

Predictors of Compliance to Hand Hygiene among Health Care Workers in Rwanda

Dieudonne Ndatimana¹, Caste Habiyakare², Francois Niragire³, Amedee Ndibaza², Olive Ntakirutimana², Onesime Manishimwe², Josue Mutabazi², Erigene Rutayisire^{1*}

¹Public Health, Mount Kenya University, Kigali-Kicukiro-Rwanda Thika Central Kenya

²Intra-Health International- Rwanda, Kigali, Rwanda

³Department of Applied Statistics, College of Business and Economics, University of Rwanda

*Corresponding author: Erigene Rutayisire. Public Health, Mount Kenya University, Kigali-Kicukiro-Rwanda. Email: rerigene@yahoo.com

Abstract

Background

Hand hygiene is critical to the prevention of Healthcare Acquired Infections. Compliance of health care workers to hand hygiene in developing countries is reportedly low.

Objective

The aim of this study was to assess predictors of hand hygiene compliance among healthcare workers in Rwanda

Methods

This cross-sectional study was conducted in 26 selected hospitals. Trained hospital IPC focal points anonymously observed 1380 hand hygiene opportunities from 341 healthcare workers. Logistic regression analysis was used to identify predictors of compliance to hand hygiene among health care workers using Stata.

Results

The overall compliance to HH was 72.4%. It was respectively 70%, 77% and 60% less likely in labor (AOR=0.30, 95% CI: 0.19-0.49), maternity (AOR= 0.27, 95% CI: 0.17-0.43), and neonatology (AOR= 0.40 95% CI: 0.25-0.65) departments than in theater. Other clinical staff than nurses/midwives were 35% less likely to comply than did medical doctors. The availability of water source and soap at hand washing station was associated with 2.5 times higher odds of compliance (AOR=2.46, 95% CI: 1.27-4.77).

Conclusion

The compliance to HH is associated with the availability of hand hygiene facilities. Well-maintained water sources and soap at hand washing stations should be a priority in health care settings.

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Introduction

Hand hygiene (HH) measures as defined by WHO guidelines [1] are effective in reducing Healthcare Acquired Infections (HAIs). Various studies indicate that HH measures are a cost-effective method of preventing HAIs,[2,3] and it is regarded as one of the most important elements of infection control activities.[4] HH is the single most important, simplest, and least expensive means of reducing the prevalence of HAIs and the spread of antimicrobial resistance. [1] However, it is far from certain that HH interventions would be feasible and effective in LMICs. Many health facility settings from these countries lack an established culture of infection control with associated systems and funding including HH facilities. HH associated infections are a threat to patient safety and the most common adverse events resulting from prolonged hospital stay.[1] In Low and Middle Income Countries (LMICs), an estimated 15% of patients acquire HAIs during their hospital stay. It is also estimated that 26% of neonatal deaths and 11% of maternal deaths are caused by infections acquired through unclean births.[5]

Health care workers are also on constant threats of acquiring HAIs. From the early data on COVID19 infections, WHO reported that health care workers accounted for 14% of all positive cases despite that they only represented 3% of the general population.[6] Proper use of hand hygiene is critical and the primary measure to the prevention of these infections, but the lack of compliance among health-care providers is problematic worldwide.[1] Understanding the level of hand hygiene as well as key determinants helps countries and programs to make appropriate decisions to shape Infection Prevention and Control (IPC) programs and inform investments in IPC systems. There is a limited number of studies on HH in LMICs and in Rwanda in particular. Few studies conducted about hygiene compliance in health care settings among healthcare providers in Rwanda, either focused on one hospital or even one department. [7,8,9,10,11,12]

The current study aimed at determining the prevalence of hand hygiene compliance among health care workers and related predictors from selected departments in 26 hospitals of Rwanda.

Methods

Study Design

This study was conducted through a secondary data analysis from an observational cross-sectional data collected through USAID-Ingobyi activity's IPC learning efforts. It was conducted in 26 hospitals located in 20 of the 30 Rwanda's administrative districts that benefited from the USAID-funded Ingobyi Activity Project support aimed to improve reproductive, maternal, newborn and child health outcomes since 2017. They included two referral, 2 provincial and 22 district hospitals.

Sampling

The study population was composed of staff working in the selected departments by the time of data collection. The sample size was 341 obtained using Yamane's formula with 95% confidence level and 0.5 as level of precision. Probability and non-probability sampling techniques were used to select the sample for this study. Selected hospitals are all under USAID-Ingobyi activity support. Departments were purposively selected based on their likelihood to pose major threats to patients and providers if IPC measures are not reinforced. Cluster sampling was used to select participants within departments, and a systematic sampling method was used to enroll participants from each department using a list of health care workers on duty and assigned to the selected departments on the day of data collection. The study included participants meeting the following criteria: being a health care provider, working and on duty in one of the selected hospitals and departments as well as being selected in the sample. It excluded all health care providers that were not working in the selected departments or not on the duty on the day of data collection and not selected for the sample.

If there is a situation, where a selected study participant was requested to work in another service or did not have the opportunity to provide care, that one was excluded in the study and replaced by the next eligible health care worker on the list.

Data collection

Data was collected in May 2021 from each department that may influence compliance to hand hygiene, using an electronic tool adapted from the WHO hand hygiene observation tool to add hand hygiene facilities. These included availability of running water, location and cleanliness of sinks, availability of alternates to sinks when not available, availability of soap, hand dryer and its holder as well as availability of alcohol-based hand rub as an alternative to hand washing. These were in addition to professional category, the type of hospital, departments, and hand hygiene indication that was observed. Data collectors were trained hospital IPC focal points to minimize Hawthorne effect. Prior to the data collection, permission was obtained from the hospital leadership and data collectors worked hand in hand with the heads of departments to seek permission to conduct the observation of hand hygiene practice in their departments, but health care workers were not informed.

The observer anonymously observed each selected health care worker during the delivery of health care activities. In case several hand hygiene indications were presented in one opportunity, the first action performed by the observed health worker was recorded. If a health worker did not have an opportunity to perform an indicated action requiring hand hygiene, the observer recorded it as not applicable. Data collectors were supervised by USAID-Ingobyi IPC staff who provided closer guidance and troubleshoot any issue during data collection. At the end of fieldwork, data were submitted into a password protected Secure Socket Layer (SSL) server with daily data backups.

Data analysis

Data were downloaded from the server in Comma-separated Values (CSV) format then uploaded in STATA V.17 for data cleaning and analysis. Hand hygiene moments were recorded as patient protective or self-protective; and hospitals was grouped into referral and district hospitals. The referral category combined provincial and referral hospitals. A new variable was recorded by combining the availability of running water, alternative water source and soap. Descriptive statistics including frequency and percentages were analyzed to present the distribution of study participants from each hospital type, each department and by profession. In addition, frequency, and proportion of departments with assessed hand hygiene facilities was analyzed. To estimate compliance rate across different category of expected predictors, frequency and percentages were also used. The compliance rate was calculated by dividing the count of all performed hand hygiene action over the total count of observed hand hygiene opportunities. Series of chi-square tests of independence were performed to test the association of the HCWs' compliance to hand hygiene with each of the selected potential predictors. The binary outcome variable was the compliance to hand hygiene practice among health care workers, categorized to capture whether the participants complied to HH action or not. Logistic regression analysis was performed to assess the relationship between the selected factors with compliance to hand hygiene. A factor with p-value less than 0.05 was considered as a predictor.

Ethical consideration

The study was implemented in accordance with the research protocol approved by the MKUR research ethical committee (Ref: MKU/ETHICS/013/2022). Permission to conduct data collection was obtained from each hospital's leadership and the data collection was conducted hand in hand with those responsible of study departments. Names of study participants were not recorded during data collection. Data were saved on password-protected devices and were submitted and stored on protected server and computers through an SSL certificate.

Results

From the 341 study participants, 85.3% (291) were from the 22 District hospitals and 14.7% (50) were from the four study referral hospitals. The theatre room had the highest proportion with 18.5% (63) of the participants followed by emergency department and labour ward each with 15.8% (54) of the participants. The isolation service had fewer participants, represented by 7.3% (25). Nurses and midwives represented 51.8% (168), doctors were 33.4% (109) while other clinical staff represented 19.6% (64). Other clinical staff included anaesthetist, physiotherapist, and nutritionist. Water for hand hygiene was available in 95.9% of the departments; alcohol-based hand rub in 88.8%, soap was available in 92.9% of the washing stations. Water sources for hand hygiene were estimated to be closer to the place of care provision in 76.9% of departments while sinks and hand washing stations were qualified clean in 76.3% of departments. (Table 1)

In total 1380 hand hygiene opportunities were observed, out of which 999 (72.4%) hand hygiene actions were recorded. The compliance to hand hygiene action was higher in referral hospitals (80.4%) than in the district hospitals (71.4%) with P-value equal to 0.021. Compliance varied with different departments, with Theater and isolation rooms recording higher compliance respectively at 86.1% and 80.2%, followed by pediatrics (72.7%), neonatology (72.1%), and emergency department (69.6%). The least performers were labor wards and maternity wards with 64.2% of compliance (p-value<0.001). Departments with water source for hand washing with soap available to each hand washing station seemed to record high compliance (73.3%) compared to those where the water facilities were not available (45.8%), with a p-value<0.001. Departments with clean sinks were more compliant (73.8%) compared to those qualified as less clean (67.1%) with a p-value =0.023. Comparative assessment of the health professional categories observed,

doctors (72.1%) and nurses/midwives (75.4%) had a higher compliance than other clinical staff (64.5%) with a p-value = 0.004. . Health care providers seemed to comply more when they were trying to protect themselves (76.2%) than trying to protect patients (68.6%) with a p-value =0.001. Among the observed factors, location of water sources, availability of hand dryer or paper towel near each hand washing station and the availability of alcohol-based hand rub were not associated with compliance to hand hygiene. Health care workers from departments with conveniently located sinks complied at 72.1% while those with sinks qualified as non-conveniently located complied at 73.6%, departments with hand dryer or towel paper near each hand washing station complied at 74.1% compared to 70.0% in those without these facilities. Finally, the compliance of health workers from departments where alcohol-based hand rub was available was 72.4% versus 72.0% where they were not. (Table 1)

Table 1. Compliance to hand hygiene and its association to potential predictors in the 25 selected hospitals in Rwanda (n= 1380)

Factors and their levels	Compliance to hand hygiene				p-value
	No		Yes		
	N	%	N	%	
Type of the hospital					
Referral	29	19.6	119	80.4	0.021
District	352	28.6	880	71.4	
Hospital departments					
Theater Room	34	13.9	210	86.1	<0.001
Isolation	19	19.8	77	80.2	
Labor Ward	73	35.8	131	64.2	
Maternity Ward	76	35.9	136	64.2	
Neonatology	58	27.9	150	72.1	
Pediatrics	48	27.3	128	72.7	
Emergency	73	30.4	167	69.6	
Availability of any water source and soap					
No	26	54.17	22	45.83	<0.001
Yes	355	26.7	977	73.3	
Sinks or other water sources are conveniently located					
No	76	26.4	212	73.6	0.603
Yes	305	27.9	787	72.1	
Sinks are clean					
No	96	32.9	196	67.1	0.023
Yes	285	26.2	803	73.8	
There is hand dryer or towel paper near each hand washing station					
No	175	30.0	409	70.0	0.093
Yes	206	25.9	590	74.1	
There are hand disinfectants available (>60% Alcohol)					
No	47	28.0	121	72.0	0.909
Yes	334	27.6	878	72.4	
Profession					
Doctors	124	27.9	320	72.1	0.004
Nurse/Midwives	169	24.6	519	75.4	
Other clinical staff	88	35.5	160	64.5	
Types of hand hygiene moments					
Patient protection	217	31.4	473	68.6	0.001
Self-protection	164	23.8	526	76.2	

Health care workers from district hospitals (AOR=0.60, 95%CI: 0.37, 0.95) were about 40% less likely to comply with hand hygiene practice compared to those in referral hospitals. Compared to the theater room, the odds of compliance to HH were 63% lower in the emergency department (AOR=0.37, 95% CI: 0.26, 0.72), 70% lower in the labor ward (AOR=0.30, 95% CI: 0.19, 0.49), 73% lower in the maternity ward (AOR=0.27, 95% CI: 0.17, 0.43), 60% lower in the neonatology department (AOR=0.40, 95% CI: 0.25, 0.65) and 56% lower in pediatric department (AOR= 0.44, 95% CI: 0.22, 0.61). There was no statistically significant difference in the compliance to hand hygiene from providers of theater room and those working in the isolation rooms (AOR=0.61, 95% CI: 0.32, 1.15).

HCWs working in the areas with availability of water source either from sinks or tiptaps combined with availability of soap at all hand hygiene stations were more than two times likely to comply with hand hygiene (AOR= 2.46, 95% CI: 1.27, 4.77). There was no significant difference of compliance to hand hygiene between doctors and nurses/midwives. However, other clinical staff were 45% less likely to comply than doctors (AOR= 0.65, 95% CI: 0.45, 0.91). The odds of compliance to hand hygiene were 50% higher when health service providers were trying to protect themselves than when they were trying to protect patients (AOR=1.50, 95% CI: 1.18, 1.92). (Table 2)

Table 2. Logistic regression model for predictors of compliance to hand hygiene among health care workers from 25 selected hospitals in Rwanda (n=1380)

Factor and their categories	AOR (95% CI)	P-value
Type of the hospital		
Referral	1	
District	0.60 (0.37-0.95)	0.028
Hospital department		
Theater Room	1	
Isolation	0.61 (0.32-1.15)	0.127
Labor Ward	0.30 (0.19-0.49)	<0.001
Maternity Ward	0.27 (0.17-0.43)	<0.001
Neonatology	0.40 (0.25-0.65)	<0.001
Pediatrics	0.44 (0.22-0.61)	<0.001
Emergency	0.37 (0.26-0.72)	0.001
Availability of any water source and soap		
No	1	
Yes	2.46 (1.27-4.77)	0.008
Sinks are clean		
No	1	
Yes	1.23 (0.87-1.72)	0.241
Profession		
Doctors	1	
Nurse/Midwives	1.17 (0.89-1.55)	0.262
Other clinical staff	0.65 (0.45-0.91)	0.014
Types of hand hygiene moments		
Patient protection	1	
Self-protection	1.50 (1.18-1.92)	0.001

Discussion

Hand hygiene is widely recognized as the single most important, simplest, and least expensive means of reducing the prevalence of HAIs and the spread of antimicrobial resistance.[1] With the outbreak of COVID19, it was more emphasized and went beyond focusing on healthcare providers; and the campaign extended to general population to mitigate the spread COVID19. In this study the overall compliance to hand hygiene indication was 72.4%. This was a high compliance compared to other previous studies that ranged from 9.2% to 43.4%.[13] Our results were however consistent with other studies conducted in the COVID19 period,[14,15,16,17] and demonstrated a great improvement in the compliance of health workers to hand hygiene compared to the period before the pandemic. A systematic review from seven studies estimated the overall hand hygiene of health care providers during the pandemic period to be 74%.[14] The high prevalence of hand hygiene in this study was shown to be highly associated with the availability of water for hand hygiene and soap at each washing station.

During the COVID 19 period, the government and hospitals improved the hand hygiene facilities. The Government of Rwanda collaborated with World Vision to provide handwashing facilities in 49 hospitals and 250 health facilities.[5] In this study, 95.9% and 76.3% of departments had respectively water for hand washing and soap at each washing station. Some studies highlighted limited availability of functional and accessible hand hygiene facilities including lack of water, soap, hand sanitizers, and unclean, blocked or leaking sinks as well as poorly positioned amenities as a main challenge for compliance to HH.[18,19] While the availability of hand sanitizers has been proven to increase hand hygiene,[20] and to be more effective and easier to use,[21] this study did not find its availability to be associated with health care workers' HH compliance.

The same results were also reported in Benin, where health care workers were likely to use soap and water than the alcohol-based hand rub.[22] Hand hygiene compliance varied from the type of hospitals and departments. It was significantly higher in referral hospitals (80.4%) than district hospitals (71.4%). The presence of specialist doctors was believed to influence compliance to HH.

A study conducted in Malaysia reported that hospitals with specialists and referral hospitals were two to three-fold more likely to comply with hand hygiene.[23] In addition, these hospitals are likely to have improved hand hygiene facilities, hand hygiene audit and observation measures, strict HH protocols, increased expertise in IPC measures and continuous IPC education to maintain their level of accreditation. A study conducted in Tanzania showed that improvement in the HH compliance scores increased with the facility level, improving progressively from basic level at health center and district hospital to intermediate level at referral and tertiary hospitals.[24] Health care workers from operating room were more likely to comply with hand hygiene requirements than other studied departments. There was, however, no significant difference with the isolation room. In these two departments compliance to hand hygiene is most promoted; emphasized during trainings and measures are put in place to regularly monitor and remind staff about adherence to HH practices compared to other departments. In addition, the observed difference could be due to HCWs perceived severity of risks from the operating room, and isolation services. This study has shown that HCWs were more likely to comply with hand hygiene when they try to protect themselves than protecting patients. Same observation was highlighted in Nigeria,[25,18] Benin, [22] and Canada.[26] During the COVID 19 pandemic the perceived severity was more pronounced. At the time of data collection, the isolation rooms were mostly receiving COVID 19 patients,

where additional training and hand hygiene measures might have been reinforced to mitigate the spread of COVID19 to frontline health workers. A study conducted in German during the outbreak period, reported an adaptation of HCWs behavior increasing HH practices from 47% before the outbreak, to 79% in the period of high awareness reaching even 100% in strict precaution moment.[27] The compliance of doctors was slightly lower (72.1%) than nurses/midwives (75.4%), though not significantly different. In contrast, doctors had a higher significant compliance than other observed clinical staff (64.5%). Other studies that highlighted the same findings,[26] cited lower education of hand hygiene among auxiliary workers.[14]

As limitations of this study were, this study explored compliance of hand hygiene among healthcare workers within only selected 26 hospitals of Rwanda. Private hospitals were not represented and only six departments were considered. The study did not explore socio-demographics of observed health care workers, and there are some other key points which were not discussed in this research, like hand hygiene among patients, visitors and infections related to poor hand hygiene. There might have been a potential Hawthorne effect that refers to a tendency in some individuals to alter their behavior in response to their awareness of being observed, if the study participants happen to know that they are being observed. However, measures were put in place to minimize Hawthorne effect.

Conclusion

The compliance rate to HH was high in all the studied hospitals and departments. The availability of hand hygiene infrastructures and facilities was highly associated with HCWs' compliance. Therefore, the availability of well-maintained water sources combined with an uninterrupted supply of soap at each hand washing stations should be a priority within hospitals.

In addition, HCWs' IPC education should emphasize more on patients' protection, ensure other clinical staff are not left behind and alcohol-based hand rub be promoted as an alternative where or when hand washing infrastructures are compromised.

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