Knowledge and Practice of Nurses Regarding Infection Control Measures in Tertiary Care Hospital

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Abstract: *Hospital-acquired infections (HAIs) pose a significant challenge to patient safety, particularly in low- and middle-income countries like Pakistan. Nurses play a critical role in preventing these infections through adherence to infection control measures. However, gaps in knowledge and compliance remain a significant concern in tertiary care settings.* **Objective:** *This study aimed to assess the knowledge and practices of nurses regarding infection control measures in a tertiary care hospital in Lahore, Pakistan.* **Methods:** *A cross-sectional observational study was conducted among 115 registered nurses working in various departments of a tertiary care hospital in Lahore. Participants were selected using a simple random sampling technique. Data were collected through a validated self-administered questionnaire assessing demographic characteristics, infection control knowledge, and compliance with standard precautions. Descriptive and inferential statistical analyses were conducted using SPSS version 23. The chi-square and independent t-tests evaluated associations between demographic factors and infection control knowledge and practice scores. Pearson's correlation coefficient was applied to assess the relationship between knowledge and practice scores, with a significance level of $p \leq 0.05$.* **Results:** *The majority of participants were female (84.7%), aged 22-30 years (56.7%), and had 1-5 years of clinical experience (55%). Regarding infection control knowledge, 28.1% had poor knowledge, 53.8% had fair knowledge, and 18.1% had high knowledge levels. Nurses with a BSN/MSN degree had significantly higher knowledge scores ($p = 0.012$) than those with a Post-RN diploma. Infection control practices were generally better, with 91.2% of nurses demonstrating high compliance, while only 2.2% exhibited poor adherence. Female nurses had significantly higher mean knowledge ($p = 0.041$) and practice scores ($p = 0.004$) than male nurses. A positive correlation was found between higher education levels and improved knowledge and practice scores, though experience did not significantly impact practice adherence.* **Conclusion:** *While most nurses adhered to infection control practices, gaps in knowledge were evident, particularly among those with lower educational backgrounds and male nurses. Targeted training programs and continuous education initiatives are necessary to enhance knowledge and compliance with infection control guidelines. Strengthening institutional policies and ensuring resource availability could improve adherence and reduce HAIs in Pakistan's healthcare settings.*

Keywords: Nurses, Infection Control, Compliance, Nosocomial Infections, Knowledge, Healthcare Workers,

Introduction

Hospital-acquired infections (HAIs) are a significant public health concern globally, contributing significantly to increased morbidity, mortality, and financial burdens on healthcare systems. The World Health Organization (WHO) estimates that 7-10% of hospitalised patients in high-income countries and 15-20% in low- and middle-income countries (LMICs), including Pakistan, develop HAIs (1). Infection control measures are crucial in minimising the spread of infectious diseases within healthcare settings. Among healthcare workers, nurses are at the frontline of infection prevention, making their knowledge and adherence to infection control practices essential in reducing hospital-acquired infections (2).

In Pakistan, the burden of nosocomial infections remains high due to inadequate infection control policies, lack of awareness, and suboptimal adherence to standard precautions (3). Studies conducted in tertiary care hospitals in Pakistan have reported high prevalence rates of HAIs, ranging between 20-30% (4). Despite multiple national and international infection prevention guidelines, healthcare professionals' compliance remains suboptimal, particularly among nurses (5). This noncompliance is often attributed to limited access to personal protective equipment (PPE), lack of continuous education programs, and excessive workload in hospital settings (6).

Hand hygiene remains the cornerstone of infection control, with evidence suggesting that proper handwashing can reduce healthcare-associated infections by up to 50% (7). However, studies have shown that compliance with hand hygiene practices among nurses in Pakistani hospitals is inconsistent, with reported adherence rates ranging from 30% to 70% (8). Furthermore, improper sterilisation of medical equipment, inadequate waste disposal practices, and failure to use PPE effectively contribute to the increased risk of cross-infections (9).

Several studies have highlighted the impact of training and education on improving infection control practices. A survey in Lahore found that nurses who received formal infection control training had significantly higher knowledge scores ($p < 0.01$) compared to those who did not (10). Similarly, a recent systematic review indicated that regular infection control workshops and in-service training can enhance compliance rates by 40-60% (11). However, despite these findings, institutional-level infection control programs remain insufficient in many healthcare facilities across Pakistan (12).

While infection prevention is a fundamental aspect of patient care, knowledge gaps and suboptimal adherence to infection control measures among nurses continue to pose significant challenges in Pakistan. Given the high prevalence of HAIs and inconsistent compliance with infection control protocols, it is imperative to assess the current knowledge and practices among nurses working in tertiary care hospitals. This study aims to bridge the existing knowledge gaps by evaluating the infection control

practices of nurses in a major tertiary care hospital in Lahore. The findings of this study will provide evidence-based recommendations to improve infection control training programs, enhance policy implementation, and ultimately reduce the incidence of HAIs in Pakistani healthcare settings.

Methodology

The study was conducted as a cross-sectional observational study at a tertiary care hospital in Lahore, Pakistan, after obtaining ethical approval from the Institutional Review Board. The study assessed nurses' knowledge and practices regarding infection control measures. The study included one hundred fifteen nurses and was selected using a simple random sampling technique. The inclusion criteria comprised registered nurses working in various departments, including medical, surgical, and intensive care units, with a minimum of one year of clinical experience. Nurses on extended leave, those working in administrative roles, or those unwilling to participate were excluded from the study.

Data was collected using a structured self-administered questionnaire developed based on validated international guidelines for infection control. The questionnaire consisted of demographic data, knowledge assessment, and practice assessment. The knowledge section included multiple-choice questions evaluating nurses' understanding of infection prevention strategies, hand hygiene protocols, sterilisation techniques, and personal protective equipment (PPE) usage. The practice section contained questions assessing adherence to infection control guidelines, including compliance with hand hygiene, use of sterile gloves, proper disposal of biomedical waste, and handling of sharp instruments.

Before the main study, a pilot test was conducted on a small subset of nurses to ensure the questionnaire's clarity, reliability, and validity. Minor modifications were made based on the feedback. The final questionnaire was distributed to participants, who were given 20 minutes to complete it. Responses were collected and checked for completeness. Confidentiality and anonymity of participants were maintained throughout the study.

Data analysis was performed using SPSS version 23. Descriptive statistics, including frequencies and percentages, were used to summarise demographic characteristics. Mean and standard deviation were calculated for continuous variables, while categorical variables were analysed using the chi-square test. The independent t-test was applied to compare mean knowledge and practice scores across different demographic groups. Pearson's correlation test was used to determine the association between knowledge and practice scores. A p-value of ≤ 0.05 was considered statistically significant.

Results

The study assessed the knowledge and practice of infection control measures among nurses in a tertiary care hospital in Lahore, Pakistan. A total of 115 nurses participated, with the majority being female (84.7%) and aged 22-30 years (56.7%). Most nurses were married (56.1%) and held either a Post-RN (45.4%) or BSN/MSN (49.2%) degree. Most participants had 1-5 years of clinical experience (55%), while 8.3% had more than 10 years of experience.

According to the knowledge assessment, 28.1% of nurses had poor knowledge, 53.8% demonstrated fair knowledge, and 18.1% exhibited high knowledge levels regarding infection control practices (Table 2). When mean knowledge scores were compared across demographic variables, nurses aged 43-55, female nurses, and those with more than 10 years of experience had the highest scores. However, there were no statistically significant differences based on age or experience. The only significant difference in knowledge scores was found based on gender (p = 0.041), with female nurses exhibiting higher scores (Table 4).

Furthermore, nurses with a BSN/MSN degree had significantly higher knowledge scores (p = 0.012) than those with a Post-RN or other

qualifications. This suggests that higher education levels are associated with better infection control knowledge.

The majority of nurses demonstrated high adherence to infection control practices. According to the practice assessment, only 2.2% of nurses had poor practice, 6.6% had fair practice, and 91.2% had high practice scores (Table 3).

When practice scores were analysed according to demographic variables, nurses aged 22-30, female nurses, and those with less than 5 years of experience showed the highest adherence to infection control practices. However, statistically significant differences were observed only for gender (p = 0.004), with female nurses having higher mean practice scores than male nurses (Table 5).

A positive correlation was observed between higher levels of education and improved knowledge and practice scores. Nurses with a BSN/MSN qualification had higher mean knowledge scores (p = 0.012) than those with a Post-RN qualification or other degrees. Still, there was no significant difference in practice scores between education levels (p = 0.484) (Table 6).

Table 1: Demographic Characteristics of Nurses

Variable	Categories	Frequency (n=115)	Percentage (%)
Age (years)	22-30	65	56.7
	31-42	30	26.1
	43-55	20	17.4
Gender	Male	18	15.7
	Female	97	84.3
Marital Status	Married	65	56.5
	Unmarried	50	43.5
Education Level	Post-RN	52	45.2
	BSN/MSN	63	54.8
Years of Experience	1-5 years	63	55
	6-10 years	42	36.5
	>10 years	10	8.5

Table 2: Knowledge Level among Nurses

Knowledge Level	Frequency (n=115)	Percentage (%)
Poor	32	28.1
Fair	62	53.8
High	21	18.1

Table 3: Practice Level among Nurses

Practice Level	Frequency (n=115)	Percentage (%)
Poor	3	2.2
Fair	8	6.6
High	104	91.2

Table 4: Knowledge Scores by Demographic Variables

Variable	Categories	Mean Knowledge Score	P-value
Age (years)	22-30	7.2	0.091
	31-42	7.8	
	43-55	8.1	
Gender	Male	6.5	0.041
	Female	7.9	
Education Level	Post-RN	7.1	0.012
	BSN/MSN	8.5	
Experience	1-5 years	7.3	0.084
	6-10 years	7.7	
	>10 years	8.2	

Table 5: Practice Scores by Demographic Variables

Variable	Categories	Mean Practice Score	P-value
Age (years)	22-30	8.9	0.183
	31-42	9.1	
	43-55	9.4	
Gender	Male	8.2	0.004
	Female	9.3	
Education Level	Post-RN	8.8	0.484
	BSN/MSN	9.2	
Experience	1-5 years	8.7	0.215
	6-10 years	9.0	
	>10 years	9.5	

Table 6: Correlation between Knowledge and Practice Scores

Variable	Categories	Mean Knowledge Score	Mean Practice Score	P-value
Education Level	Post-RN	7.1	8.8	0.012
	BSN/MSN	8.5	9.2	0.484
Years of Experience	1-5 years	7.3	8.7	0.084
	6-10 years	7.7	9.0	0.215
	>10 years	8.2	9.5	0.183

Discussion

The findings of this study highlight significant gaps in nurses' knowledge and practices regarding infection control in tertiary care hospitals. A substantial proportion of nurses demonstrated only fair understanding of infection control measures, with 53.8% scoring in the mid-range and 28.1% having poor knowledge. These findings align with a study in Saudi Arabia, where approximately 50% of healthcare workers lacked sufficient understanding of infection control protocols (13).

When analysing infection control practices, 91.2% of nurses reported good compliance, which is higher than the 78.3% adherence rate observed in a study in Malaysia (14). This difference may be attributed to differences in training programs and institutional policies regarding infection control. However, a study in Ethiopia reported lower adherence, with only 63.5% of healthcare workers following standard precautions (15).

Gender differences were evident in our study, with female nurses demonstrating significantly higher mean knowledge scores (p = 0.041) and practice scores (p = 0.004) than their male counterparts. Similar trends were observed in a Nigerian study, where female nurses had a 15% higher compliance rate than their male colleagues (16).

Experience levels also influenced infection control knowledge and practices. Nurses with over 10 years of experience had the highest mean knowledge scores (p = 0.188), but their practice scores were lower than those with 1-5 years of experience. This is consistent with findings from a study in Pakistan, which reported that younger nurses exhibited better adherence to infection control protocols (17).

Educational background played a crucial role in infection control knowledge. Nurses with BSN/MSN qualifications had significantly higher knowledge scores (p = 0.012) than those with post-RN diplomas. This correlates with a study conducted in Yemen, where bachelor's degree nurses were found to have a 20% higher knowledge score than diploma-holding nurses (18).

The study also revealed an association between marital status and infection control practices. Married nurses reported slightly higher compliance rates than single nurses, though the difference was not statistically significant (p = 0.720). An Iranian study observed a similar pattern where married healthcare workers exhibited more consistent adherence to infection control measures (19).

The implications of these findings are significant. While training programs appear to improve infection control practices, targeted interventions are necessary to enhance knowledge among nurses, particularly those with lower educational qualifications and male nurses. Continuous professional education, regular workshops, and institutional policy reinforcement should be emphasised to bridge these knowledge gaps (20).

Despite the study's strengths, including a robust sample size and a focus on tertiary care hospitals, certain limitations must be acknowledged. The reliance on self-reported data may introduce bias, and observational studies should be incorporated into future research to validate findings.

Furthermore, hospital infection control audits can help ensure compliance with best practices (21) (22).

Conclusion

In conclusion, while compliance with infection control practices among nurses was relatively high, there remains room for improvement in knowledge dissemination, particularly among certain demographic groups. Future research should explore the impact of structured training programs and policy enforcement on long-term adherence to infection control guidelines.

Declarations

Data Availability statement
All data generated or analysed during the study are included in the manuscript.
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Approved by the department concerned. (IRBEC-KMCS-03-24)
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The authors declared the absence of a conflict of interest.

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All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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