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ORIGINAL ARTICLE *HAND HYGIENE*

Compliance, Barriers, and Enhancers of WHO "Five Moments for Hand Hygiene" Among Healthcare Workers in Tanzania

Peter Chilipweli, MSc[1], Given Mwambope, BSc[2], Abubakar O. Abdallah, BSc[3], Patrick Mwakubo, BSc[4], Aneth Dunia, MD[4]

Departments of [1]Community Medicine and [2]Environmental Health, Catholic University of Health and Allied Sciences, Tanzania, [3]Department of Environmental Health, Ruaha Catholic University, Tanzania, [4]Department of Community Medicine, Catholic University of Health and Allied Sciences, Tanzania.

***Corresponding author:**
Peter Chilipweli,
Department of Community Medicine, School of Public Health, Catholic University of Health and Allied Sciences (CUHAS-BUGANDO), Tanzania

chilipwelipeter64@gmail.com

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ABSTRACT

Background and Objective: Nosocomial infections from inconsistent hand hygiene (HH) significantly increase morbidity, mortality, and healthcare costs globally. To address this, the World Health Organization (WHO) introduced the "Five Moments for Hand Hygiene" in 2009, emphasizing critical points for HH to prevent healthcare-associated infections. Despite its importance, compliance among healthcare workers (HCWs), particularly in resource-limited settings like Tanzania, remains challenging. This study assessed awareness and compliance with the "Five Moments" in Misungwi District Council.

Methods: This was a cross-sectional study design to assess HH compliance among HCWs in Misungwi District. A mixed-methods approach combined quantitative observations of compliance and qualitative surveys exploring barriers and enhancers. A multistage random sampling technique selected 154 participants from Comprehensive Emergency Obstetric Care (CEmOC) facilities. Data collection involved questionnaires and checklists. The Statistical Package for the Social Sciences was used to analyze sociodemographic and compliance data.

Results: The study revealed that a total of 154 participated, whereby the response rate was 33%, and most participants were female. The mean and mode age for participants were 39.05 and 34.5 years, respectively, but the age of 30–39 had the highest frequency. Furthermore, the study result showed that 95 (61.7%) had working experience between 5 and 10 years. HH awareness was low, with 53.9% answering fewer than three questions correctly. Compliance averaged 37.87%, with the highest adherence after touching body fluids (93.6%) and the lowest before touching patients (14.8%). Key barriers included lack of awareness (88.7%) and irregular water supply (84.8%), while guidelines (82.5%) and a suitable environment (77.5%) were key enhancers.

Conclusion and Implications for Translation: Based on the Five Moments HH awareness, compliance is low in Misungwi District CEmOC facilities, requiring targeted education, adequate resources, and barrier mitigation. Promoting a culture of HH can enhance compliance, reduce infections, and improve patient safety. A collaborative approach involving healthcare leaders, staff, and stakeholders is essential for sustainable improvements.

Keywords: Developing Countries, Five Moments for Hand Hygiene, Hand Hygiene, Healthcare-Acquired Infections, Misungwi

INTRODUCTION

Hand washing is the rubbing together of all hand surfaces and crevices using soap or chemicals and water. This includes all individual, institutional, or environmental factors influencing hand-cleansing practices. "Five Moments for Hand Hygiene" (Five Moments) are approaches designed

by the World Health Organization (WHO) to minimize the risk of transmission of microorganisms between a healthcare worker (HCW), patient, and environment.[1] The importance of this approach is to reduce the multitude of adverse effects, such as hospital-acquired infections (HCAIs).[2] The five moments are as follows:

(1) Before touching a patient, (2) before a procedure, (3) after a procedure or body fluid exposure risk, (4) after touching a patient, and (5) after touching a patient's surroundings.

Moreover, the exact duration of hand washing depends on the circumstances. A washing time of 10–15 seconds is recommended to remove transient flora from the hands. High-risk areas, such as nurseries, usually require about a 2-minute hand wash. Soiled hands usually require more time.

The WHO introduced "Five Moments" to minimize problems related to hand washing, specifically hospital acquired infections (HAIs), defined by the WHO as infections occurring in a patient during the process of care in a health facility that were not present or incubating at the time of admission but appearing after discharge,[1] and occupational infections among HCWs in the facility. The acquisition of an infectious agent causing HAI is aided by the mode or vehicle of transmission of the infectious agent to a susceptible host, that is, contaminated hands of HCWs, as one of the factors.[2,3] Most HAIs can be prevented by simple measures of Infection Prevention and Control, such as hand hygiene (HH). Practicing HH using alcohol-based hand rub for 20–30 seconds or hand washing with running clean water and soap for 40–60 seconds is very effective against pathogens causing HAIs, including multidrug-resistant pathogens. Alcohol-based hand rub is recommended when hands are not visibly soiled, while washing hands with running clean water and soap is recommended when hands are visibly soiled with blood or other body fluids.

Nosocomial infections due to poor HH are a major cause of increasing morbidity, mortality, and healthcare costs among hospitalized patients worldwide. The high prevalence of these infections, as high as 19%, in developing countries poses a challenge to HCWs' hands, which are the most common type of vehicle for transmission of healthcare-associated infections.[4] Pathogenic microorganisms can stay for 2–60 minutes on HCWs' hands.[5-7] Hand washing is the simplest and most effective measure to prevent infections. However, about 50% of healthcare-associated infections occur at the hands of healthcare providers (HCPs) in most low- and middle-income countries. The level of knowledge, as well as attitude and practice of HH among HCWs, is reportedly poor. Inadequate HH facilities and lack of adequate and appropriate training are the major factors contributing to poor knowledge, attitude, and practice of HH among HCWs. In Nigeria, about 55.8% and 68.8% of HCWs washed their hands before patients' palpations and giving injections, respectively. In Ethiopia, about 65.9% of HCWs are reported to be knowledgeable about HH, and 56% have poor practices. Tanzania reported compliance of 56.1% and 30.5% to HH practices among HCWs in healthcare facilities with and without HH interventions, respectively.[8] It has been indicated that HCAI prevalence rates in Tanzania vary between 14.8 and 19.1%.[1] However, a study conducted in 2002 at Kilimanjaro Christian Medical Center in Tanzania showed the overall prevalence of HCAI to be 14.8% and surgical site infections reaching as high as 40% in one medical setting.[9]

Different studies have assessed the awareness, attitude, and practice of HH among HCWs. However, little focus has been placed on the correct application technique and duration of the procedure, which is considered crucial to achieving the desired effect for both hand rubbing with an alcohol-based hand rub and hand washing with soap and water.[10] Therefore, this study was aimed at assessing awareness, compliance, barriers, and enhancers of "Five Moments" among HCWs in Misungwi District, which is located in the southern part of Mwanza Region in Tanzania, bordering several other districts and Lake Victoria. It is a predominantly rural district with a population of over 250,000, where healthcare challenges are significant due to limited resources.

Conceptual Framework

A conceptual framework [Figure 1] representing the study variables and how these variables are related to each other was used to explain the natural progression of the phenomenon to be studied.[11] The conceptual framework illustrates how the study's independent and dependent variables relate to each other to assess the effectiveness of "Five Moments" among HCWs.

METHODS

Study Design

An observational cross-sectional study was adopted due to the nature of the research, which involved collecting data (similar variables) at one point in time in different health facilities among HCWs.[12]

Approaches

Mixed-methods research, which combined qualitative and quantitative methods, was used. This approach helped to gain a comprehensive understanding of the topic from different perspectives. This includes:

i. Quantitative Data: This was used to measure the actual compliance rates of HCWs with "Five Moments."
ii. Qualitative Data: Open-ended survey questions helped

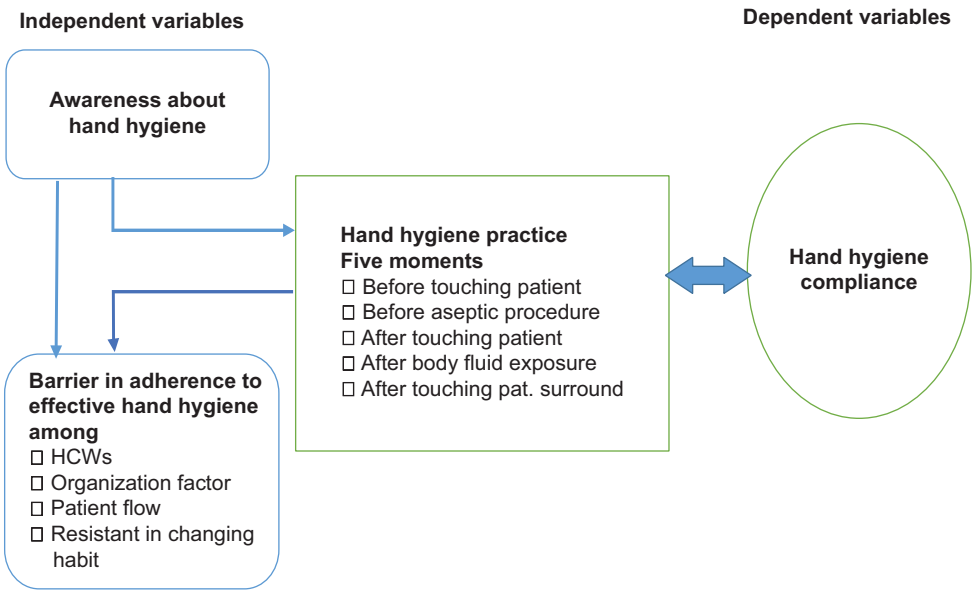

Figure 1: Conceptual framework showing compliance and knowledge of healthcare workers (HCWs) regarding the five moments for hand hygiene.

explore the reasons behind HCWs' Five Moments HH behaviors, showing barriers and enhancers to compliance and suggesting improvements.

Study Setting

The study was conducted in the Misungwi district Council (Latitude: 2°51′00″ S Longitude: 33°04′59″ E), which is one of the seven councils of the Mwanza region. It is situated in the Southern part of the region. The district shares a border with Mwanza City to the North, Shinyanga rural to the South, Sengerema, and Geita region to the West Kwimba district to the East, and Magu district to the Northeast. The district covers an area of 2,553 km^2, including 2,378 km^2 of land and 175 km^2 of water from Lake Victoria. The district was established in the year 2000. The district is divided into four divisions, Misungwi, Mbarika, Inonelwa, and Usagara, comprising 50,697 households, 635 hamlets, 27 wards, 116 registered villages, and 57 healthcare facilities.

Sampling Frame

All HCWs within Healthcare Facility Rosters from Comprehensive Emergency Obstetric Care (CEmOC) health centers in Misungwi District were considered. Workers from these facilities were proposed due to the type of service provision (CEmOC) that is most likely to pose HAI which can be transmitted by the hands of HCWs containing microbes through direct contact.

Study Population

The study population included physicians, doctors, nurses, and medical laboratory technicians working at Misungwi CEmOC facilities.

Sample

The sample in each stratum (CEmOC facility) was determined using a stratified sampling technique to ensure proportional allocation under which the sizes of the samples from the different strata remained proportional to the sizes of the strata.[13] As shown in the Table 1, HCWs from different CEmOC facilities qualified for inclusion criteria.

Proportionate sampling procedure, the proportional allocation was considered because there are no difference within-stratum variances, and the purpose of sampling happened to estimate the population value of some characteristic(s).

Sample size calculations

The sample size for the study was calculated according to the methods described by Jakart et al.[13] as follows:

P_i represents the proportion of the population included in stratum I, and n represents the total sample size; the number of elements selected from stratum I is $n.\ P_i$.[13]

Size of N = 551 (study population), which is divided into 5 - strata of size N_1, = 218, N_2, = 64, N_3 = 105, N_4 = 98 and N_5 = 66

For stratum with N_1 = 142

$P_1 = N_1/N$
Then; $n_1 = n.P_1$
$n_1 = 218 \times 218/551$
$n_1 = 87$

Therefore, the same procedure was repeated to N_2, = 8, N_3 = 20, N_4 = 17, and N_5 = 8, respectively [Table 1].

The formula above shows 140 respondents, but over 10%[14] were added to cater to non-respondents or dropouts. Hence, the sample size was 154.

Table 1: Healthcare worker sample stratification.

Health facility	Population	P=N_X/N	Sample size=*n*
Misungwi District Hospital	N_1=218	0.3956	87
Bukumbi Hospital (FBO)	N_2=64	0.1161	8
Misasi Health Center	N_3=105	0.1906	20
Koromije Health Center	N_4=98	0.1778	17
Mbarika Health Center	N_5=66	0.1197	8
Total	N=551		140

FBO: Faith-based organization, N: Total population.

Sampling technique

A multistage random sampling technique was used to select eligible participants in this study.[15] This technique was used because "Five Moments " impacts every HCW in any health facility within CEmOC.[16] At the facility level, HCWs from each facility were stratified into doctors, nurses, medical laboratory technicians, and physicians. Finally, the list of HCWs in each stratum was obtained through the head of the departments, and the questionnaires were administered to the participants using simple random selection according to their sampling fraction, as indicated in Table 1.

Data Collection Procedures and Instruments

The permission from the Misungwi District Executive Director for data collection was presented to the Misungwi District Medical Officer, who subsequently informed the respective facility in-charges, introducing the researcher and research assistants. The facility in charge was instructed to cooperate and assist with the study at their facilities. At every respective facility, the researcher explained the purpose of the study and its benefits to HCWs. Data collection was conducted conveniently according to the duty roster of the particular unit/wards to maximize the response rate, and each respondent had ample time of 30–45 minutes to fill out the questionnaire. The questionnaires were collected from the respondents immediately after they had completed them to prevent the loss of the questionnaires. Furthermore, a non-participatory observational checklist for HH activities was used as an additional method to observe the practice of HCWs in complying with "Five Moments."

Data collection instruments

This included a self-administered questionnaire to assess HCWs' awareness of HH and the barriers to compliance. It also included a checklist to observe their adherence to the "Five Moments" during clinical practices. The checklist was designed following WHO recommendations and supported by literature on HH compliance, ensuring it captured critical aspects of practice.[1,2,17-20]

Pre-testing of the Tools

A sample of 14 HCWs, which is 10 (10%) from Misungwi District Hospital, was used to pre-test the tool before the actual study, but they were not included in the sample. This enabled the researcher to test the instrument to bring accurate and reliable results to the study. However, the findings from the pre-test were used to make necessary adjustments to improve the tool. Hence, after adjustment from the pre-test conducted, the same tool was administered to all participants.

Validity of Instruments

In this study, the tool's validity was achieved by reviewing all questions with the help of research experts and providing opinions on the coverage of the item of the research objectives. The comments and clarification from reviewers were taken into consideration and analyzed to ensure the validity of the tools.

Training of Research Assistants

This study recruited a research assistant with experience in data collection and research activities and good communication skills in English and Swahili. The research assistants were trained for 2 days on how to use the tools to collect data, recruit subjects, safeguard the confidentiality of the subjects, prepare reports and materials, and assess the client's needs. Furthermore, the research assistant was not from the same setting to minimize a conflict of interest.

Data Analysis

The Statistical Package for the Social Sciences version 23 was used for data entry and analysis. Data was entered, coded, and cleaned. Descriptive statistics were used to summarize sociodemographic characteristics, mainly frequency and proportion for categorical variables and mean (standard deviation) or median (Interquartile range) for continuous variables.

RESULTS

Demographic Characteristics

A total of 154 HCWs from Misungwi District CEmOC facilities participated in this study, with a response rate of 33%. The majority of the participants were female. The mean and mode for participants were 39.05 and 34.5 years, respectively. Furthermore, study results showed that 95 (61.7%) had working experiences between 5 and 10 years, while the majority, 95(61.7%) had a Diploma [Table 2].

Awareness of Moments for HH

The study found that 53.9% of HCWs had low HH awareness, while awareness of germ transmission factors varied, with 20.7% recognizing risks from jewelry or artificial nails [Table 3].

Preferences of HH Commodities among HCWs

Most HCWs, 79.88%, preferred HH using water and soap rather than alcohol hand rub. This could be influenced by personal habits, cultural norms, and perceptions of effectiveness.

Table 2: Social-demographic distribution of health care workers included in the study.

Variables	Frequency	Percentage
Gender		
Male	74	48
Female	80	52
Age		
20–29	7	4.5
30–39	93	57.8
40–49	31	20.1
50–59	23	14.9
Years of working experience		
<1 Year	0	0
1–5 Years	11	7.1
5–10 Years	95	61.7
>10 Years	48	31.2
Level of education		
Certificate	0	0
Diploma	95	61.6
Degree	56	36.4
Master	3	1.9
Cadre among health providers		
Medical lab staff	27	17.5
Doctors	41	26.6
Nurses	81	52.6
Physicians	5	3.2

Duration of Alcohol Use or Hand Rub

HCWs who reported spending standard time (1 minute) were only 23%, on the other hand, 11% reported spending a minimum of 20 seconds when using alcohol-based rub, followed by 40% who said to spend 10 seconds, and 26% used 3 seconds. An alcohol-based hand rub for at least 20 seconds is recommended for effective HH.

Compliance of HH among HCWs

The compliance rate of "Five Moments " had varying levels of adherence, with high adherence after touching body fluids (93.6%) and moderate levels after patient contact (34.65%). Compliance was low for aseptic procedures (30.4%) and patient surroundings (15.9%), with the lowest rate before patient contact (14.8%). Overall compliance averaged 37.87%, indicating a need for significant improvement [Figure 2].

Barriers and Enhancers to HH Compliance

The study identified key barriers to HH compliance, including lack of awareness (88.7%) and irregular water supply (84.8%). Enhancers included the availability of guidelines (82.5%) and a supportive environment (77.5%) [Table 4].

DISCUSSION

Knowledge of "Five Moments" among HCWs was low at 46.1%. This contrasts with findings in Jordan, where nurses scored 55.3%,[11,21,22] and in Ethiopia, where 65.9% were knowledgeable.[10,23] Common barriers to practice included

Table 3: Knowledge and perceptions of factors influencing hand hygiene compliance.

Item	Yes *n* (%)	No *n* (%)
Training received in "Five Moments for Hand Hygiene"	31 (20.1)	123 (79.9)
Infection is transmitted from patient to client	63 (40.9)	91 (59.1)
Contaminated equipment can spread infection	41 (26.6)	131 (73.4)
Contaminated hands of clinical staff can spread infection (ARP)	32 (20.7)	122 (79.3)
Increased germs were associated with wearing jewelry (rings, bangles)	32 (20.7)	122 (79.3)
Increased germs were associated with artificial fingernails	31 (20.1)	123 (79.9)
Increased germs were associated with damaged skin	74 (48.1)	80 (51.9)
Increased germs were associated with regular use of hand cream	15 (9.7)	139 (90.2)

ARP: Acute resuscitation plan, n: Sampled population.

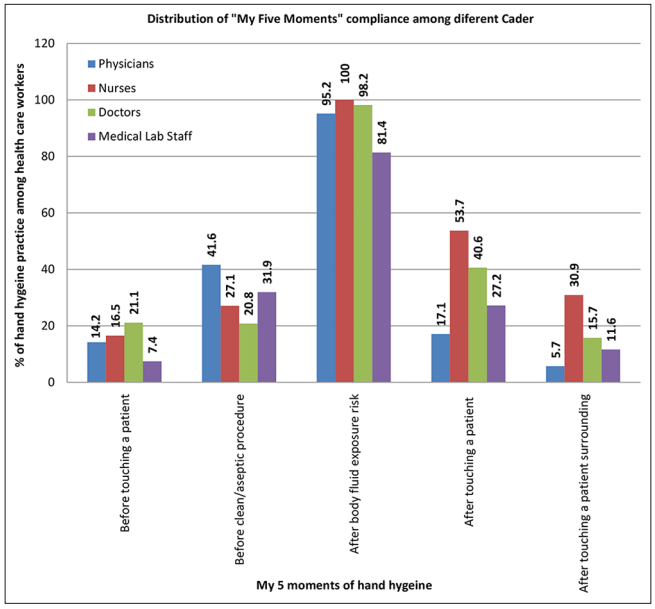

Figure 2: Distribution of healthcare workers' compliance with "Five Moments for Hand Hygiene" across cadres.

Table 4: Barriers and enhancers of HH* compliance.

Barriers	***n* (%)**
Lack of awareness regarding moments for HH	136 (88.7)
Irregular water supply for HH	131 (84.8)
Skin dryness caused by HH products	116 (75.1)
Insufficient time (high workload)	104 (68.1)
Inconvenient location of sinks/dispensers for HH	104 (67.1)
Wearing gloves	84 (54.2)
Lack of sanctions for non-compliance	79 (51.3)
Enhancers	***n* (%)**
Availability of guidelines as an HH reminder	127 (82.5)
Suitable environment that promotes HH	119 (77.5)
Room for feedback on HH products	106 (68.4)

*HH: Hand hygiene, *n*: Sample size.

insufficient hand washing supplies (42.9%), work overload (25.8%), and time constraints (31.9%). In addition, 48.1% of respondents recognized the link between damaged skin and increased germs, and 40.9% acknowledged hand-mediated infection transmission, though these findings differed from Jordanian studies. Key barriers to compliance were time limitations, skin irritation, wearing gloves, lack of awareness, and ignorance of guidelines.

Only 37.9% of HCWs adhered to the "Five Moments" guideline, higher than Nigeria's 12.2% but lower than global standards.[24,25] Compliance was highest (93.6%) after exposure to body fluids but lowest (14.8%) before patient contact. These findings mirror studies in Nigeria and Ethiopia, emphasizing the need for targeted interventions. Nurses showed higher compliance due to frequent patient interactions, aligning with findings by Chavali et al.[26]

Barriers included lack of awareness (88.7%), skin dryness (75.1%), insufficient time (68.1%), irregular water supply (84.8%), and inconvenient hand washing facilities (67.1%) as shown in Table 4. These were consistent with studies in Ethiopia and Nigeria, highlighting environmental and administrative obstacles.[19] Encouraging factors included the availability of guidelines (82.5%), a conducive environment (77.5%), and feedback mechanisms (68.4%). Similar findings in Iran highlighted the role of supportive infrastructure and education.[21,27]

Addressing barriers and reinforcing enhancers is essential to improving HH compliance by ensuring the availability of HH facilities at every point of service, as this could improve the practice. Furthermore, the Council management team should provide HH awareness and other efforts to improve these moments to protect HCWs and their clients from HAIs. The institution is recommended to facilitate an interventional study on the number of microorganisms in HCWs before and after hand washing. Health facility management recommended facilitating on-the-job training regarding infection prevention, including "Five Moments" in accordance with the WHO guidelines. Strategies include education, infrastructure development, and leadership support. A collaborative approach can promote a culture of HH, enhancing compliance, reducing infections, and improving patient safety.

CONCLUSION AND IMPLICATIONS FOR TRANSLATION

The overall "Five Moments for HH" awareness and compliance is low in Misungwi District CEmOC facilities. Hence, there is a need for continuous efforts to improve HH practices among HCWs. Implementing targeted educational programs, ensuring adequate resources, and addressing barriers will lead to enhanced compliance and, consequently, reduced healthcare-associated infections. Ultimately, promoting a culture of HH in healthcare settings will contribute to better patient outcomes and safer healthcare delivery. A comprehensive approach involving healthcare leadership, staff, and relevant stakeholders is essential to achieving sustainable HH compliance and improving patient safety.

Key Messages

It is very vital to prioritize hand hygiene in the healthcare facilities, as it will reduce healthcare associated infection among workers and patients, but of the most important, all the healthcare providers deserve to come back home safely.

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COMPLIANCE WITH ETHICAL STANDARDS

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