had a nursing degree, 42.3% had Basic Nursing (i.e., Registered nurses), while 36.4% had post-basic nursing qualifications. More than half of the respondents (57.6%) had previously attended seminars on infectious disease control (IDC), see Table 1.

Participants' pre- and post-intervention scores of the assessment of the use of hand sanitizer

The Mean score of the respondents after the intervention (88.3±11.1%) was significantly higher than the score before the intervention (54.8±14.5%) and this was statistically significant ($p < 0.001$). All the participants performed step 2 during the pre-and post-intervention phases of the study. During the pre-intervention phase, step 7 was the most frequently omitted, only 9 (13.6%) participants completed this step. However, after the intervention, 50(75.8%) participants completed this step representing a significant improvement of 45.5% (p -value < 0.001) in the performance of this step. The pre-and post-intervention scores for other steps and their variations are detailed in Table 2.

Association between respondents' appropriateness in the use of hand sanitizer and socio-demographic and professional characteristics

There was no significant association between respondents' socio-demographic and professional characteristics and the level of appropriateness in the use of hand sanitizer. Details are in Table 3.

Discussion

This study evaluated the impact of multiple interventions on the appropriate use of hand sanitizer among nurses in a tertiary hospital in Nigeria. We reported that the practical demonstration of appropriate use and

enhancement of self-directed learning resulted in significant improvement in the appropriateness of the use of hand sanitizer among participants.

Most of the respondents were female. Given that the study was conducted among nurses, this perhaps reflects the general preponderance of females in the nursing profession. Also, according to a WHO report, women constituted 70% of health and social sector workers.¹⁴ Pre-intervention, all participants performed steps 1 and 2 i.e., application of the hand sanitizer and rubbing it between the two palms. However, step 7 (i.e., rotational rubbing backwards and forward with clasped fingers of the right hand in the left and vice versa) is the most frequently omitted step during the use of hand sanitizer. This perhaps suggests that participants are unaware that the fingertips could constitute an important source of transmission of infectious pathogens. This has implications for the overall effectiveness of the decontamination using hand sanitizer and should be prioritized during hand hygiene training. More than half of the participants (54.8%) in the current study had good baseline practice of appropriate use of hand sanitizer. However, a study conducted in a similar setting in Ethiopia reported a higher proportion of participants (76%) with good practice in the use of hand sanitizer. The Ethiopian study recruited diverse healthcare professionals including physicians, pharmacists and medical laboratory technicians unlike the current study conducted solely among nurses, this difference in the study population could thus account for the differences in the level of practice.¹⁵

In this study, practice-improving interventions i.e., practical demonstration of appropriate use and enhancement of self-directed learning resulted in the improvement of the practice of the appropriate use of hand sanitizer. The improvement was most noticeable in steps three, five, six, seven and eight. This finding is consistent with the report of a systematic review to evaluate the hand

hygiene teaching strategies among nursing staff.¹⁶ In the study, strategies such as reminders, practical simulations, videos, and audiovisual media significantly improve hand hygiene practices and compliance. Similarly, in Bangladeshi studies, multimodal interventions resulted in a significant increase in hand hygiene behaviour and practices among participants after the intervention.^{17,18}

The study found no significant correlation between demographic and professional characteristics and the practice of the use of hand sanitizer. Although not statistically significant, a higher proportion of participants who have spent less than five years at work had good practice but there were no differences in the practice among nurses who have stayed beyond five years. Perhaps senior nurses (with higher years of experience) had limited involvement in ward activities while focusing more on administrative tasks and this may account for the observed poor practice among them. However, another study conducted in Ethiopia reported a statistically significant association between years of experience of healthcare workers and the appropriate use of hand sanitizer.¹⁵ The discrepancy in findings may stem from variations in study populations. The current study exclusively surveyed nurses, whereas the Ethiopian study involved other healthcare workers.

Those with a B.Sc. in nursing had the lowest excellent practice in the use of hand sanitizer among the nurses despite having the highest qualification in the study environment, we were unable to identify a possible rationale for the low response in this cohort. No significant association was obtained between previous attendance of IDC seminars and the level of appropriateness in the use of hand sanitizer although higher proportions of participants who had attended previous IDC seminars had good practice. This finding is contrary to research conducted by Ekwere and Okafor in 2013, which showed that those who attended a seminar on infectious disease control had a high level of appropriateness in the use of hand sanitizer.¹⁹ The relatively smaller sample size of the current study may have accounted for the lack of statistical significance

Conclusion

Practical demonstration of appropriate use and enhancement of self-directed learning resulted in significant improvement in the appropriateness of the use of hand sanitizer among nurses in this study as evidenced by improved scores and increased completion of critical steps. There was, however, no association between the participants' demographic or professional characteristics and the level of appropriateness in the use of hand sanitizer.

RECOMMENDATION

Health facilities should prioritize periodic practical demonstrations of hand sanitizer use for nurses and provide every nurse with the standard guideline for its use to enhance self-directed learning. Additionally, periodic assessments of the appropriateness of use should be incorporated into the overall infection prevention and control activities.

Conflict of interest

No conflicts of interest

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