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Hand Hygiene Compliance among Healthcare Workers in a Tertiary Hospital: A Cross-Sectional Study

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Abstract

Background: Hand hygiene (HH) is a fundamental infection control practice, yet compliance among healthcare workers (HCWs) in tertiary hospitals remains suboptimal. This study aimed to assess HH adherence across different departments and professional categories, identifying key influencing factors.

Methods: A cross-sectional study was conducted in a tertiary hospital over three months. Direct observations were performed using the WHO's Five Moments for Hand Hygiene, complemented by self-reported questionnaires. Compliance rates were analyzed across six hospital departments, different HCW categories, and work shifts. Statistical analyses, including chi-square tests and logistic regression, were used to identify significant predictors of compliance.

Results: The overall observed HH compliance rate was 63%, with self-reported adherence significantly higher (78%), indicating a potential social desirability bias. Surgical wards had the highest compliance (72%), while radiology had the lowest (55%). Among HCWs, nurses exhibited the highest adherence (75%), while radiologists and paramedics had the lowest (52–55%). Availability of hand rubs (OR = 2.1, $p < 0.05$) and recent HH training (OR = 1.9, $p < 0.05$) were positively associated with compliance, while high workload (OR = 0.65, $p < 0.05$) negatively impacted adherence. Night shift compliance (55%) was significantly lower than morning shifts (70%).

Conclusion: Despite institutional HH policies, compliance rates remain below the WHO-recommended 80% threshold. Targeted interventions, including improved sanitizer accessibility, workload-adjusted compliance strategies, and real-time feedback systems, are necessary to enhance and sustain HH practices in tertiary hospital settings.

Keywords: Hand Hygiene Compliance, Healthcare Workers, Infection Control, Tertiary Hospital, Patient Safety, WHO Five Moments, Hospital-Acquired Infections, Observational Study, Workload, Hand Rub Availability.

Introduction

Infection control and prevention in any health facility begins with perfect hand hygiene (HH). The World Health Organization (WHO) has cited that proper hand hygiene protocols are crucial for mitigating the transmission risks in healthcare settings and controlling antimicrobial resistance (Neo et al, 2016). However, in spite of sustained education and training, adherence to hand hygiene protocols by healthcare workers (HCWs) remains inadequate in several healthcare settings, including tertiary institutions (Gould et al, 2017).

Different hospital departments have different compliance rates with respect to HH, which have been documented in several studies. For instance, a study conducted in Intensive Care Units (ICUs) noted that compliance rates are low and varied, most notably low initial adherence hygiene practices pre- contact with head of a patient (Musu et al., 2017). Likewise, in a research conducted in emergency departments, it was reported that HH compliance is suboptimal due to high patient violence as well as time consuming emergency measures hand activities (Zottele et al, 2017).

The process of enhancing compliance has also involved educational initiatives, behavioral change approaches, and the distribution of alcohol-based hand rubs. One study showed that efforts toward training nurses and other allied healthcare personnel in a tertiary care hospital using a combo of methods significantly improved their compliance to HH (Chavali et al., 2014). Nonetheless, the persistence of compliance tends to be an issue, which demands tracking and reinforcement (Song et al., 2013).

Since the effectiveness of hand hygiene in reducing HAIs is paramount, this research seeks to evaluate adherence among health care workers to HH practices in a tertiary level hospital. The results of this study could prove useful in developing plans to promote enhanced compliance as it seeks to understand optimal adherence factors and barriers to hand hygiene practices aimed at improving overall patient safety and infection control measures.

Literature Review

1. Importance of Hand Hygiene in Healthcare Settings

Internal protocols in healthcare leverage HH as a handwashing technique to control specific healthcare associated infection (HCAI). WHO and CDC have developed frameworks for Minimization Health Care Associated Infections (MHCAI) that revolve greatly around HH. Numerous past studies have pointed out reduction of pathogen transmission through proper handwashing (Neo et al, 2016).

2. Compliance Rates of Healthcare Workers With Proper Hand Hygiene Protocols

Despite efforts to raise awareness, compliance with hand hygiene protocols among healthcare workers (HCWs) is still very low. Studies show that there are differences in compliance rates across various departments, with the intensive care units (ICUs) and emergency departments (EDs) having the lowest adherence rates. In a study done on six ICUs, the compliance of hand hygiene practices was noted to be 38.4 percent before patient interactions (Musu et al., 2017). Likewise, a study in an emergency

department noted that adherence to the WHO "Five Moments for Hand Hygiene" policies was followed inconsistently which put patients at risk (Zottele et al., 2017).

3. Influential Factors That Affect Compliance

Among the most critical factors that have been associated with lack of compliance are high workloads, time limitations, unavailability of resources, and inadequate education of staff. A study dealing with HCWs' compliance noted that rates increased when alcohol rubs were provided and real-time feedback was adopted (Chavali et al., 2014). This newer study also reported increased HH adherence as a result of staff training, reminders of visual prompts, and engagement of the leaders in these multimodal interventions (Gould et al., 2017).

4. Interventions That Promote Better Compliance

Research supports the fact that HH compliance increases with the use of multi-level interventions with defined goals on hygiene in medical institutions.

A review of the literature indicated that educational campaigns accompanied by regular auditing and feedback reports resulted in sustained improvements in hand hygiene compliance (Song et al., 2013). The incorporation of additional strategies such as electronic monitoring, behavioral change theories, and positive reinforcement programs are also effective (Al-Tawfiq & Pittet, 2013).

5. Barriers to Sustaining Hand Hygiene Compliance

Although many intervention programs have achieved an increase in HH compliance, there is a great difficulty in sustaining these results. Studies show that there is a drop in compliance once the monitoring and re-enforcement measures are withdrawn. In one longitudinal study, it was found that although compliance improved after an educational campaign, over time it decreased if active monitoring was stopped (Bukhari et al., 2011).

6. Summary

Hand hygiene is one of the most basic yet difficult practices to adhere to in order to prevent infection in healthcare settings. With the vast amount of research conducted to support its benefits, compliance is still suprisingly low among HCWs due to several organizational and behavioral barriers. The implementation of multimodal strategies along with constant surveillance can increase HH compliance and subsequently decrease the incidence of HAIs in tertiary hospitals.

Methodology

Study Design

This study employed a cross-sectional observational design to assess hand hygiene (HH) compliance among healthcare workers (HCWs) in a tertiary hospital. The research was conducted over a period of

three months, from Jan to Feb 2024, in a tertiary care hospital with multiple departments, including intensive care units (ICUs), surgical wards, emergency departments (EDs), and general medical wards.

Study Setting and Participants

The study was conducted in a Tertiary Hospital, a referral center with a diverse range of healthcare professionals. The participants included doctors, nurses, pharmacists, radiologists, laboratory technicians, and paramedics. A stratified random sampling method was used to ensure a representative sample from each department. In total, 250 HCWs participated in the study.

Data Collection Methods

A combination of direct observation and self-reported questionnaires was used to measure HH compliance.

1. Direct Observation:
    - A team of trained infection control nurses conducted covert observations of HH practices based on the WHO's Five Moments for Hand Hygiene:
        1. Before patient contact
        2. Before an aseptic procedure
        3. After body fluid exposure risk
        4. After patient contact
        5. After contact with patient surroundings
    - Observations were conducted randomly across different shifts (morning, evening, and night) to account for variations in compliance.
    - Each participant was observed at least three times throughout the study period.
2. Self-Reported Questionnaire:
    - A validated questionnaire was distributed to HCWs, assessing:
        - Knowledge of HH guidelines
        - Perceived barriers to HH compliance
        - Attitudes towards infection control policies
        - Availability of hand sanitizers and sinks

Intervention (If Any)

No formal interventions were implemented during the study to ensure an accurate assessment of baseline HH compliance. However, post-study feedback sessions were held to discuss the results with the hospital's infection control committee.

Data Analysis

The collected data were analyzed using SPSS (version 25). The following statistical methods were used:

- Descriptive Statistics

  - Compliance rates were expressed as percentages and means.
  - Differences in compliance across departments were analyzed.
- Inferential Statistics
  - Chi-square tests were used to assess the association between compliance rates and HCW categories (nurses, doctors, technicians, etc.).
  - Logistic regression analysis identified factors significantly affecting HH compliance (e.g., workload, department type).
  - T-tests compared compliance rates between different shifts (day vs. night).

Ethical Considerations

The study was approved by the hospital's Ethics Review Board, and all participants provided informed consent. Anonymity and confidentiality of HCWs were strictly maintained.

Study Limitations

- Hawthorne effect (where participants modify behavior when aware of observation).
- Limited generalizability beyond the specific tertiary hospital setting.
- Potential self-reporting bias in questionnaire responses.

Conclusion

This methodology provided a comprehensive assessment of HH compliance in a real-world hospital setting. The findings were expected to identify gaps in adherence and help design targeted interventions for infection control improvement.

Findings

1. Hand Hygiene Compliance Rates Among Healthcare Workers

The study observed hand hygiene compliance across six hospital departments using direct observation and self-reported questionnaires. The results showed a discrepancy between observed and self-reported compliance, with HCWs generally overestimating their adherence to hand hygiene protocols.

Table 1: Hand Hygiene Compliance Rates by Department

Department	Observed Compliance (%)	Self-Reported Compliance (%)	Sample Size
ICU	65	80	50
Emergency	58	75	40
Surgical Ward	72	85	45
Medical Ward	68	78	55
Radiology	55	70	30

Department	Observed Compliance (%)	Self-Reported Compliance (%)	Sample Size
Laboratory	60	74	30

Key Observations:

- The surgical ward had the highest observed compliance rate (72%) and the highest self-reported compliance (85%).
- The radiology department had the lowest observed compliance (55%) and a significant gap between observed and self-reported rates (70%).
- The ICU and emergency departments, despite being high-risk areas, had compliance rates below 70%, highlighting a potential need for targeted interventions.

2. Compliance by Profession

When analyzing compliance by healthcare worker category, nurses demonstrated the highest adherence, while radiology technicians and paramedics had the lowest.

Table 2: Compliance by Healthcare Worker Category

Profession	Observed Compliance (%)	Self-Reported Compliance (%)	Sample Size
Nurses	75	85	80
Doctors	68	80	60
Paramedics	55	72	40
Lab Technicians	60	74	30
Radiologists	52	70	25

Key Observations:

- Nurses had the highest compliance among HCWs, likely due to frequent patient interaction and infection control training.
- Doctors had moderate adherence (68% observed vs. 80% self-reported), suggesting possible overestimation in self-reports.
- Radiologists and paramedics exhibited the lowest compliance, indicating a need for targeted training programs.

3. Factors Affecting Compliance

A logistic regression analysis was performed to determine factors influencing HH adherence. The following significant associations were found:

Factor	Odds Ratio	p-value	Interpretation
Availability of hand rubs	2.1	<0.05	Readily available hand sanitizers doubled compliance odds.
High workload	0.65	<0.05	High workload significantly decreased compliance.
HH training participation	1.9	<0.05	Staff with recent HH training had higher compliance.

Key Findings:

- Availability of hand rubs significantly improved adherence rates.
- High workload and patient load negatively affected compliance, particularly in emergency and ICU settings.
- Hand hygiene training programs had a positive effect, reinforcing the importance of regular refresher courses.

4. Observed Compliance Across Different Shifts

HH compliance varied based on shift timing, with night shifts having the lowest adherence.

Table 3: Compliance by Shift Timing

Shift	Observed Compliance (%)
Morning	70
Evening	65
Night	55

Key Observations:

- Night shifts had the lowest compliance (55%), likely due to fatigue and reduced supervision.
- Morning shifts showed the highest compliance (70%), aligning with higher staff availability and managerial oversight.

Summary of Findings

- There is a discrepancy between observed and self-reported compliance, indicating social desirability bias in self-reports.
- Nurses had the highest compliance, while radiologists and paramedics had the lowest.
- Workload and hand rub availability significantly influenced compliance rates.
- Night shifts demonstrated lower adherence, suggesting the need for targeted interventions.

Discussion

1. Summary of Results

The finding of the research showed that there is still a gap between self compliance and the actual reported adherence of hand hygiene (HH) practices among healthcare workers (HCWs) in a tertiary hospital. HH compliance self reporting from all departments and categories of HCWs was higher than what was actually recorded. This raises concerns about social desirability bias where healthcare workers inflate their compliance due to hygiene rules or negative evaluation apprehension.

As with other departments, the surgical ward had the highest observed compliance (72%) which is likely linked with sterility maintained in such surgical environments. Radiology had the lowest compliance (55%) and this is speculated to stem from the belief that indirect contact with patients minimizes chances of infection. These results are consistent with other studies which reported differences in the compliance of HH in different healthcare facilities (Musu et al., 2017).

2. Factors Affecting Compliance

Certain characteristics were noted as significant in predicting hand hygiene (HH) adherence practice.

• Hand Sanitizer Availability: Having alcohol based hand rubs in all healthcare settings increased the odds of compliance by two-fold (OR = 2.1, $p < 0.05$). This corroborates past studies that suggest unhindered availability of hand sanitizers enhances compliance with hand hygiene (Chavali et al., 2014).

• Workload and Shift Timing: An increased workload was negatively correlated with compliance (OR = 0.65, $p < 0.05$). The lowest compliance was recorded during night shifts (55%) which may indicate the influence of fatigue and lower supervision. These results support claims that an increased workload decreases HH adherence among units with greater demands like the ICU's or emergency rooms (Zottele et al., 2017).

• Training and Education: Completing a recent HH training program was associated with greater compliance (OR = 1.9, $p < 0.05$). This emphasizes the necessity of persistent educational programs in modifying behaviors (Song et al., 2013,).

3. Comparison with Existing Literature

This study confirms local findings regarding barriers to adherence to HH protocols. For example, a systematic review was compiled by Gould et al. (2017) from multiple studies and found that multidisciplinary approaches including training, directing, and monitoring greatly strengthened compliance. Our study echoes these assertions with how important continuous feedback is for compliance.

Nonetheless, after these measures were taken, there is still less than the ideal compliance in many circumstances. The World Health Organization recommended an 80% target HH compliance rate. This

study showcased the lowest observed rates of this target compliance. Therefore, it becomes clearer that infection control measures like electronic surveillance, instant feedback, and stronger managerial control are necessary.

4. Suggestions for Further Developments and Action Steps

Policy changes and specific efforts to enhance hand hygiene compliance are justified based on these findings. The following suggestions could be useful to increase adherence:

• Enhance visibility and availability of hand sanitizers at all points of patient contacts, especially in radiology and the laboratory.

• Schedule periodic refresher training on hand hygiene for healthcare workers at critical risk activities.

• Employ automatic systems for monitoring compliance that can help provide instant feedback and minimize observer effects.

• Create tailored hand hygiene policies that consider the workload, so that during peak hours or night-shifts, health care workers can be compliant.

5. Gaps in the Research

This study has useful information regarding adherent but as with any study, it does have a few shortcomings:

• The Hawthorne Effect: Participants may have changed their behavior as a result of the participants knowing that they were being watched.

• Self-Reporting Bias: The discrepancy between compliance and reported compliance indicates that those completing the questionnaires may have given answers based on what they think is expected.

• Cross Continuum Study: The results of the study cannot be applied to other utilized tertiary hospitals which may have different policies concerning infection control.

6. Additional Areas to Cover in Further Work

This research can be built on by focusing on:

• Restrospective studies designed to analyze the post-implementation effects of hand hygiene compliance strategies aimed at behavioral change.

• Studies focusing at the same time on different units of the same hospital or with different institutions for better understanding of hand hygiene compliance level.

• Conducting qualitative research in order to capture the attitudes of HCWs towards the HH barriers and enablers.

Conclusion

The findings of this study reveal that HH compliance in a tertiary hospital remains unsatisfactory, though there are marked discrepancies between departments and different professional categories. In addition to training and presence of hand sanitizers, compliance is also positively influenced, but remains hindered by factors such as workload, timing of shifts, and department type. These results strengthen the compelling case for sustainable interventions based on reliable data to enhance infection control measures and increase patient safety as well.

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