



UNCOVERING TRENDS IN HAND HYGIENE COMPLIANCE: A MULTI-STRATIFICATION ANALYSIS FROM A TERTIARY CARE CENTRE

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ABSTRACT

Background: This study aimed to assess hand hygiene compliance using a multi-stratification approach across different healthcare worker categories, departments, and WHO's "Five Moments" for hand hygiene in a tertiary care setting.

Methods: An observational study was conducted at Sheikh Khalifa Bin Zayed Al Nahyan (SKBZN), Rawalakot, from June 2024 to December 2024. A total of 72 healthcare workers, including doctors, nurses, allied health staff, and housekeeping personnel, were observed during routine patient care. Compliance was measured according to WHO guidelines. Data were analyzed using SPSS version 26, with chi-square tests applied to explore associations between demographic and professional factors and compliance rates. **Results:** Overall compliance was moderate, with the highest adherence after exposure to body fluids (76.4%) and after patient contact (70.8%). Compliance was lowest before patient contact (47.2%) and before aseptic tasks (51.4%), with statistically significant differences across the five WHO moments ($p=0.003$). Nurses demonstrated the highest compliance (73.3%), followed by doctors (63.6%), allied health staff (50.0%), and housekeeping staff (37.5%), with significant variation by profession ($p=0.012$). Departmental analysis revealed that ICU staff had the highest compliance (82.4%), while Emergency/OPD staff had the lowest (45.5%) ($p=0.021$).

Conclusion: Hand hygiene compliance remains suboptimal, with significant differences across professions, departments, and WHO moments. Strengthening targeted training, ensuring consistent resource availability, and fostering a culture of accountability are essential for improving compliance and enhancing patient safety.

Keywords: Hand hygiene, Compliance, WHO Five Moments, Healthcare workers, Infection control, Tertiary care hospital

INTRODUCTION

Healthcare-associated infections (HAIs) continue to pose a major challenge for patient safety worldwide, contributing to increased morbidity, prolonged hospital stays, and added healthcare costs. According to the World Health Organization (WHO), proper hand hygiene is the single most effective measure to reduce the risk of HAIs, yet compliance among healthcare workers remains inconsistent across different regions and clinical settings (1-3).

Despite extensive campaigns and guidelines, global compliance rates often remain below 60%, with considerable variation depending on professional category, workload, and availability of resources (4, 5). Studies from developed countries have shown that adherence tends to be higher among nurses compared to doctors, possibly due to their direct involvement in patient care (6, 7). In contrast, in many low- and middle-income countries, barriers such as limited supplies of alcohol-based hand rub, inadequate training, and high patient turnover contribute to poor compliance (8-10).

In Pakistan, several hospital-based studies have highlighted gaps in infection prevention practices, with hand hygiene being one of the most neglected components. Previous local research indicates that compliance tends to be reactive performed more often after patient contact or exposure to body fluids rather than proactive, such as before patient contact or aseptic procedures. This reactive pattern reduces the protective impact of hand hygiene and undermines infection control strategies (11, 12). The current study was designed to investigate hand hygiene compliance at a tertiary care hospital in Rawalakot, using a multi-stratification approach. By examining compliance across healthcare worker categories, hospital departments, and the WHO's "Five Moments for Hand Hygiene," the study aimed to uncover trends that can inform targeted interventions. Findings from this work are expected to contribute to improving infection control policies and to provide context-specific recommendations for strengthening compliance in Pakistani healthcare facilities.

METHODOLOGY

This observational study was carried out at Sheikh Khalifa Bin Zayed Al Nahyan (SKBZN), Rawalakot, over a period of seven months, from June 2024 to December 2024. The study focused on assessing hand hygiene compliance among healthcare workers using a structured observational approach, based on the World Health Organization (WHO) "Five Moments for Hand Hygiene" framework. The study was approved by the Institutional Review and Ethical Committee of Sheikh Khalifa Bin Zayed Al Nahyan (SKBZN), Rawalakot prior to data collection. Written informed consent was obtained from all participants after explaining the study objectives and assuring them of confidentiality. No personal identifiers were recorded, and data were used strictly for research purposes. A total of 72 healthcare workers were enrolled in the study. The sample included doctors, nurses, allied health staff, and housekeeping personnel from various hospital departments, such as Medicine, Surgery, Pediatrics, Intensive Care Unit (ICU), and Emergency/Outpatient departments. Participants were selected using a purposive sampling technique to ensure representation from each professional category and department. Hand hygiene opportunities were recorded during routine clinical activities without prior intimation to the staff, in order to minimize the Hawthorne effect. Observations were conducted by trained investigators who had undergone orientation sessions to standardize data collection and reduce observer bias. Each healthcare worker was observed for multiple opportunities across their shift. Data were collected using a structured checklist adapted from the WHO guidelines, which included demographic details (age, gender, professional category, years of experience, and department) along with compliance indicators for each of the five recommended moments of hand hygiene.

Compliance was defined as the correct performance of hand hygiene at the appropriate moment using either alcohol-based hand rub or soap and water, with attention to duration and technique. Non-compliance was recorded when the opportunity was missed or performed inadequately. In addition, the availability of hand hygiene resources such as alcohol-based hand rubs and soap-and-water

facilities was noted during observations. All collected data were entered into SPSS version 26 for statistical analysis. Descriptive statistics were calculated for demographic variables, while categorical variables were expressed as frequencies and percentages. The Chi-square test or Fisher's exact test, where applicable, was used to evaluate associations between demographic factors, professional categories, departments, and hand hygiene compliance. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Among the 72 healthcare workers observed, the mean age was around the mid-30s, with the majority falling between 25–34 years. Female participants (55.6%) slightly outnumbered males (44.4%). Nurses represented the largest professional group (41.7%), followed by doctors (30.6%), allied health staff (16.7%), and support staff including housekeeping (11.0%). Most participants were working in medicine and ICU departments, accounting for 48.6% collectively. Staff with less than five years of work experience comprised more than half of the sample, highlighting the relatively junior workforce composition. No significant difference in age, gender, or years of experience was observed across departments ($p>0.05$).

Table 1: Demographic characteristics of healthcare workers (n=72)

Variable	Categories	Frequency (n)	Percentage (%)	p-value
Age group	<25 years	12	16.7	0.312
	25–34 years	34	47.2	
	35–44 years	18	25.0	
	≥45 years	8	11.1	
Gender	Male	32	44.4	0.226
	Female	40	55.6	
Profession	Doctors	22	30.6	0.041*
	Nurses	30	41.7	
	Allied staff	12	16.7	
	Housekeeping	8	11.0	
	Medicine	18	25.0	
Department	Surgery	14	19.4	0.067
	ICU	17	23.6	
	Pediatrics	12	16.7	
	Emergency/OPD	11	15.3	
	Years of experience			
Years of experience	<5 years	38	52.8	0.114
	5–10 years	22	30.6	
	>10 years	12	16.6	

*Significant at $p<0.05$

Out of all observed hand hygiene opportunities, compliance was highest after exposure to body fluids (76.4%) and after patient contact (70.8%), whereas the lowest compliance was recorded before patient contact (47.2%) and before aseptic tasks (51.4%). These variations were statistically significant ($p=0.003$), indicating that compliance differed across WHO's "Five Moments."

Table 2: Hand hygiene compliance by WHO Five Moments (n=72)

WHO Five Moments	Compliance (%)	Non-compliance (%)	p-value
Before patient contact	34 (47.2)	38 (52.8)	0.003*
Before aseptic task	37 (51.4)	35 (48.6)	
After body fluid exposure	55 (76.4)	17 (23.6)	
After patient contact	51 (70.8)	21 (29.2)	
After contact with surroundings	42 (58.3)	30 (41.7)	

*Significant at $p<0.05$

When stratified by profession, nurses showed the highest compliance (73.3%), followed by doctors (63.6%). Allied staff compliance stood at 50.0%, while housekeeping staff demonstrated the lowest compliance at only 37.5%. The differences were statistically significant ($p=0.012$), highlighting the role of profession in adherence to hand hygiene practices.

Table 3: Compliance across professional categories (n=72)

Profession	Compliance n (%)	Non-compliance n (%)	p-value
Doctors	14 (63.6)	8 (36.4)	
Nurses	22 (73.3)	8 (26.7)	
Allied staff	6 (50.0)	6 (50.0)	
Housekeeping	3 (37.5)	5 (62.5)	0.012*

*Significant at $p<0.05$

Compliance was highest in ICU (82.4%), followed by Pediatrics (66.7%), and lowest in Emergency/OPD (45.5%). Staff in ICU were significantly more compliant than those in general wards or outpatient departments ($p=0.021$).

Table 4: Compliance across departments (n=72)

Department	Compliance n (%)	Non-compliance n (%)	p-value
Medicine	10 (55.6)	8 (44.4)	
Surgery	8 (57.1)	6 (42.9)	
ICU	14 (82.4)	3 (17.6)	
Pediatrics	8 (66.7)	4 (33.3)	
Emergency/OPD	5 (45.5)	6 (54.5)	0.021*

*Significant at $p<0.05$

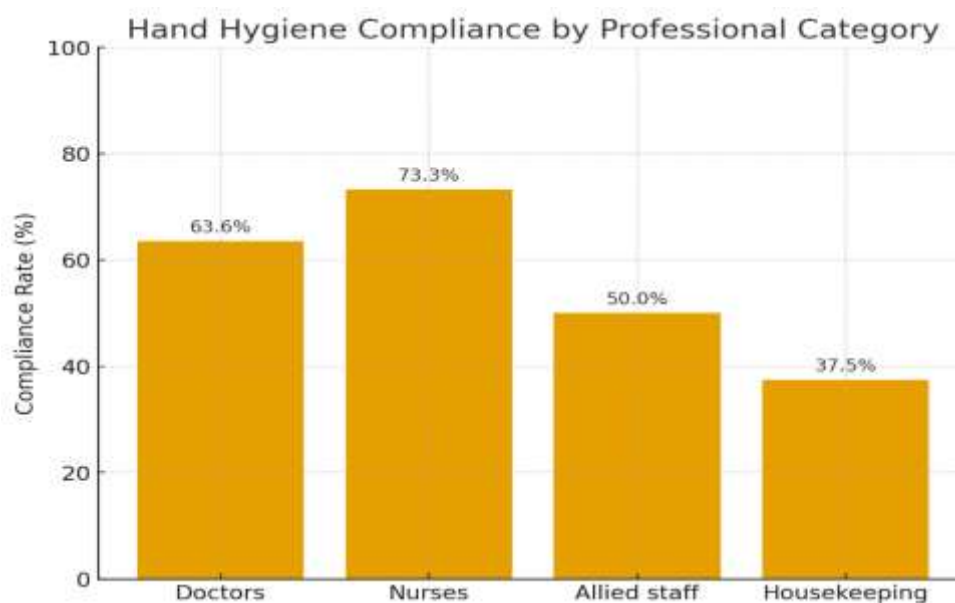


Figure 1: bar chart showing hand hygiene compliance rates by professional category.

DISCUSSION

This study explored hand hygiene compliance among healthcare workers at a tertiary care center, highlighting important differences across professional groups, departments, and the WHO's recommended "Five Moments." Overall compliance was found to be moderate, with the highest adherence observed after exposure to body fluids and patient contact, while compliance before patient interaction and aseptic procedures was noticeably lower. These findings underscore a persistent gap between awareness and consistent practice.

The results are consistent with international literature. Studies reported that healthcare workers were more likely to perform hand hygiene after patient contact or body fluid exposure than before contact, reflecting a reactive rather than preventive approach to infection control (13, 14). Similarly, a study from India observed that compliance was significantly higher after patient care activities compared to before, attributing the difference to ingrained habits and lack of reinforcement (15, 16). This pattern was also confirmed in our study, suggesting that despite growing global emphasis on infection prevention, anticipatory compliance before patient contact remains an area of weakness.

Profession-specific differences observed in this study are also supported by prior work. Nurses in our cohort demonstrated better compliance than doctors, allied staff, and housekeeping personnel. This aligns with a report from the United States where nurses consistently outperformed physicians in adherence rates, possibly due to greater bedside presence and direct patient responsibilities (17, 18). Conversely, lower compliance among housekeeping and support staff in our study mirrors findings from a study conducted in Lahore, Pakistan, which noted that non-clinical staff were often excluded from hand hygiene training sessions, leading to reduced awareness and adherence (19).

Departmental variations were also evident, with ICU staff showing the highest compliance, followed by Pediatrics, while Emergency and OPD departments lagged behind. This finding resonates with a Saudi Arabian study, where ICU units had better compliance due to stricter infection control protocols and closer supervision (20). In contrast, high patient flow and time constraints in Emergency departments were linked with poor compliance, a trend echoed in our setting as well.

Another important finding was the predominance of alcohol-based hand rub over soap and water in observed compliance, reflecting global recommendations for its convenience and efficacy. A review from the WHO emphasized that alcohol-based formulations encourage higher compliance due to reduced time and ease of use (21). However, our observations also noted variability in resource availability across departments, which may have influenced adherence.

Overall, these findings suggest that hand hygiene compliance is influenced not only by individual factors such as professional role and experience but also by systemic factors including workload, departmental culture, and resource provision. Strengthening compliance therefore requires a multi-pronged approach regular training across all staff categories, ensuring consistent availability of resources, and fostering a culture of accountability through monitoring and feedback.

CONCLUSION

This study highlights that hand hygiene compliance at a tertiary care hospital remains suboptimal, with clear variations across professional categories, departments, and the WHO's recommended moments. Nurses and ICU staff showed comparatively better adherence, while doctors, allied staff, and emergency department workers demonstrated significant gaps. Compliance was strongest after patient contact and body fluid exposure, reflecting a reactive rather than preventive practice.

The findings call for targeted interventions that go beyond general awareness campaigns. Strategies should include department-specific reinforcement, structured training for all categories of healthcare staff including non-clinical personnel and ensuring the uninterrupted availability of hand hygiene resources. Regular audits with feedback and managerial support are also critical to sustaining improvements. By addressing both behavioral and systemic barriers, healthcare facilities can strengthen hand hygiene practices, reduce healthcare-associated infections, and ultimately improve patient safety.

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