Student's Journal of Health Research Africa
e-ISSN: 2709-9997, p-ISSN: 3006-1059
Vol. 6 No. 5 (2025): May 2025 Issue
https://doi.org/10.51168/sc98pr45
Original Article

Compliance with hand hygiene practices among ICU healthcare workers: A prospective observational study.

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Abstract

Background

Hand hygiene is a fundamental component of infection prevention in healthcare settings. Compliance is particularly important in intensive care units (ICUs), where healthcare workers have frequent contact with critically ill patients and invasive devices.

Objective

To assess hand hygiene compliance among ICU healthcare workers and evaluate its association with professional category, WHO hand hygiene moments, and previous hand hygiene training.

Methods

A prospective observational study was conducted among 200 ICU healthcare workers at RIMS, Ranchi, from August 2024 to March 2025. One primary hand-hygiene opportunity was observed for each healthcare worker, resulting in 200 observations in total. Compliance was assessed according to the WHO Five Moments for Hand Hygiene framework. Data were analysed using descriptive statistics and the chi-square test, with $p<0.05$ considered statistically significant.

Results

Among 200 observations, appropriate hand hygiene was performed in 136 (68.0%), while 64 (32.0%) opportunities were missed. Compliance was highest among doctors (75.0%) and lowest among support staff (53.3%), although the difference between professional categories was not statistically significant ($\chi^2=5.58$, $p=0.134$). Compliance was highest before aseptic procedures (75.0%) and after body-fluid exposure (75.0%), and lowest after contact with patient surroundings (57.5%). Previous hand hygiene training was significantly associated with better compliance (73.3% vs 60.0%; $\chi^2=3.92$, $p=0.048$).

Conclusion

Overall hand hygiene compliance was moderate. Previous training was significantly associated with better compliance, highlighting the importance of regular education, monitoring, feedback, and accessible hand hygiene facilities.

Keywords: *Hand hygiene; healthcare workers; intensive care unit; infection prevention; compliance; Five Moments; hand hygiene training.*
Submitted: *March 16, 2025* ***Accepted:*** *April 20, 2025* ***Published:*** *May 20, 2025*

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Introduction

Healthcare-associated infections remain an important challenge in hospital practice and contribute to patient morbidity, mortality, prolonged hospitalization, and increased healthcare costs. The hands of healthcare workers are an important route for transmission of microorganisms between patients and the healthcare environment. Consequently, hand hygiene is regarded as one of the most fundamental measures for preventing transmission of infectious agents in healthcare settings.[1,2] The World Health Organization (WHO) provides comprehensive recommendations for improving hand hygiene practices among healthcare workers.

The WHO "Five Moments for Hand Hygiene" framework identifies five important situations requiring hand hygiene: before touching a patient, before a clean or aseptic procedure, after body-fluid exposure or risk, after touching a patient, and after touching patient surroundings.[3]

ICUs represent high-risk environments because patients frequently require invasive procedures, vascular access, urinary catheters, mechanical ventilation, and repeated clinical interventions. Healthcare workers consequently

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have frequent opportunities for hand contamination and transmission of microorganisms. Adequate hand hygiene is therefore particularly important in ICU infection-prevention programmes.

Despite its simplicity, compliance with hand hygiene recommendations is often suboptimal. Factors that may contribute to poor adherence include heavy workload, inadequate staffing, lack of convenient access to hand hygiene products, insufficient training, skin irritation, forgetfulness, and inadequate monitoring. WHO recommends a multimodal approach incorporating system change, education and training, evaluation and feedback, reminders, and an institutional safety climate.[4]

Pittet et al. demonstrated that a hospital-wide programme emphasizing hand hygiene and alcohol-based hand disinfection could improve compliance, supporting the importance of institutional interventions.[5]

However, compliance may vary among healthcare professional groups and according to the specific clinical situation. Direct observation using standardized hand hygiene indications can help identify these gaps and guide targeted interventions.

Therefore, the present study was designed to assess compliance with hand hygiene practices among ICU healthcare workers at RIMS, Ranchi, and to determine its association with professional category, WHO hand hygiene moments, and previous hand hygiene training.

Aim

To assess compliance with recommended hand hygiene practices among healthcare workers working in the ICU of RIMS, Ranchi.

Objectives

1. To determine the overall hand hygiene compliance among ICU healthcare workers.
2. To assess compliance according to the WHO Five Moments for Hand Hygiene.
3. To compare compliance among different categories of healthcare workers.
4. To determine the association between previous hand hygiene training and compliance.
5. To identify important gaps in hand hygiene practices among ICU healthcare workers.

Materials and Methods

Study Design

Prospective Observational study.

Study Setting

The study was conducted in the ICU of Rajendra Institute of Medical Sciences (RIMS), Ranchi.

Study Duration

The study duration was 8 months, from August 2024 to March 2025.

Sample Size

The sample size was calculated using the single-proportion formula, where Z was 1.96 at a 95% confidence level, p was the anticipated hand hygiene compliance of 50%, q was 1−p (0.50), and d was the absolute precision of 7%. Substitution of these values yielded a minimum sample size of approximately 196 healthcare workers. Considering feasibility and to obtain a round number, the final sample size was fixed at 200 ICU healthcare workers.

Study Population

The study population comprised ICU healthcare workers involved in patient care or activities within the ICU, including doctors, nurses, laboratory/technician staff, and support staff.

Inclusion Criteria

1. Healthcare workers posted in the ICU during the study period.
2. Healthcare workers involved in direct or indirect ICU patient-care activities.
3. Healthcare workers willing to participate in the observational assessment.

Exclusion Criteria

1. Visitors and patient attendants.
2. Administrative personnel without ICU patient-care responsibilities.
3. Healthcare workers not posted in the ICU during the observation period.
4. Individuals who declined participation.

Data Collection

A structured observation format based on the WHO hand hygiene framework was used. The observer recorded one predefined hand-hygiene opportunity for each participating healthcare worker. The opportunity was classified according to the relevant WHO hand hygiene moment.

The five moments were:

1. Before touching a patient.
2. Before a clean/aseptic procedure.
3. After body-fluid exposure/risk.
4. After touching a patient.
5. After touching patient surroundings[3]

Hand hygiene was considered compliant when the healthcare worker performed appropriate hand hygiene at the observed indication.

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Study Variables

The following variables were recorded:

1. Professional category
1. Previous hand hygiene training
1. WHO hand hygiene moment
2. Performance of hand hygiene
3. Compliance status

Statistical Analysis

Data were summarized using frequencies and percentages. Associations between categorical variables were evaluated using the chi-square test. A p-value <0.05 was considered statistically significant.

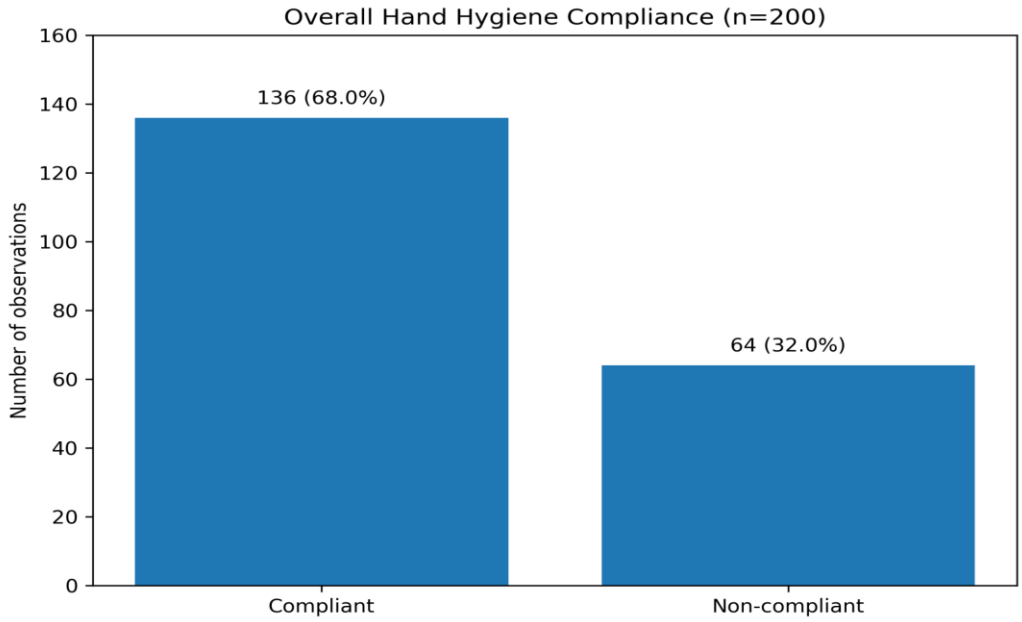
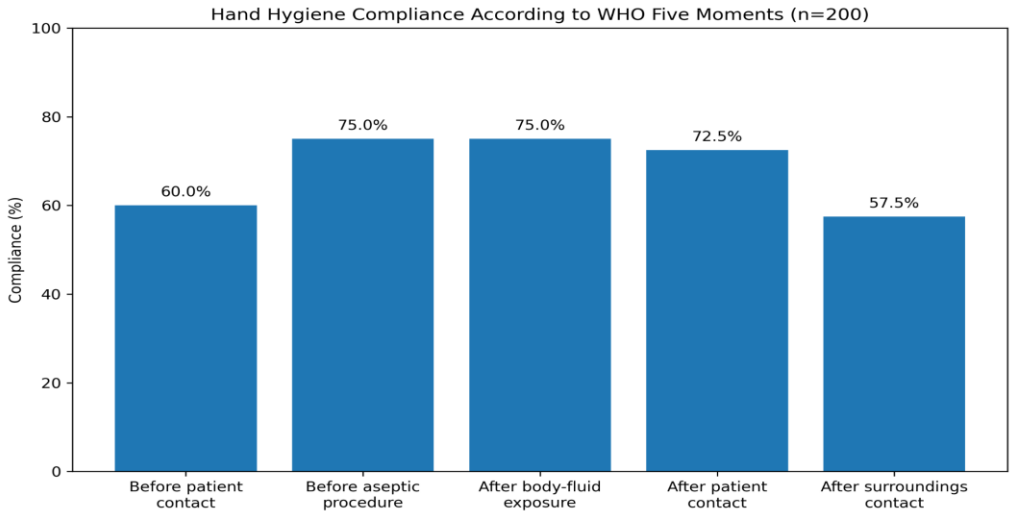


Figure 1: Overall hand hygiene compliance among 200 ICU healthcare workers, showing 68.0% compliance and 32.0% non-compliance.



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https://doi.org/10.51168/sc98pr45
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Figure 2: Hand hygiene compliance across the five WHO-defined moments among 200 observations, with the highest compliance before aseptic procedures and after body-fluid exposure and the lowest after contact with patient surroundings.

Results

A total of 200 healthcare workers were included.

Distribution of Healthcare Workers

Professional Category	Number	Percentage
Nurses	100	50.0%
Doctors	40	20.0%
Laboratory/ technician staff	30	15.0%
Support staff	30	15.0%
Total	200	100.0%

Among the 200 healthcare workers, 120 (60.0%) had received previous formal hand hygiene training, while 80 (40.0%) had not.

Overall Hand Hygiene Compliance

Of the 200 observed hand-hygiene opportunities, appropriate hand hygiene was performed in 136 (68.0%), whereas it was not performed in 64 (32.0%).

Hand Hygiene status	Number	Percentage
Compliant	136	68.0%
Non-compliant	64	32.0%
Total	200	100.0%

Thus, the overall hand hygiene compliance was 68.0%.

Compliance According to Professional Category

Professional Category	Observations	Compliant	Non-compliant	Compliance
Nurses	100	70	30	70.0%
Doctors	40	30	10	75.0%
Laboratory/ technician staff	30	20	10	66.7%
Support staff	30	16	14	53.3%
Total	200	136	64	68.0%

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Doctors showed the highest compliance (75.0%), followed by nurses (70.0%), laboratory/technician staff (66.7%), and support staff (53.3%).

The difference between professional categories was not statistically significant (χ^2=5.58, p=0.134).

Compliance According to WHO Five Moments

The 200 observations were distributed equally across the five WHO hand hygiene moments, with 40 observations per moment.

WHO Five Moments	Observations	Compliant	Non-compliant	Compliance
Before touching patients	40	24	16	60.0%
Before clean/asecptic procedure	40	30	10	75.0%
Antibody-fluid exposure	40	30	10	75.0%
After touching patient	40	29	11	72.5%
After touching surroundings	40	23	17	57.5%
Total	200	136	64	68.0%

Compliance was highest before aseptic procedures and after body-fluid exposure (75.0% each) and lowest after touching patient surroundings (57.5%).

The difference among the five moments was not statistically significant (χ^2=8.53, p=0.074).
WHO identifies these five situations as the key moments when hand hygiene should be performed.[3]

Association Between Previous Training and Compliance

Previous training	Compliant	Non-compliant	Total	Compliance
yes	88	32	120	73.3%
No	48	32	80	60.0%
Total	136	64	200	68.0%

Healthcare workers who had received previous training showed higher compliance than those without previous training (73.3% vs 60.0%).
This difference was statistically significant (χ^2=3.92, p=0.048).

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Summary of Findings

Parameters	Finding	Statistical result
Overall compliance	136/200(68.0%)	–
Doctors	75.0%	–
Nurses	70.0%	–
Laboratory /technician staff	66.7%	–
Support staff	53.3%	–
Professional category	–	X^2=5.58, p=0.134
Highest WHO moments	75.0%	–
Lowest WHO moments	57.5%	–
WHO moment	–	X^2=8.53, p=0.074
Previous training	73.3% vs 60.0%	X^2=3.92, p=0.048

Discussion

The present study assessed hand hygiene compliance among 200 ICU healthcare workers, using 200 primary observations, with one predefined observation for each healthcare worker. Overall compliance was 68.0%, indicating that hand hygiene was performed in approximately two-thirds of observed opportunities. The WHO recommends structured observation of hand hygiene behaviour.
using its standardized framework to monitor compliance and identify areas requiring improvement.[1],[3]
Compliance varied among professional groups, ranging from 53.3% among support staff to 75.0% among doctors. However, the difference was not statistically significant (χ^2=5.58, p=0.134). Differences in hand hygiene behaviour between professional categories may be influenced by workload, frequency of patient contact, training, awareness, and accessibility of hand hygiene products.
The highest compliance was observed before aseptic procedures and after body-fluid exposure, both at 75.0%. The lowest compliance was observed after touching patient surroundings (57.5%). Contact with patient surroundings represents an important hand hygiene opportunity because microorganisms may contaminate surfaces around patients. WHO specifically identifies touching patient surroundings as the fifth moment requiring hand hygiene.[3]
Compliance before patient contact was 60.0%, suggesting that opportunities for preventing microorganism transmission to patients may be missed. In contrast, better compliance after body-fluid exposure may reflect greater perception of contamination risk.
Previous hand hygiene training was significantly associated with better compliance. Trained healthcare workers demonstrated 73.3% compliance compared with 60.0% among those without previous training (χ^2=3.92, p=0.048). Although this finding cannot establish causality, it supports the importance of regular education and training. WHO recommends training healthcare workers and implementing a multimodal hand hygiene improvement programme.[4]
Pittet et al. reported that implementation of a hospital-wide programme emphasizing hand hygiene and alcohol-based hand disinfection improved compliance, demonstrating the potential value of institutional interventions.[5]
The present findings therefore suggest that improving hand hygiene requires continuous education rather than one-time training alone. Regular monitoring, feedback, visible reminders, and convenient availability of alcohol-based hand rub can complement educational interventions.
The WHO multimodal strategy incorporates system change, education and training, evaluation and feedback, workplace reminders, and institutional safety climate, providing a practical framework for improving compliance.[4]

Conclusion

The study demonstrated 68.0% overall hand hygiene compliance among 200 ICU healthcare workers. Compliance varied across professional categories and WHO hand hygiene moments, although these differences were not statistically significant. Previous hand hygiene training was significantly associated with better compliance. Regular training, monitoring, feedback, workplace reminders, and

adequate availability of hand hygiene facilities should be emphasized to improve adherence and strengthen infection-prevention practices in ICUs.

Limitations

The study was limited by its single-centre setting and relatively small sample size of 200 healthcare workers, which may restrict generalizability. Only one primary hand-hygiene observation was assigned to each participant, which may not fully represent an individual's usual hand hygiene behaviour across different shifts and clinical situations. Direct observation may also introduce a Hawthorne effect, whereby healthcare workers modify their behaviour when they are aware of being observed. The study did not evaluate other potentially important factors such as workload, staffing levels, availability of alcohol-based hand rub, skin irritation, or detailed knowledge scores.

Source of funding

No external funding received.

Conflict of interest

No Conflict of interest.

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Vol. 6 No. 5 (2025): May 2025 Issue
https://doi.org/10.51168/sc98pr45
Original Article

PUBLISHER DETAILS:

Student's Journal of Health Research (SJHR)
(ISSN 2709-9997) Online
(ISSN 3006-1059) Print
Category: Non-Governmental & Non-profit Organization
Email: studentsjournal2020@gmail.com
WhatsApp: +256 775 434 261
Location: Scholar's Summit Nakigalala, P. O. Box 701432, Entebbe Uganda, East Africa