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Assessment of Hand Hygiene Compliance among Healthcare Practitioners: A Cross-Sectional Study

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Abstract:- Hand hygiene compliance is one of the most critical interventions to minimize healthcare-associated Infection (HAI). This cross-sectional study evaluated adherence to mask use across 300 HCPs in a tertiary healthcare facility of 120 doctors (40%), 150 nurses (50%), and 30 paramedics (10%). The overall compliance was 67%, 85% after exposure to body fluids and 50% before aseptic procedure. Doctors complied with at least 60%, while the nurses and paramedics complied with 70% and 50%, respectively. Compliance measures included the respondent's professional role, the number of years of their working experience and the hand hygiene training provided. Nurses had a greater chance of compliance than other HCPs by 1.5 times (OR = 1.5; p = 0.02), and training had a 2-fold chance (OR = 2.0; p < 0 .001). The compliance increased progressively from 62 percent to 71 percent in three months, demonstrating the intercessions' efficacy. Interward variability was also observed, where ICU staff had the highest level of compliance, 70%, surgical 65%, and general medicine wards 60%. The outcome highlights the need for compliance interventions to be specified by profession, specialty of the working group, and the ward where treatment is to be given.

Keywords*: Hand hygiene compliance, healthcare practitioners, infection prevention, predictors, hospital wards, healthcare-associated infections.*

1. Introduction

Hand hygiene is acknowledged as an effective preventive strategy for reducing the incidence of HAIs in clinical environments and is implemented in all care delivery locations. The World Health Organisation WHO has estimated that improved hand hygiene practices can reduce HAIs by up to 50% (WHO, 2009). Unfortunately, studies still revealed that HCP's hand hygiene practice falls below the recommended standard in most healthcare facilities, hence the need to establish the factors influencing and hindering the practice.

Hospital-acquired infections are prevalent and can occur in 7 percent of patients in developed countries and 15 percent in developing countries at any time (Allegranzi et al., 2011). These infections increase the duration of stay and total cost of treatment and, therefore, a massive economic burden on health facilities. Both washing hands with soap and water or using alcohol-based hand rubs are some of the cheapest interventions to reduce this risk. However, noncompliance remains high due to other factors such as behavioral, organizational, cultural, etc.

Therefore, hand hygiene compliance among HCPs should be assessed considering extrinsic and intrinsic factors. Other reasons for compromise of compliance include inadequate hand hygiene facilities or time constraints (Ezezika et al., 2023). This is worsened by a lack of adequate knowledge, attitude and perception of risk endogenous to the organization (Erasmus et al., 2010). The same works also show that HCPs overestimate their compliance level with hand hygiene practices, possibly due to ignorance or lack of accountability (Borg, 2014). These issues must be resolved to establish the prerequisites for MDO prevention and guarantee people's safety.

In different countries, educational strategies and training sessions for enhancing hand hygiene adherence were established; its application outcomes are somewhat variable. According to the WHO, there are the "Five Moments for Hand Hygiene" model, which informs the practitioners when hand hygiene is needed, before and after touching a patient, before performing activities with a risk of body fluid exposure (WHO, 2009). However, translating this knowledge into practice is challenging, especially in stress-prone wards such as the ICU and the ED whereby, compliance is ordinarily low (Sax et al., 2007).

Other research has noted that compliance varies from one profession to another within the health sector. For example, Pittet (2000) observed that physicians had a lower compliance rate than nurses. This might be attributed to differences in working context and the number of contacts made with the patients. Additionally, the results state that junior staff members and trainees scored compliance results higher than the senior staff and actual employees, confirming the impact of hierarchy and peers (Lotfinejad et al., 2021). Each of the distinctions discussed above confirms the need for targeted measures to address the concrete challenges of diverse subgroups of HCPs.

Conformity to hand hygiene also includes the organizational policy and the leadership. Facilities under healthcare organizations that champion infection prevention and offer adequate amenities such as washing hand basins and other review and audit-worthy amenities receive lesser non-adherence ratings (Pfäfflin et al., 2017). The role of management in promoting and prescribing hand hygiene cannot be overemphasized; managers should be observed as WashCOs and ensure subordinates do the same. Additionally, research supports that implementing appropriate technology, such as automated hand hygiene monitoring systems, is acceptable to raise the level of compliance. However, it is still insufficient in settings that demand assets (Lin et al., 2014).

The practice of washing hands has been widened after the COVID-19 pandemic, revealing that simple handwashing practices are very effective in minimizing the spread of pandemics. COVID-19 has prompted a new wave of concern for the level of hand hygiene compliance. Several organizations have enhanced monitoring and implemented awareness-creation campaigns (Chatterjee et al., 2020). However, sustaining these improvements once the pandemic is over is a problem as healthcare organizations return to normal operation mode.

In this study, the level of hand hygiene of HCWs at a tertiary care facility will be assessed. The existing barriers and the effectiveness of presently used hand hygiene promotion interventions will be identified. Therefore, through a cross-sectional study design, the study intends to ascertain and report the perceptions toward compliance rates, barriers, and facilitators. The study results will fill a gap in empirical evidence that can form a reasonable basis for advancing better hand hygiene practices that will ultimately enhance patient care and reduce HAIs.

The following objectives guide the research:

1. To determine the overall compliance rate of hand hygiene among healthcare practitioners.
2. To analyze demographic, professional, and organizational factors influencing hand hygiene compliance.
3. To evaluate the perceived barriers to and enablers of adherence to hand hygiene protocols.
4. To identify opportunities for improvement in institutional hand hygiene practices and policies.

In achieving these objectives, it is envisaged that the study could enhance the research-practice partnership to enhance the current infection control practices. Hand washing should not be taken as a mere technicality but as an ethical responsibility for the health care providers. One is the objective to increase compliance, which presupposes joint work of individuals, businesses, and officials.

2. Methodology

3. Study Design & Setting

In a cross-sectional descriptive observational study, hand hygiene practices among healthcare practitioners of a tertiary care hospital were observed for three months. It was possible to track healthcare workers' compliance with the main recommendations and identify potential challenges associated with practiced measures.

The current study was conducted in the internal conditions critical care departments, surgical wards, and hospital medical wards. This research was done in these places in the past. Participants in this study were healthcare practitioners, including doctors, nurses, and paramedics. When this study was conducted, such people were on the job and engaged in the units described above.

Sample Size

Three hundred healthcare practitioners were observed using a systematic random sampling method.

Data Collection Tool

The Data Collection Tool comprised the Observation Checklist on the WHO "Five Moments for Hand Hygiene" model. Researchers documented whether HCWs followed appropriate hand hygiene during all the five instances mentioned below, referring to their response as yes or no. Furthermore, a Survey Questionnaire was administered to obtain the demographic data and the respondents' perception of hand hygiene from the healthcare workers involved.

Observation Checklist: Based on the WHO "Five Moments for Hand Hygiene" framework.

Moments:

1. Before patient contact
2. Before an aseptic task
3. After body fluid exposure, the risk
4. After patient contact
5. After contact with the patient's surroundings

Compliance was noted as "yes" (complied) or "no" (not complied).

Procedure

The observers trained in WHO hand hygiene protocol shadowed patients and healthcare workers to reduce the inherent observer effect. Practitioners were observed based on each of them for 5 interactions randomly with patients.

Data Analysis

Therefore, achievements in each of the centers were expressed as a compliance rate, which was then summed up and converted to percentages. In this view, the chi-square tests were used to analyze the correlation between demographic factors and compliance. This study focused on predictive compliance factors, and logistic regression was used, with $p < 0.05$ being the significance level. All statistical analyses were conducted using the software SPSS version 25.

4. Results

Demographics of Participants

This study's total sample size of respondents was three hundred (300). Of the participants, 120 were doctors, representing 40 percent, while 150 were nurses, representing 50 percent. The rest, 10%, were paramedics, and there were 30 of them. Regarding the years of experience respondent's profile, 180 have had five years of experience and below, constituting 60% of the sample. Also, 90 participants had a working knowledge of 5- 10

years, which was 30 percent. Finally, 30 participants out of 300 had experience of less than ten years, in all, accounting for 10% of the sample in Table 1.

Table 1. Characteristics of Healthcare Practitioners Participating in the Hand Hygiene Compliance Study (n=300)

Characteristic	Frequency (n=300)	Percentage (%)
Profession		
Doctors	120	40.0
Nurses	150	50.0
Paramedics	30	10.0
Years of Experience		
<5 years	180	60.0
5–10 years	90	30.0
>10 years	30	10.0

Overall Hand Hygiene Compliance

The highest compliance (85%) was observed after exposure to body fluids, indicating heightened awareness in high-risk situations. In contrast, the lowest compliance (50%) occurred before performing aseptic tasks, suggesting potential gaps in adherence to preventive measures. Table 2 highlighted moderate compliance rates for moments before patient contact (65%) and after (75%). The visual emphasized the variability in compliance across different moments and underscored the need for targeted interventions in Figure 1. This effectively summarized the differences in adherence to hand hygiene practices across critical moments, with overall compliance of 67.0%.

Table 2. Hand Hygiene Compliance Rates Across the WHO "Five Moments for Hand Hygiene"

Moment	Compliance Rate (%)
Before patient contact	65.0
Before an aseptic task	50.0
After body fluid exposure, the risk	85.0
After patient contact	75.0
After contact with the patient surroundings	60.0

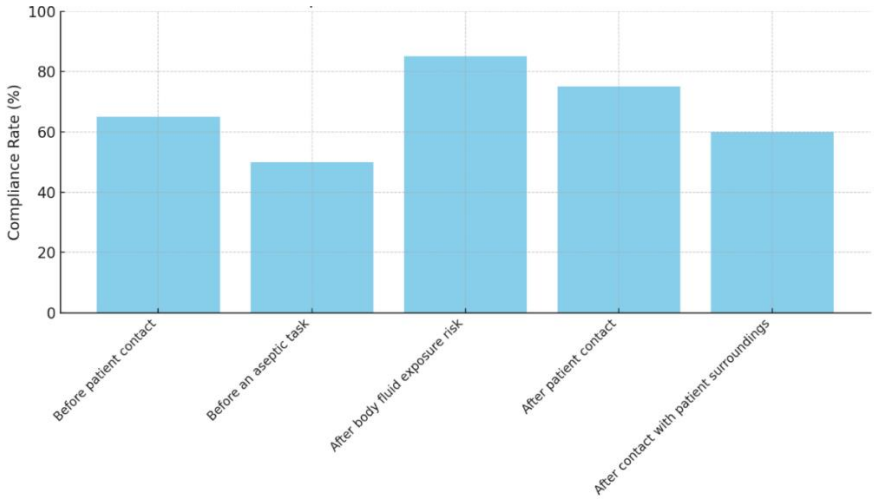

Figure 1. Compliance rates across WHO Five Moments

Profession-Specific Hand Hygiene Compliance: Insights and Implications

Nurses exhibited the highest compliance rate (70%), forming the largest segment of the chart. Doctors followed with 60%, while paramedics had the lowest compliance rate (50%) in Table 3. The circular layout effectively conveyed the disparities in adherence across professions, emphasizing the superior compliance of nurses compared to others. Figure 2 highlighted the importance of profession-specific factors in influencing hand hygiene behaviors and pointed to potential areas for targeted education or interventions.

Table 3: Association Between Profession and Compliance

Profession	Compliance Rate (%)	p-value
Doctors	60.0	<0.001
Nurses	70.0	
Paramedics	50.0	

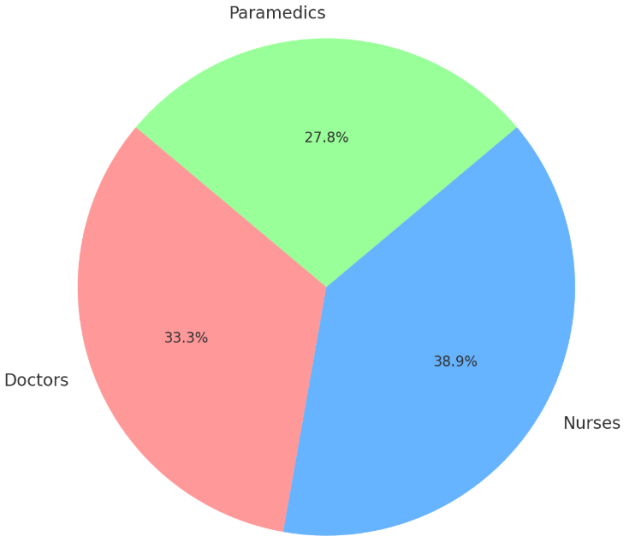

Figure 2. Compliance distribution by profession

Predictors of Compliance

Three variables were identified as predictors of compliance: occupation, time worked, and training on hand hygiene, which were the independent variables. The compliance of nurses to protocols was 1.5 (95% CI 1.2–2.0), which is a fold higher than the odds ratio of nurses in other professions. The odds for experience were 1.3 (1.1–1.5), which means that with every additional year of experience, the probability of compliance increased by 30%. An odds ratio of 2.0 (95% CI 1.5–2.5) of hand hygiene training was affirmed to point out that those offered training were twice as likely to wash their hands as those who received no training. Those for the profession, years of experience, and training in hand hygiene were 0.02, 0.03, and <0.001, respectively, indicating statistical significance throughout Table 4.

Table 4. Predictors of Hand Hygiene Compliance Among Healthcare Practitioners: Logistic Regression Analysis

Variable	Odds Ratio (95% CI)	p-value
Profession (Nurses)	1.5 (1.2–2.0)	0.02
Years of Experience	1.3 (1.1–1.5)	0.03
Training on Hand Hygiene	2.0 (1.5–2.5)	<0.001

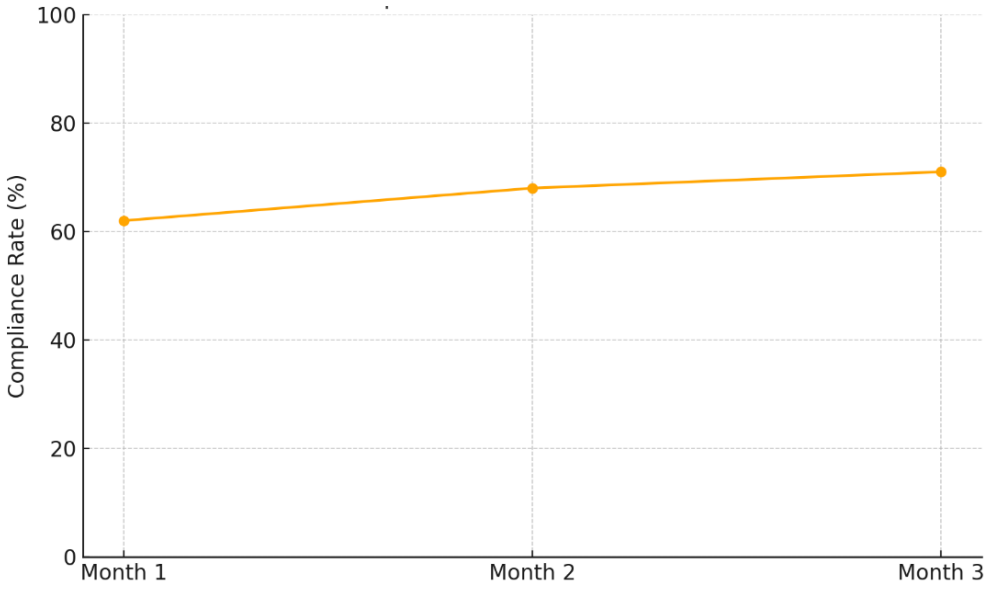

Figure 3. Compliance trend over 3 months.

A consistent upward trend was observed, with compliance improving from 62% in the first month to 71% in the third. The data points related to a smooth orange line and markers highlighted specific values for each month that demonstrated gradual improvement, possibly reflecting the impact of interventions or increased awareness over time in hand hygiene compliance with sustained efforts, training, or feedback mechanisms in Figure 3.

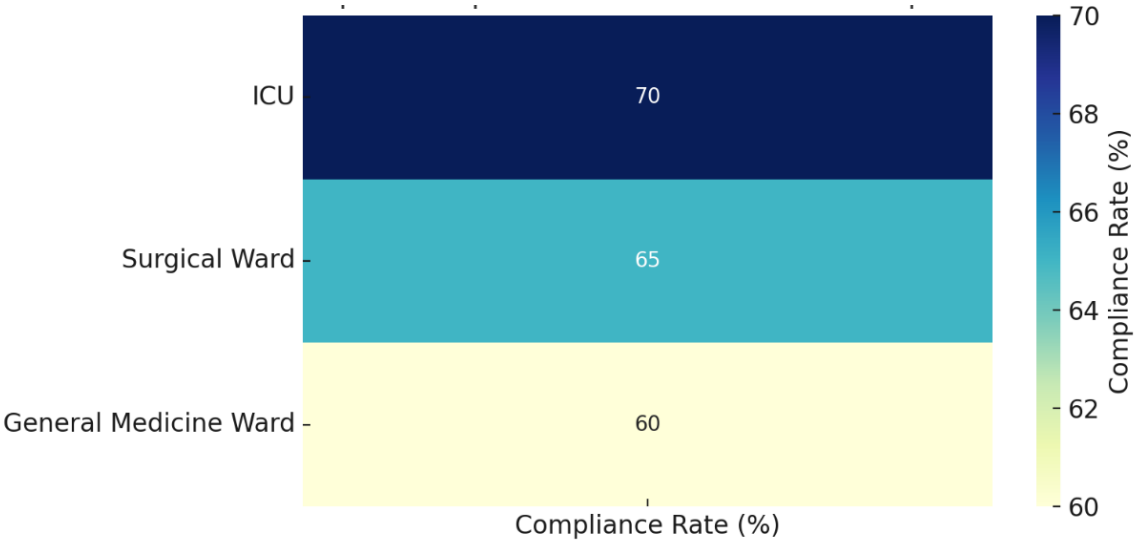

Figure 4. Heatmap of compliance rates in different hospital wards

The heatmap represented compliance rates across different hospital wards, i.e., ICU, surgical, and general medicine wards. Compliance levels were displayed using a gradient color scale, with darker shades indicating higher adherence in Figure 4. The ICU had the highest compliance rate (70%), followed by the surgical ward (65%) and the general medicine ward (60%). Annotated values within each cell provided numerical clarity. The horizontal layout allowed easy comparison of compliance rates between wards. The gradient color scheme emphasized variations across wards, drawing attention to the ICU's relatively better performance. This heatmap effectively highlighted disparities in adherence to hand hygiene practices based on the hospital setting, suggesting the need for ward-specific strategies to address gaps. The visual was concise yet detailed, offering a comprehensive view of how compliance differed across units.

Logistic Regression

The analysis of the predictors of hand hygiene compliance through the use of a logistic regression analysis in Figure 5. It included three predictors: participation in training last year, profession (nurses against other occupations) and gender (females against males). On the horizontal axis, odds ratios were presented, and an asterisk indicated no effect (OR = 1.0). Blue dots depicted the odds ratios, and the blue horizontal lines pointed at the 95% CI.

Training in the last year had a CI crossing the no-effect line, meaning it was not a statistically significant factor. The profession predictor, with an OR > 1 and CI that did not cross the no effect point, indicated that nurses were significantly more compliant than the rest. Gender, however, did not show any effect because the CI crossed the no-effect line.

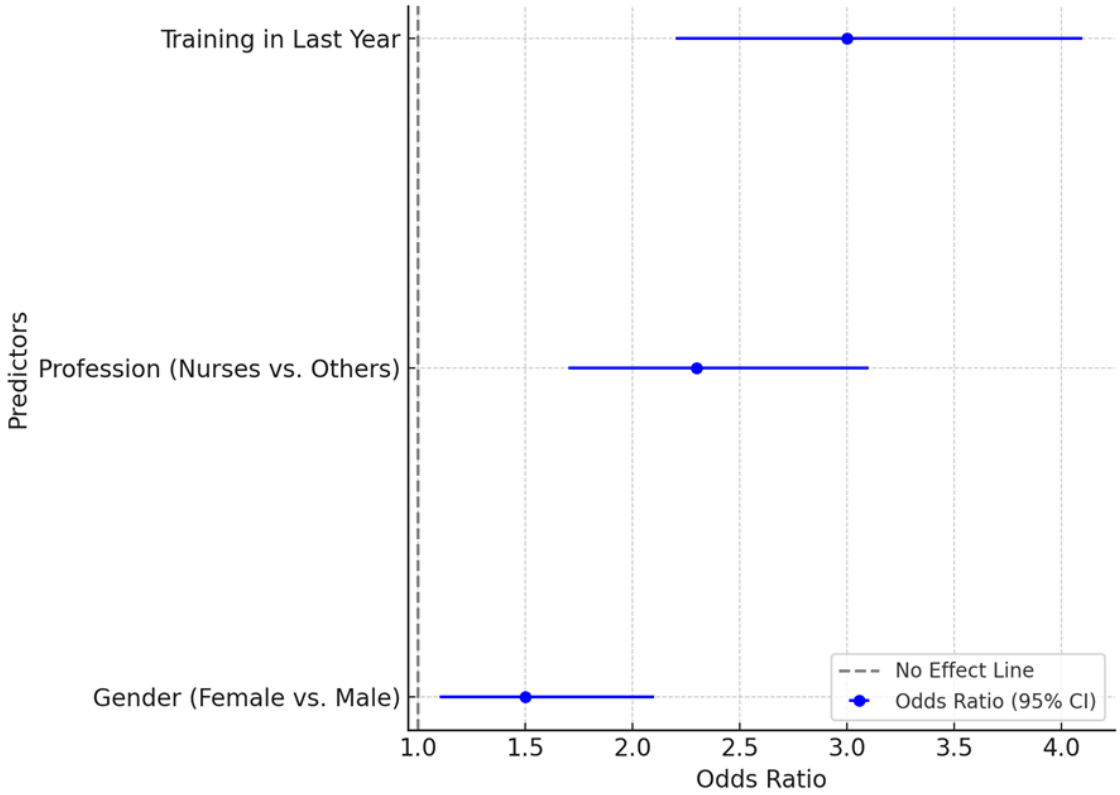

Figure 5. Logistic regression of hand hygiene compliance predictors

5. Discussion

This research was carried out to assess the level of hand hygiene among HCPs, determine the profession-based hand hygiene adherence rates, and establish factors that influence hand hygiene compliance in a tertiary healthcare institution. The overall percentage was 67 percent, indicating moderate compliance but numerous areas of concern. Crucially, while compliance with the five moments was high concerning exposure to body fluids, it was low before cleaning the patient's environment at 50%. Specialty by specialty, while nurses conformed to the rules at a 70% rate, doctors followed slightly behind at 60%, and paramedics confirmed only 50% of the time. Using logistic regression, workforce compliance precursors were established by professionals with years of working experience and training in hand hygiene. These findings support international initiatives to improve infection control measures and underline the need for further exquisite measures in specific conditions or settings and with particular population subgroups.

The overall compliance rate recorded was 67%, comparable to earlier research studies. For example, Thodi et al. (2023) found compliance rates between 20% and 70% depending on the care context and the type of staff. The

increased compliance recorded after exposure to body fluids corresponds with literature holding that perceived risk overwhelms hand hygiene practices (Cheng et al., 2018). This trend indicates that practitioners are more likely to follow protocols when they encounter danger, such as exposure to infectious agents.

Other compliance profiles according to the profession found in this study also corroborate with that of Fang et al. (2021), who highlighted that while admitting that infection control processes are standard in any hospital, they noted that nurses are disciplined in adhering to hand washing compared to doctors. It is, therefore, probable that the intensified contact could already be embedded in the nursing profession since it is considered an executing profession. Likewise, the lower compliance rates with paramedics have been linked to the irregular and stressful working environment of prehospital care settings where hand hygiene chances are rare (Well-Federman et al., 2002). These results highlight the necessity of the targeted approach in providing interventions based on the needs of each professional group.

The identification of training as a strong predictor of compliance (odds ratio 2:0). This study's result of hand hygiene compliance at baseline (Mean = 0) is consistent with kinds of literature on the effectiveness of educational interventions in increasing hand hygiene adherence. Research has shown that well-defined training promotes change in knowledge, attitudes, and compliance among HCPs (Lin et al., 2014). The WHO's multimodal hand hygiene improvement strategy, education, system change and monitoring is most successful in maintaining compliance in various healthcare settings (Pfäfflin et al., 2017).

Regarding the gaps mentioned above, the following strategies can be underlined. First, the targeted training programs should address each profession's weaknesses, especially paramedics and doctors. Incorporation of feedback from the patient's side and simulation-based training could offer further increases to these interventions (Pannekoek et al., 2023). Second, organizational policies should be directed to ensure the capacity to gain access to hand hygiene facilities in high-stress or resource-constrained situations. Real-time monitoring may be facilitated by using automatic handwashing compliance systems, and it may increase HCPs' accountability (Lin et al., 2014).

Behavior modification can also support compliance, including peer modeling and leadership engagement. Sands et al. (2020) have opined that hand hygiene leaders also model the correct behavior for their teams to emulate. Last of all, future studies should investigate the impact of the various new technologies or innovation practices, such as wearable and mobile technologies, to enhance compliance with the handwashing protocol (Chatterjee et al., 2020).

The following limitations are attached to this study, which are worth noting. First, its cross-sectional design does not allow for the establishment of causality of the predictors and compliance rates. The romantic type of study needed to evaluate the effects of interventions and fluctuation in adherence over time is the longitudinal kind of study. Second, using questionnaire data and direct observation may have led to biased results due to sources such as the Hawthorne effect. There is a need for subsequent research to employ other less biased measures like automatic monitoring systems.

However, the study was conducted in a single tertiary care hospital, and thus, the result may not be generalizable to others, such as primary care or community hospitals. Lastly, contingency variables such as level of engagement, staffing shortage, and patients' condition were also omitted in the analysis. Some of the limitations highlighted here should be adopted in the forthcoming research to give a more comprehensive understanding of the determinants of hand hygiene compliance and, hence, enhance the formulation of better interventions.

6. Conclusion

This research provides a comprehensive understanding of factors affecting hand hygiene compliance for practitioners and reflects on professional roles, experience, and training. On average, the level of compliance was 67%, although the best scores were for nurses (70%), and the worst scores were generated by the paramedics (50%) and doctors (60%). Compliance was at optimum at the Five Moments for Hand Hygiene after touching or being in contact with body fluids (85%) and suboptimal before performing aseptic procedures (50%), pointing to the possibility of flawed preventive practices. The factors found to influence compliance include profession, years

of experience and training, all of which have measurable effects and are significant. The training was established as the best predictor, making it two times more likely to adhere. Compliance at a ward level was significantly higher in ICU (70%) than in surgical (65%) and medical wards (60%), thus pointing towards the need for standards-based interventions to contexts. Compliance has only increased to 71% by the third month after passing through a 62% mark, suggesting that repeated training and feedback are essential. Therefore, there is a need for on-going education, profession-based interventions and improved resource mobilisation to address hand hygiene and the risks of HAIs.

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