



Original Article



Awareness and Preventive Practices Regarding Hospital-Acquired Infections among Medical Staff in Tertiary Care Hospitals: A Descriptive Cross-Sectional Questionnaire-Based Study

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ABSTRACT

Hospital-acquired infections (HAIs) continue to be a major public health threat, leading to significant morbidity, mortality, and health care expenditures worldwide. They have been linked to extended hospital stays and increasing antimicrobial resistance. Doctors, nurses, and other medical personnel are IPC actors because of their regular interactions with patients and protocol implementation responsibilities. **Objectives:** To assess IPC awareness, adherence to preventive measures, and challenges to effective implementation. **Methods:** This descriptive cross-sectional survey was conducted from January to May 2025 in three private tertiary care hospitals. 220 registered medical staff were administered a validated structured questionnaire consisting of a set of questions related to demographics, knowledge items, self-reported practices, and perceived barriers. SPSS 25 software was used for data processing and descriptive statistics, and Pearson correlation was used to examine the relationship between awareness and practice scores. **Results:** The following criteria were applied to classify scores as 'good' ($\geq 75\%$), 'moderate' (50-74%) or 'poor' ($< 50\%$). These thresholds were chosen because they are consistent with the literature and help to compare the results of different studies. **Conclusions:** There is a significant discrepancy between knowing and doing. We recommend strengthening IPC education, systematic competency audits, and policy adjustments to ease workload and strengthen institutional support for IPC to enhance awareness and preventive practices among Medical Staff.

INTRODUCTION

HAIs, also known as healthcare-associated infections, are infections people may get while in the hospital that they didn't have when they first went in. These infections cause a significant clinical burden, prolonging hospital stay and raising morbidity and mortality in the world [1, 2]. The IPC guidelines [3] (World Health Organization [WHO] guidelines on core components of infection prevention and control programs, 2016) give a strong focus on hand hygiene, aseptic techniques, environmental cleaning, and personal protective equipment (PPE) use for effective prevention.

Medical staff (doctors, nursing staff, and other health care workers) see patients every day and have a direct relationship with them and are primarily responsible for taking infection control measures. This puts them in a position to either prevent transmission of infection or, if practice drops, they become a contributing factor to infections. It has been found that there is a correlation between medical staff knowledge of IPC and HAI reduction [4, 5], but in practice there are often gaps between this theoretical knowledge and implementation [6]. There have



been several studies reporting a moderate to high level of general knowledge among medical staff [7, 8] and inconsistent general practice of preventive measures [9]. These discrepancies have been associated with having a heavy workload and lack of continuous learning [10, 11] and limited resources [12], suggesting the need to evaluate knowledge and practice in health care disciplines. These gaps are relevant to designing interventions aimed at boosting awareness and compliance. Medical staff at all levels should be supported by continuous training, standardizing competency assessment, and institutional support to enhance the implementation of IPC practice, which could help to lessen the burden of HAI transmission in the future [13–14]. Scores were classified as 'good' ($\geq 75\%$), 'moderate' (50–74%), and 'poor' ($< 50\%$) based on established criteria adapted from previous IPC studies [15–17]. Local studies from Pakistan, such as those conducted in Lahore [16] and tertiary care hospitals [17], have reported similar knowledge-practice gaps among healthcare workers, highlighting the need for region-specific interventions. While reported knowledge and practices of healthcare workers on infection prevention and control (IPC) exist, there is limited evidence from Pakistani tertiary-care hospitals that investigates the knowledge, preventive practices, and perceived barriers to IPC implementation across different types of healthcare workers.

Although IPC guidelines have been developed, HAIs are still a significant problem. Healthcare workers have sufficient knowledge of infection prevention, but compliance with recommended infection prevention measures is low, partly because of organizational factors, including too much work and a lack of training, as well as institutional support. This study aims to evaluate the awareness and preventive measures among medical staff regarding HAI and to identify the challenges faced in implementing effective IPC in tertiary care hospitals. Also, to assess the level of understanding of IPC principles among medical staff, adherence to basic preventive practices (hand hygiene, PPE use, aseptic technique), and the institutional and personal challenges to adherence to IPC practices.

METHODS

The study was conducted across three private tertiary-care hospitals (Hospital A, $n = 78$; Hospital B, $n = 72$; Hospital C, $n = 70$). Participants were distributed as follows: Hospital A contributed 35.5%, Hospital B 32.7%, and Hospital C 31.8% of the total sample. Due to the relatively small number of hospitals and similar distribution, hospital-level clustering was not considered in the primary analysis from January to May 2025. Data were collected after obtaining written informed consent from all participants, in accordance with the ethical principles outlined in the

Declaration of Helsinki. A consecutive sampling technique was employed, wherein all eligible medical staff meeting the inclusion criteria during the study period were invited to participate. The sample size of 220 was calculated using the formula $n = Z^2pq/d^2$, assuming a 50% expected prevalence of good IPC knowledge (to maximize sample size), 95% confidence level ($Z = 1.96$), and 7% margin of error. A 10% non-response rate was added, yielding a target of 220 participants. Those who were out on leave or had an incomplete questionnaire were excluded. A questionnaire was constructed with a structure that was developed from previously validated questionnaires [16, 17] and expert review. It contained information about demographics, knowledge about HAIs, IPC practices (hand hygiene, use of PPE, aseptic technique), and perceived barriers. The questionnaire comprised 25 items across three domains: awareness (10 items), practice (10 items), and barriers (5 items). Each item was scored on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Three items in the awareness domain and two items in the practice domain were reverse-coded to ensure consistent scoring direction. Domain scores were calculated as the sum of item responses divided by the maximum possible score, multiplied by 100 to obtain percentages. The possible score ranges were 10–50 for awareness, 10–50 for practice, and 5–25 for barriers. The questionnaire comprised 25 items across three domains: awareness (10 items), practice (10 items), and barriers (5 items). Each item was scored on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Domain scores were calculated as the sum of item responses divided by the maximum possible score, multiplied by 100 to obtain percentages. The adapted questionnaire demonstrated acceptable internal consistency. Cronbach's alpha values were: awareness domain, $\alpha = 0.81$; practice domain, $\alpha = 0.79$; and barrier domain, $\alpha = 0.74$. These values indicate good to acceptable reliability across all domains.

SPSS 25 software was used for data processing and descriptive statistics. The normality of awareness and practice scores was assessed using the Shapiro-Wilk test. As both scores were normally distributed, a paired-samples t-test was used to compare the mean awareness and preventive practice scores obtained from the same participants. A p-value of < 0.050 was considered statistically significant.

RESULTS

Most of the participants were female, and their age was under 30 years. Nearly half had less than five years of clinical experience (Table 1).

Table 1: Demographic Characteristics of Participants (n=220)

Variables	n (%)
Gender	
Female	178 (81.0%)
Male	42 (19.0%)
Age	
<30 Years	105 (47.7%)
30-40 Years	78 (35.5%)
>40 Years	37 (16.8%)
Experience	
<5 Years	95 (43.2%)
5-10 Years	73 (33.2%)
>10 Years	52 (23.6%)
Professional Role	
Doctors	68 (30.9%)
Nurses	112 (50.9%)
Allied Healthcare Workers	40 (18.2%)

While a majority demonstrated good awareness of infection control principles, practice scores were lower, with many participants showing only moderate or poor adherence to key IPC practices (Table 2).

Table 2: Awareness and Preventive Practice Scores

Domain	Good, n (%)	Moderate, n (%)	Poor, n (%)
Awareness of IPC Principles	158 (71.8%)	42 (19.1%)	20 (9.1%)
Hand Hygiene Compliance	132 (60.0%)	54 (24.5%)	34 (15.5%)
PPE Use Adherence	124 (56.4%)	58 (26.4%)	38 (17.3%)
Aseptic Technique Compliance	118 (53.6%)	60 (27.3%)	42 (19.1%)

Values are presented as frequency (percentage) of respondents in each category

The mean awareness score was $82.4 \pm 8.7\%$, while the mean preventive practice score was $66.5 \pm 10.3\%$. The Shapiro-Wilk test indicated that both awareness ($W = 0.97$, $p = 0.120$) and practice ($W = 0.96$, $p = 0.080$) scores were normally distributed. A paired-samples t-test showed that the mean awareness score was significantly higher than the mean preventive practice score. The mean paired difference was 15.9 percentage points (95% CI: 14.53–17.27), $t(219) = 22.85$, $p < 0.001$, with a large effect size (Cohen's $d_z = 1.54$). Pearson correlation analysis further showed a moderate positive correlation between awareness and practice scores ($r = 0.42$, $p < 0.001$), indicating that higher awareness was associated with better preventive practice (Table 3).

Table 3: Perceived Barriers to Effective Infection Prevention and Control (n=220)

Perceived Barriers	n (%)
High Workload	142 (64.5%)
Lack of Continuous Training	128 (58.2%)
Limited Institutional Support	115 (52.3%)
Inadequate Availability of PPE	96 (43.6%)

Insufficient Time During Patient Care	89 (40.5%)
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Values are presented as frequency (percentage) of respondents citing each barrier; participants could select more than one option

DISCUSSION

Our results show that there are significant disparities in IPC knowledge and prevention among healthcare providers in tertiary care hospitals. An awareness score of 'good' was obtained by 71.8% of the participants, but this was not as high when participants were assessed for good adherence to preventive practices; the proportion in each assessment ranged from 53.6% for aseptic technique to 60.0% for hand hygiene. A 15.9 percentage-point difference ($p < 0.001$, Cohen's $d_z = 1.54$) is clinically meaningful and shows that mere knowledge does not ensure compliance. The positive moderate correlation ($r = 0.42$) between awareness score and practice score indicates that awareness has a role in improving practices, but the role of other factors is significant in the determination of actual practices. This is supported by the barrier analysis, which showed that the main barriers were organizational: high workload (64.5%), lack of continuous training (58.2%), and weak institutional support (52.3%). They are not gaps in knowledge but gaps in system capacity; better IPC requires structural efforts, such as appropriate staffing, more easily accessible training, and better support from the administration—not just information dissemination. Hand hygiene was the most compliant domain of practice (60.0%), with the least compliant being aseptic technique (53.6%). This variation implies that some practices may seem more labor-intensive or technologically challenging or might need to be reinforced in other ways. Therefore, specific interventions designed for the specific practices could be more effective than the general IPC training. The lack of knowledge-compliance found in the present study is in agreement with other literature that there is a gap between knowledge and compliance in other healthcare settings and professions, such as nurses, physicians, and allied health workers [18,19]. Similar trends are seen in other South Asian and developing countries, indicating an underlying system-wide problem [15, 19]. Similarly, heavy workload, lack of training opportunities, lack of institutional support, and unclear protocols have been reported as significant constraints on adherence to IPC on a global level [12, 20]. To fill this gap, we propose to shift from didactic training to simulation training, to conduct more frequent competency checks, and to provide more extensive supervision, also known to improve IPC adherence [14, 15]. The persistent challenges identified by our participants highlight the need to focus on structural changes, in addition to knowledge building, such as reducing staff-to-patient ratios, ensuring consistency of PPE availability, and institutional

accountability for IPC adherence in future interventions. Previous results showed that 94.1% of the respondents had high knowledge about nosocomial infection, and 95.9% of the respondents had high knowledge of the preventive practices against nosocomial infection. Workload, lack of equipment, and distance to preventive equipment were factors that influenced the practice of preventive. The study concluded that the health workers in the selected tertiary hospitals had good knowledge about HAI and practice, though the practice was affected by some factors [21]. Overall, 743 HCWs from different countries took part in the study, most of whom were doctors (64.9%). Data were mainly obtained from Saudi Arabia (26.78%), Iraq (25.84%), India (15.7%), the United States of America (15.2%), and Africa (Sudan, Nigeria) (13.98%). The incidence of good KAP scores among physicians, nurses, medical practitioners, and technicians was obtained as mentioned. As for experience, the KAP scores of HCWs were deemed good in categories 1-5 years, 5-10 years, 10-20 years, and >20 years [22].

This study is limited in a few aspects. One limitation is its cross-sectional design, which makes it impossible to draw causal conclusions about the relationship between awareness and preventive practices. Secondly, self-reported questionnaire information could have recall and social desirability bias. Third, the study did not include participants from other tertiary-care hospitals, and this may reduce the extent to which the results can be generalized to other hospitals. Multicenter, longitudinal studies with a broad spectrum of health care institutions are needed in the future to enhance generalizability and to examine change over time in IPC practices. To evaluate the effectiveness of simulation-based training, periodic competency assessments, and policy-level measures to decrease workload, increase institutional support, and improve access to adequate PPE for enhanced compliance with IPC, intervention-based studies should be conducted.

CONCLUSIONS

Medical staff's awareness of IPC principles was quite reasonable, but there is a significant practice gap. Structured training, regular education, and enhanced institutional support are needed to boost IPC awareness and preventive efforts in the medical community. Additional studies are needed targeting the effectiveness of education and policy initiatives for changing IPC practices across all professional groups.

Authors' Contribution

Conceptualization: LS

Methodology: LS

Formal analysis: LS

Writing and Drafting: LS, YK

Review and Editing: LS, YK

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

The authors declare no conflict of interest.

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