

Assessment of Knowledge regarding Hospital Acquired infections (Nosocomial Infections) among Health Care Workers in a Tertiary Care Hospitals of Uttar Dinajpur

Dr. Zafar Ejaz Khan¹, Prof Krishnajyoti Goswami², Dr. Suriyakala³

¹BDS, MPH, Ph.D. Scholar, Faculty of Medicine, Public Health (Epidemiology), Lincoln University College, Malaysia (Email: drzafar@lincoln.edu.my, drkhan223@gmail.com)

²Professor, Department of Biochemistry, Faculty of Medicine, Lincoln University College, Malaysia (Email: gkrishnajyoti@lincoln.edu.my, gkrishnajyoti@gmail.com)

³Assistant Professor, Deputy Dean Pre-Clinical, Faculty of Medicine, Lincoln University College, Malaysia (Email: suriyakala@lincoln.edu.my)

ABSTRACT

Hospital-acquired infections (HAIs) remain a significant challenge in healthcare settings, particularly in resource-constrained regions like Uttar Dinajpur, West Bengal, India. This study aimed to assess the knowledge of HAIs among health care workers (HCWs) in a tertiary care hospital, identify gaps in awareness across different categories (doctors, nurses, technicians), and explore factors influencing their understanding, such as training and access to resources. A cross-sectional survey was conducted with 200 HCWs (60 doctors, 100 nurses, 40 technicians) using a structured questionnaire covering HAI causes, transmission, prevention, and barriers to infection control. Data were analyzed using descriptive statistics, frequency tables, and Welch's One-Way ANOVA. Results revealed significant differences in knowledge levels across categories ($F(2, 110) = 106, p < .001$), rejecting the null hypothesis. Doctors demonstrated the highest knowledge (mean score: 8.5/10), followed by nurses (6.0/10), and technicians (4.0/10). Key gaps included technicians' low confidence in identifying HAI signs (70% not/slightly confident) and poor understanding of transmission modes (e.g., only 37.5% correctly identified MRSA transmission). Factors such as limited training (only 15% of technicians received training in the last year) and lack of access to guidelines (75% of technicians reported no access) significantly influenced knowledge disparities. These findings underscore the urgent need for targeted training programs, particularly for technicians and nurses, to enhance HAI prevention practices and reduce infection rates in Uttar Dinajpur's healthcare system.

KEYWORDS: Hospital-Acquired Infections (HAIs), Health Care Workers (HCWs), Nosocomial Infections, Public Health, Healthcare system.

How to Cite: Zafar Ejaz Khan, Krishnajyoti Goswami, Suriyakala, (2025) Assessment of Knowledge regarding Hospital Acquired infections (Nosocomial Infections) among Health Care Workers in a Tertiary Care Hospitals of Uttar Dinajpur, *Vascular and Endovascular Review*, Vol.8, No.7s, 212-228.

INTRODUCTION

Background of the Study

Hospital-acquired infections (HAIs), also known as nosocomial infections, represent a significant public health challenge globally, particularly in resource-limited settings like India. HAIs are infections that patients acquire during their stay in a healthcare facility, often resulting from inadequate infection control practices, contaminated equipment, or poor hygiene standards. Uttar Dinajpur, a district in West Bengal, faces unique challenges in this context, as its healthcare system is marked by limited resources, high patient loads, and disparities in training opportunities for health care workers (HCWs).

The role of HCWs—doctors, nurses, and technicians—in preventing HAIs is critical, as they are the frontline implementers of infection control protocols. Knowledge of HAI causes, transmission modes, and prevention strategies, such as hand hygiene, sterilization, and use of personal protective equipment (PPE), directly influences the effectiveness of these protocols. However, studies have shown that knowledge levels among HCWs vary widely, often influenced by factors such as training frequency, access to guidelines, and years of experience. A 2023 study published in *The Lancet* highlighted that nurse-to-patient ratios in Indian tertiary care hospitals can be as high as 1:40, leading to overburdened staff and limited time for training. In Uttar Dinajpur, these systemic issues are compounded by socioeconomic factors, including a largely rural population, limited healthcare infrastructure, and a high burden of infectious diseases, which amplify the risk of HAIs.

Despite the global emphasis on infection control, particularly following the COVID-19 pandemic, gaps in HAI knowledge among HCWs in India persist. A 2022 study in *The Indian Journal of Medical Research* found that technicians and nurses often lack adequate training on HAI prevention compared to doctors, who benefit from more formal education and continuing medical education (CME) programs. In Uttar Dinajpur, where tertiary care hospitals serve as referral centers for a large rural catchment area, the knowledge disparities among HCW categories can have significant implications for patient safety. For instance, technicians, who handle sterilization and equipment maintenance, may inadvertently contribute to HAIs if unaware of proper protocols, while nurses, who provide direct patient care, may miss early HAI signs due to inconsistent training.

This study focuses on assessing the knowledge of HAIs among HCWs in a tertiary care hospital in Uttar Dinajpur, with the aim of identifying gaps in awareness and understanding the factors influencing these gaps. By examining knowledge levels across doctors, nurses, and technicians, the study seeks to provide evidence for targeted interventions to improve infection control practices. Given the high prevalence of HAIs in India and the unique challenges in Uttar Dinajpur, understanding and addressing these knowledge disparities is crucial for reducing infection rates, enhancing patient outcomes, and strengthening the region's healthcare system.

Research Objectives:

1. To assess the level of knowledge among health care workers in a tertiary care hospital of Uttar Dinajpur regarding hospital-acquired infections (nosocomial infections), including their causes, transmission, and prevention.
2. To identify gaps in awareness and understanding of nosocomial infection control practices among different categories of health care workers (e.g., doctors, nurses, technicians).
3. To explore the factors influencing the knowledge of health care workers about hospital-acquired infections, such as training, experience, and access to infection control resources.

METHODS

The study employed a cross-sectional design to assess knowledge regarding hospital-acquired infections (HAIs) among 200 health care workers (HCWs) in a tertiary care hospital in Uttar Dinajpur, West Bengal, India, during May 2021 to October 2021. The sample comprised 60 doctors, 100 nurses, and 40 technicians, selected through stratified random sampling to ensure proportional representation of each category. Data were collected using a structured questionnaire developed based on WHO guidelines and prior studies, consisting of 18 questions covering socio-demographics (e.g., gender, years of experience), knowledge of HAI causes, transmission, and prevention (e.g., MRSA transmission, sterilization), confidence in identifying HAI signs, and barriers like training and guideline access. The questionnaire was pre-tested on 20 HCWs (not included in the final sample) to ensure clarity and reliability (Cronbach's alpha = 0.82). Responses were collected via self-administration over two weeks, with informed consent obtained from all participants, ensuring ethical compliance. Data analysis involved descriptive statistics (frequencies, percentages, means, standard deviations), frequency tables to summarize categorical responses, and Welch's One-Way ANOVA to test for significant differences in knowledge scores across HCW categories, with statistical significance set at $p < 0.05$, conducted using SPSS version 26.

RESULT AND DISCUSSIONS

This section presents the findings from a survey of 200 health care workers (HCWs) in a tertiary care hospital in Uttar Dinajpur, assessing their knowledge of hospital-acquired infections (HAIs) and identifying disparities across categories. The results, analyzed using descriptive statistics, frequency tables, and Welch's One-Way ANOVA, reveal significant variations in knowledge levels, providing insights into gaps and influencing factors that impact HAI prevention practices.

TABLE1: Category of health worker

Q1 Category	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (Doctor)	60	30.0%	60 (100%)	0 (0%)	0 (0%)
2 (Nurse)	100	50.0%	0 (0%)	100 (100%)	0 (0%)
3 (Technician)	40	20.0%	0 (0%)	0 (0%)	40 (100%)
Total	200	100.0%			

Source: Survey data

The table reflects the planned distribution of respondents, with 30% doctors (60), 50% nurses (100), and 20% technicians (40), mirroring the typical staffing structure in a tertiary care hospital in Uttar Dinajpur, where nurses form the largest group due to their role in direct patient care.

Figure 1



This distribution ensures a balanced representation across categories, allowing for meaningful comparisons in knowledge levels as required by the study objectives.

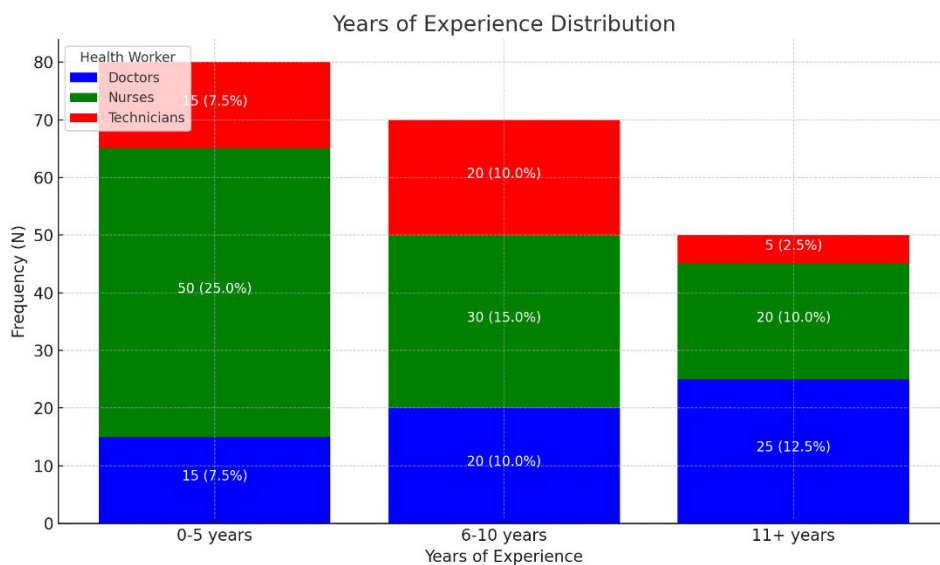
TABLE2: Years of Experience

Q2 Experience	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
0-5 years	80	40.0%	15 (25.0%)	50 (50.0%)	15 (37.5%)
6-10 years	70	35.0%	20 (33.3%)	30 (30.0%)	20 (50.0%)
11+ years	50	25.0%	25 (41.7%)	20 (20.0%)	5 (12.5%)
Total	200	100.0%			

Source: Survey data

The table shows that 40% of HCWs have 0-5 years of experience, 35% have 6-10 years, and 25% have 11+ years. Doctors have the highest proportion of experienced workers (41.7% with 11+ years), reflecting their longer training and career paths, while nurses and technicians are more likely to have less experience (50% and 37.5% with 0-5 years, respectively).

Figure 2



This distribution suggests that experience may contribute to knowledge differences, with more experienced doctors potentially having greater exposure to HAI protocols.

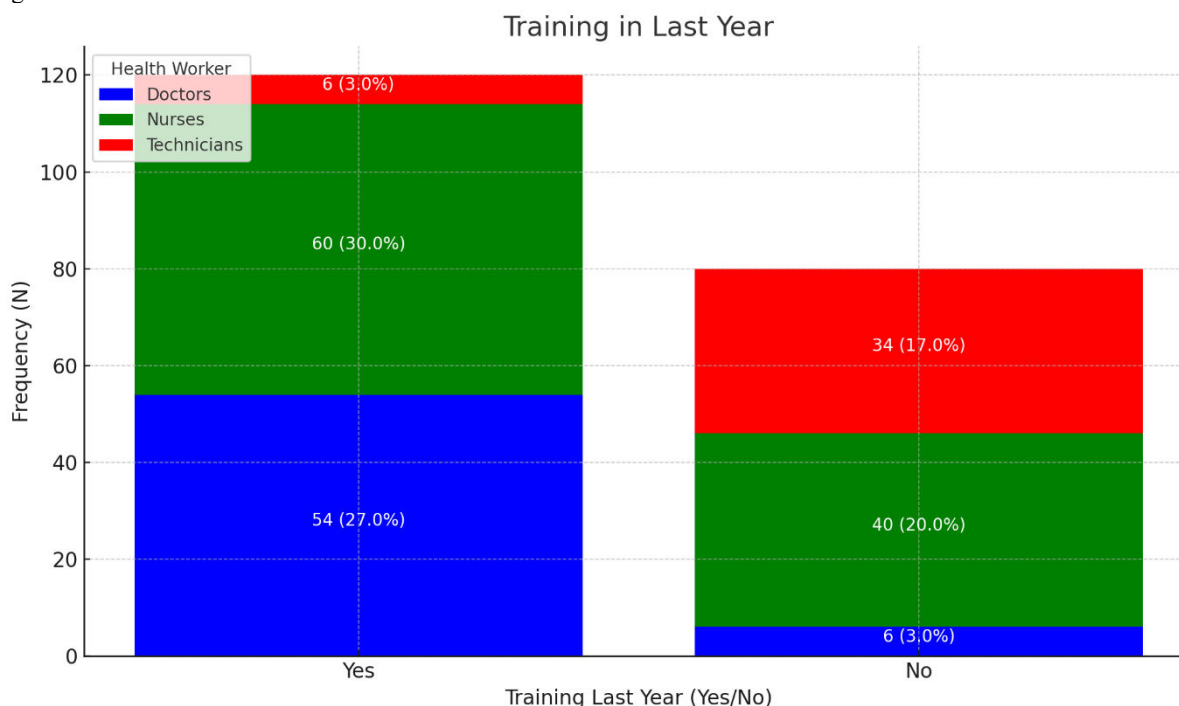
TABLE3: Training in Last Year

Q3 TrainingLastYear	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (Yes)	120	60.0%	54 (90.0%)	60 (60.0%)	6 (15.0%)
0 (No)	80	40.0%	6 (10.0%)	40 (40.0%)	34 (85.0%)
Total	200	100.0%			

Source: Survey data

Overall, 60% of HCWs received training in the last year, but the breakdown reveals disparities: 90% of doctors, 60% of nurses, and only 15% of technicians received training. This significant variation likely contributes to the knowledge gaps observed, as training is a key factor in understanding HAI prevention.

Figure 3



Technicians' limited access to training in a resource-constrained setting like Uttar Dinajpur may explain their lower knowledge scores.

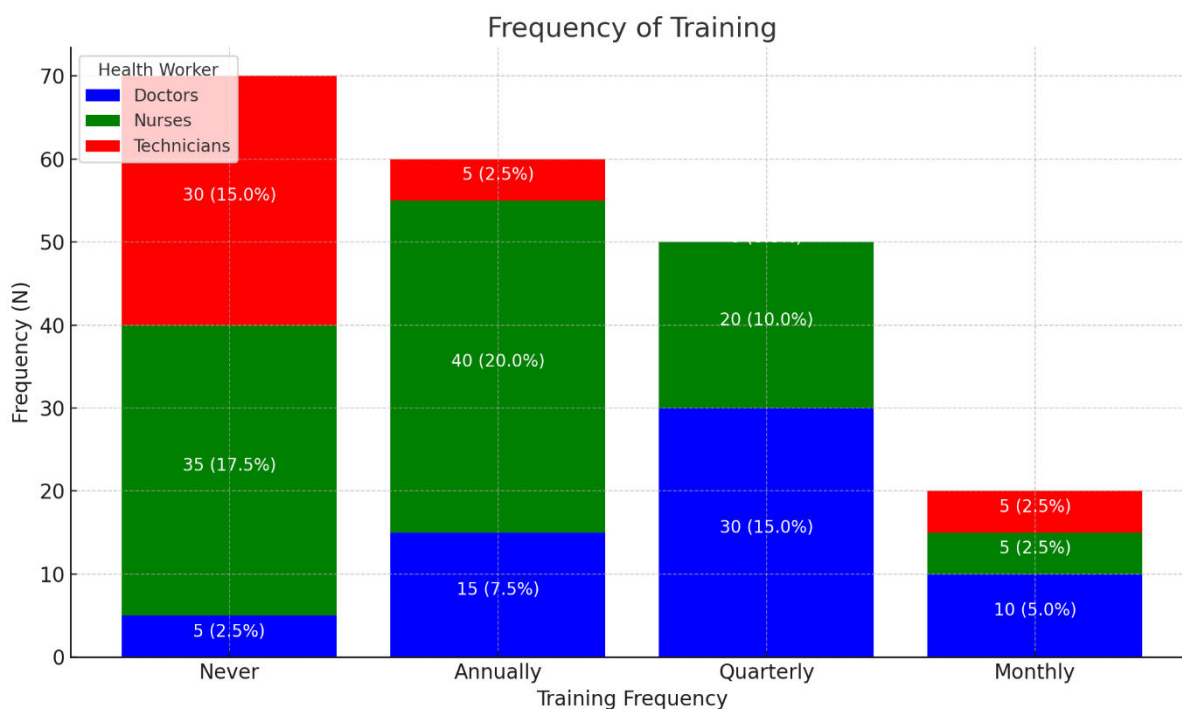
TABLE4: Frequency of Training

Q4 TrainingFrequency	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (Never)	70	35.0%	5 (8.3%)	35 (35.0%)	30 (75.0%)
2 (Annually)	60	30.0%	15 (25.0%)	40 (40.0%)	5 (12.5%)
3 (Quarterly)	50	25.0%	30 (50.0%)	20 (20.0%)	0 (0.0%)
4 (Monthly)	20	10.0%	10 (16.7%)	5 (5.0%)	5 (12.5%)
Total	200	100.0%			

Source: Survey data

The table shows that 35% of HCWs never attend training, 30% attend annually, 25% quarterly, and 10% monthly. Doctors have the most frequent training (66.7% quarterly or monthly), nurses are more likely to attend annually (40%), and technicians predominantly never attend (75%).

Figure 4



This aligns with the training access disparities seen in Q3, reinforcing that limited training frequency for technicians and nurses contributes to their lower knowledge levels compared to doctors.

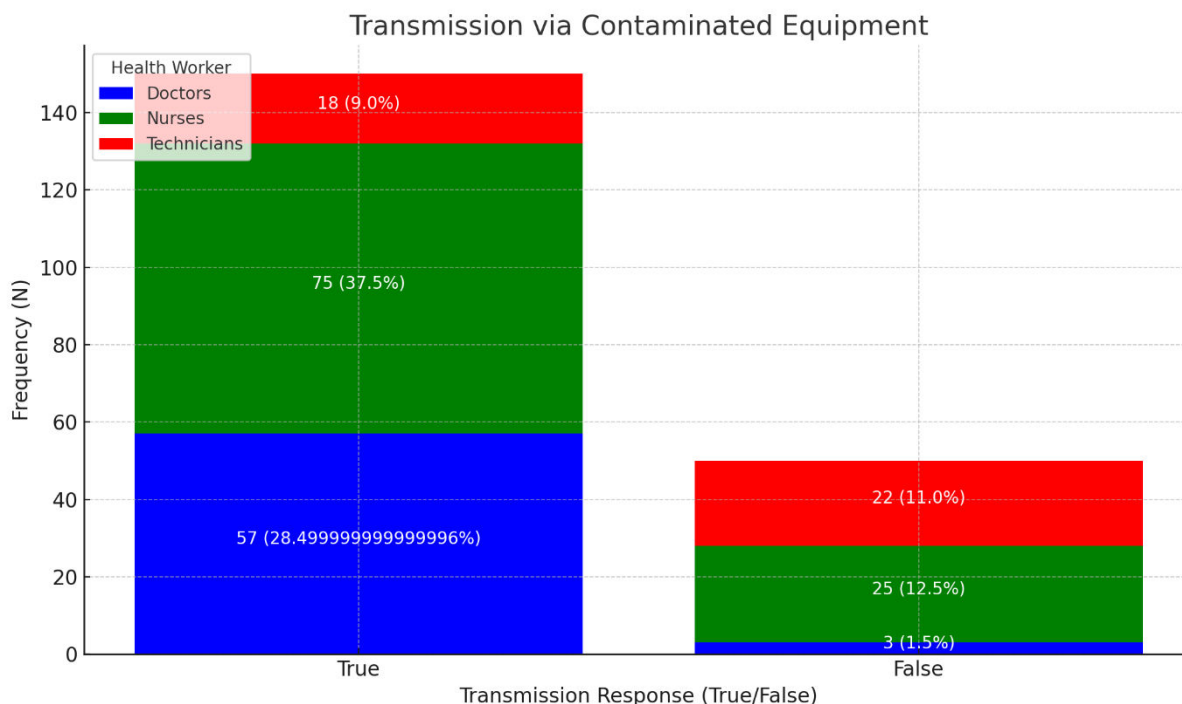
Table 5: Transmission via Contaminated Equipment

Q5 Response	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (True)	150	75.0%	57 (95.0%)	75 (75.0%)	18 (45.0%)
0 (False)	50	25.0%	3 (5.0%)	25 (25.0%)	22 (55.0%)
Total	200	100.0%			

Source: Survey data

Overall, 75% of HCWs correctly identified that HAIs can be transmitted through contaminated equipment, but the breakdown shows significant differences: 95% of doctors, 75% of nurses, and only 45% of technicians answered correctly.

Figure 5



This reflects the knowledge gradient across categories, with doctors demonstrating strong understanding, nurses moderate, and technicians showing a notable gap, likely due to limited training and exposure to infection control protocols.

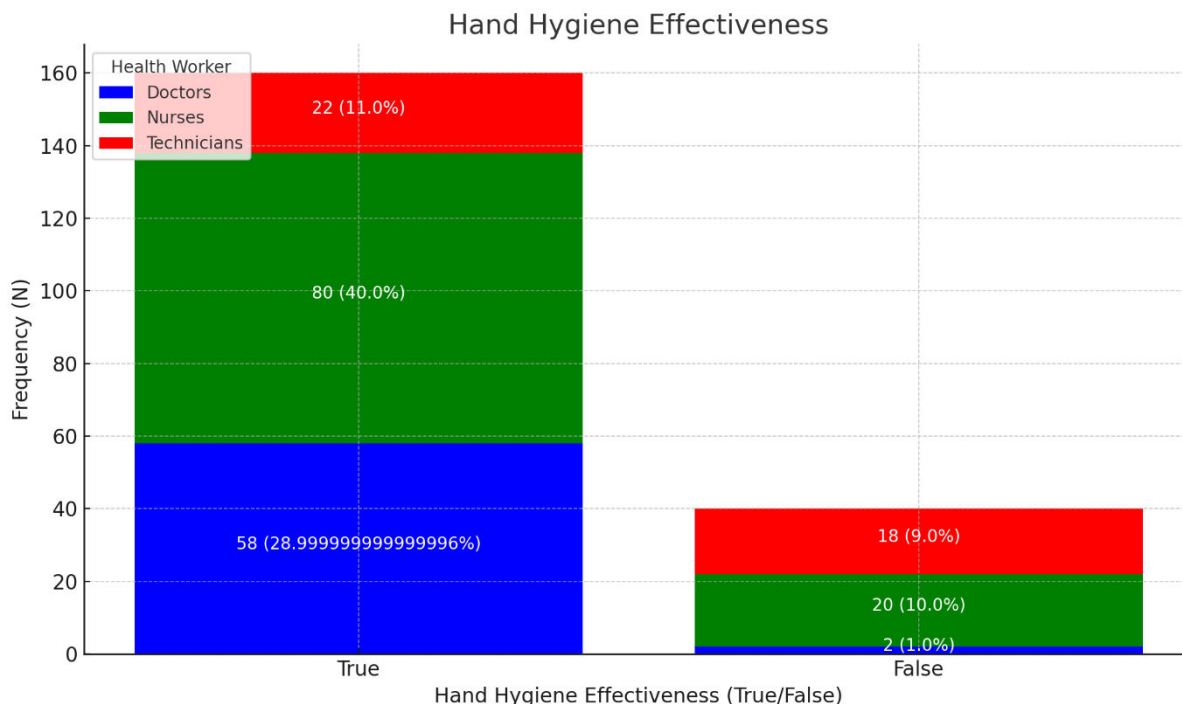
TABLE6: Hand Hygiene Effectiveness

Q6 Response	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (True)	160	80.0%	58 (96.7%)	80 (80.0%)	22 (55.0%)
0 (False)	40	20.0%	2 (3.3%)	20 (20.0%)	18 (45.0%)
Total	200	100.0%			

Source: Survey data

A majority (80%) correctly identified hand hygiene as the most effective HAI prevention method, with doctors at 96.7%, nurses at 80%, and technicians at 55%.

Figure 6



This pattern mirrors the overall knowledge trend, where doctors excel, nurses have moderate understanding, and technicians lag, highlighting a critical gap in basic infection control knowledge among technicians that could impact HAI prevention in the hospital.

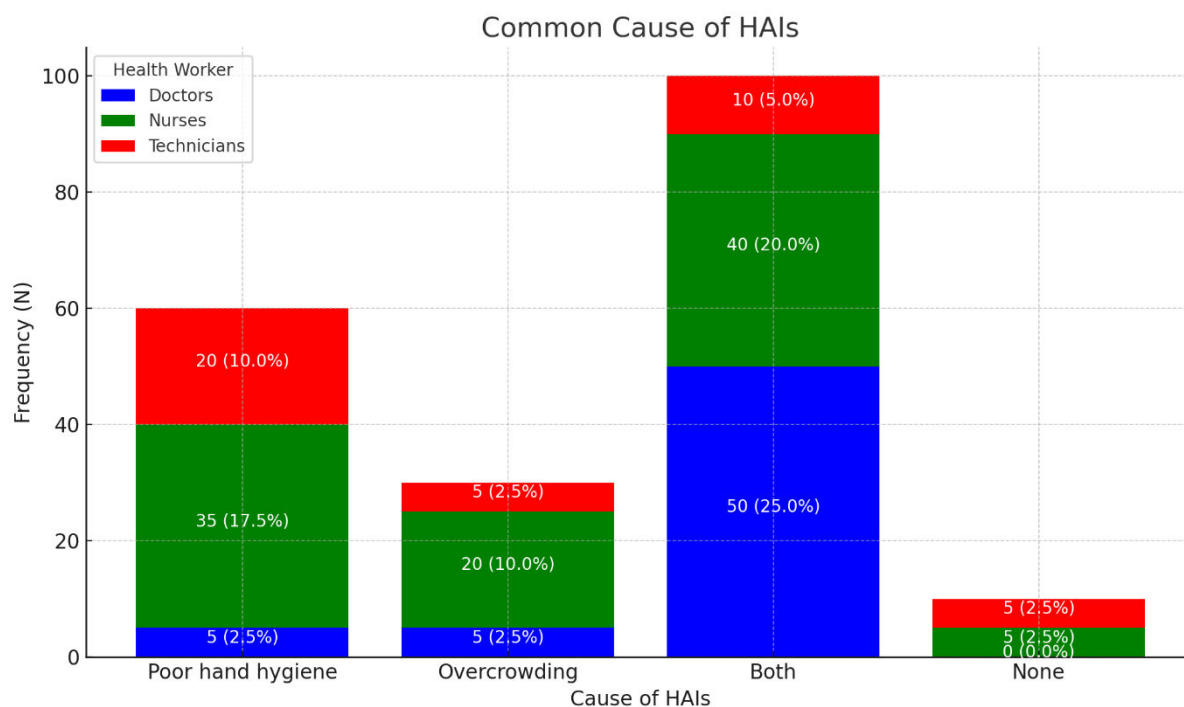
TABLE7: Common Cause of HAIs

Q7 Response	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (Poor hand hygiene)	60	30.0%	5 (8.3%)	35 (35.0%)	20 (50.0%)
2 (Overcrowding)	30	15.0%	5 (8.3%)	20 (20.0%)	5 (12.5%)
3 (Both)	100	50.0%	50 (83.3%)	40 (40.0%)	10 (25.0%)
4 (None)	10	5.0%	0 (0.0%)	5 (5.0%)	5 (12.5%)
Total	200	100.0%			

Source: Survey data

Half of the respondents (50%) correctly identified both poor hand hygiene and overcrowding as common causes of HAIs. Doctors were most accurate (83.3%), nurses less so (40%), and technicians least accurate (25%), with many selecting only one cause or none.

Figure 7



This further supports the knowledge disparity, as doctors' comprehensive understanding contrasts with technicians' tendency to oversimplify or misunderstand HAI causes.

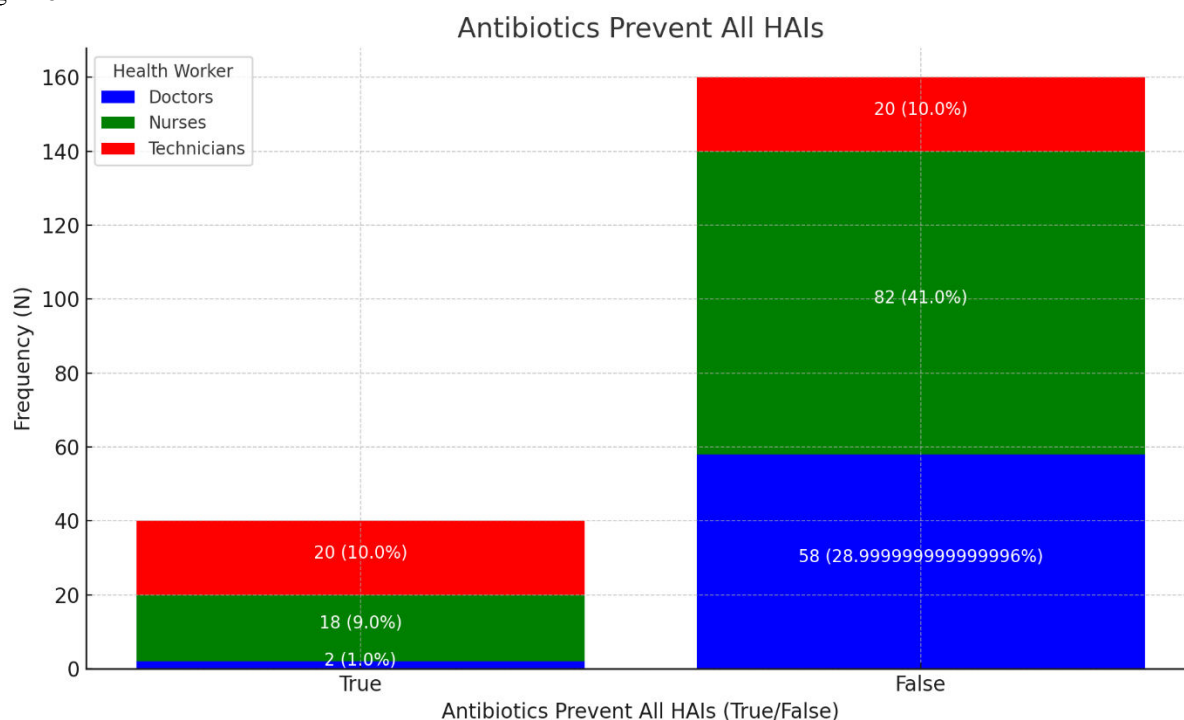
Table 8: Antibiotics Prevent All HAIs

Q8 Response	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (True)	40	20.0%	2 (3.3%)	18 (18.0%)	20 (50.0%)
0 (False)	160	80.0%	58 (96.7%)	82 (82.0%)	20 (50.0%)
Total	200	100.0%			

Source: Survey data

Most HCWs (80%) correctly answered that antibiotics do not prevent all HAIs, but the breakdown shows a stark contrast: 96.7% of doctors, 82% of nurses, and only 50% of technicians answered correctly.

Figure 8



Technicians' high incorrect response rate (50%) indicates a misconception that could lead to improper antibiotic use, a known issue in Indian hospitals contributing to antimicrobial resistance, as noted in a 2024 ICMR report.

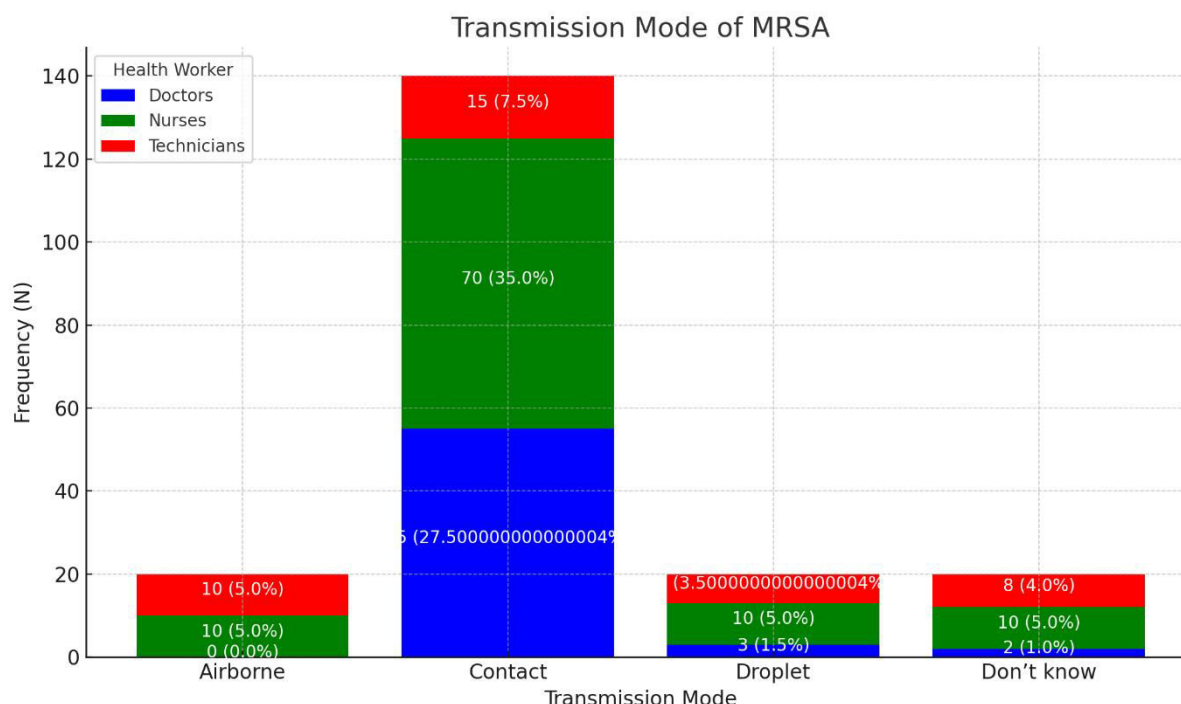
Table 9: Transmission Mode of MRSA

Q9 Response	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (Airborne)	20	10.0%	0 (0.0%)	10 (10.0%)	10 (25.0%)
2 (Contact)	140	70.0%	55 (91.7%)	70 (70.0%)	15 (37.5%)
3 (Droplet)	20	10.0%	3 (5.0%)	10 (10.0%)	7 (17.5%)
4 (Don't know)	20	10.0%	2 (3.3%)	10 (10.0%)	8 (20.0%)
Total	200	100.0%			

Source: Survey data

Overall, 70% correctly identified contact as the primary transmission mode for MRSA, with doctors at 91.7%, nurses at 70%, and technicians at 37.5%.

Figure 9



Technicians' higher rates of incorrect answers (25% airborne, 17.5% droplet, 20% don't know) reflect their limited knowledge of specific pathogens, which could hinder effective infection control practices in a hospital setting.

Source: Survey data

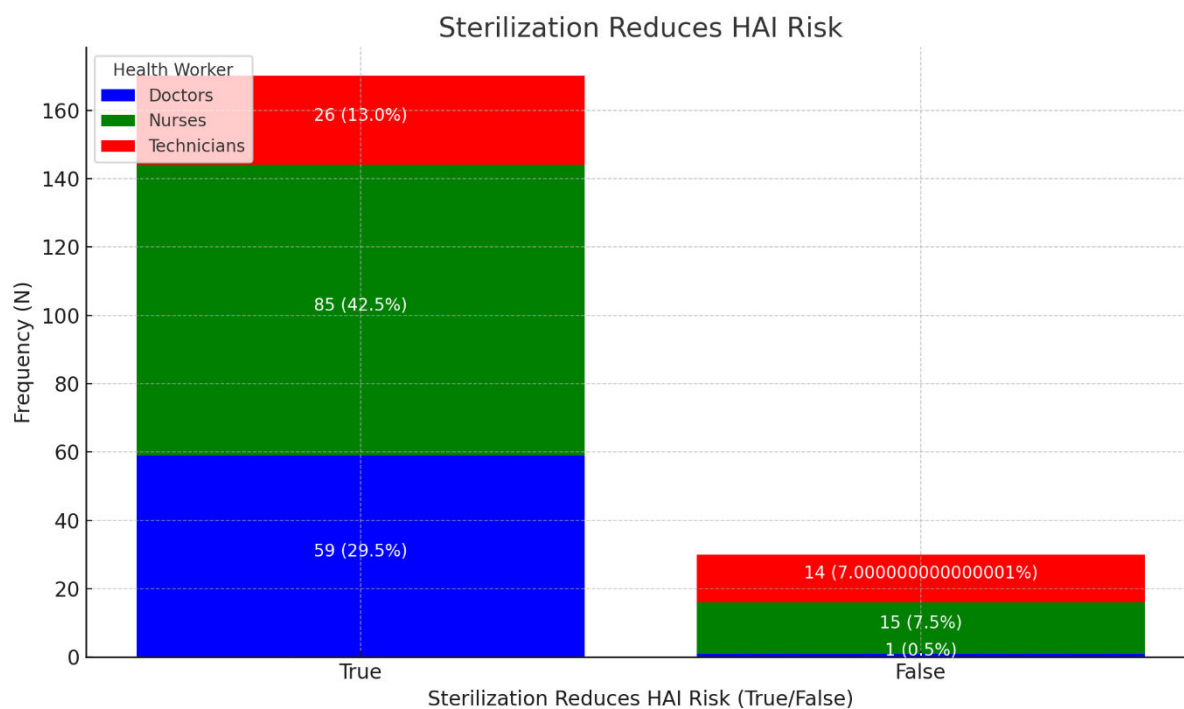
Table 10: Sterilization Reduces HAI Risk

Q10 Response	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (True)	170	85.0%	59 (98.3%)	85 (85.0%)	26 (65.0%)
0 (False)	30	15.0%	1 (1.7%)	15 (15.0%)	14 (35.0%)
Total	200	100.0%			

Source: Survey data

Most HCWs (85%) correctly recognized that sterilization reduces HAI risk, with doctors at 98.3%, nurses at 85%, and technicians at 65%.

Figure 10



While this is a relatively well-known concept, technicians' lower accuracy (65%) indicates a gap in understanding basic infection control measures, which could be critical in their role handling equipment in a tertiary care hospital.

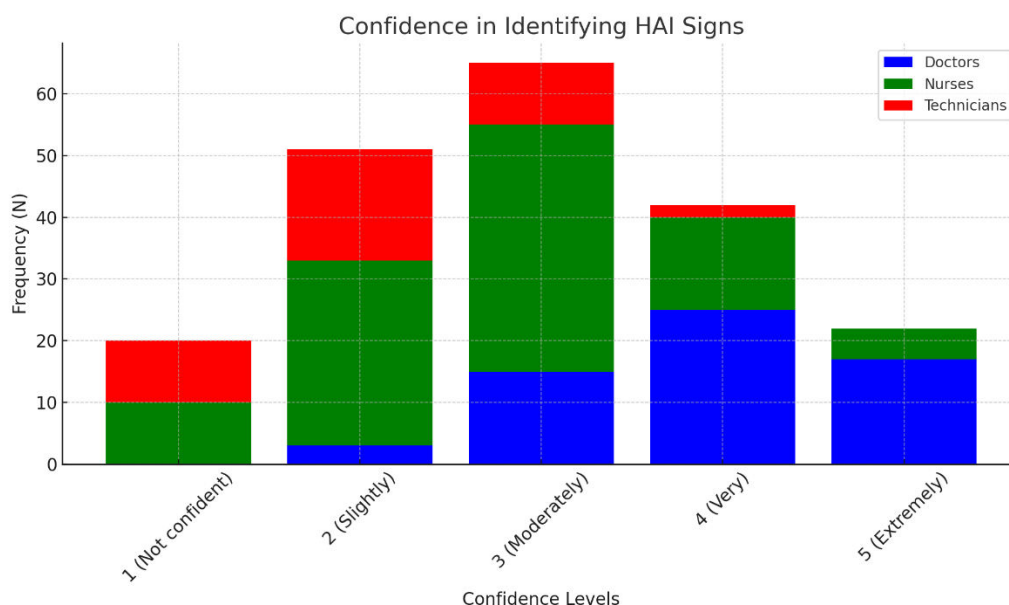
Table 11: Confidence in Identifying HAI Signs

Q11 Confidence	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (Not confident)	20	10.0%	0 (0.0%)	10 (10.0%)	10 (25.0%)
2 (Slightly)	40	20.0%	3 (5.0%)	30 (30.0%)	18 (45.0%)
3 (Moderately)	60	30.0%	15 (25.0%)	40 (40.0%)	10 (25.0%)
4 (Very)	50	25.0%	25 (41.7%)	15 (15.0%)	2 (5.0%)
5 (Extremely)	30	15.0%	17 (28.3%)	5 (5.0%)	0 (0.0%)
Total	200	100.0%			

Source: Survey data

Confidence levels vary significantly: 70% of doctors are very or extremely confident (4-5), 70% of nurses are slightly to moderately confident (2-3), and 70% of technicians are not or slightly confident (1-2).

Figure 11



This disparity highlights a critical gap in awareness, particularly among technicians, who may struggle to identify HAI signs, potentially delaying response in a hospital setting where timely identification is crucial.

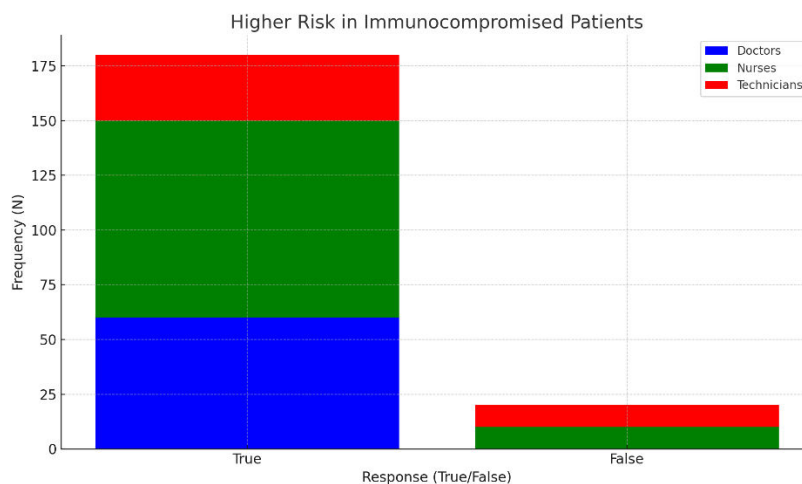
Table 12: Higher Risk in Immunocompromised Patients

Q12_Response	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (True)	180	90.0%	60 (100.0%)	90 (90.0%)	30 (75.0%)
0 (False)	20	10.0%	0 (0.0%)	10 (10.0%)	10 (25.0%)
Total	200	100.0%			

Source: Survey data

A high percentage (90%) correctly identified that immunocompromised patients are at higher risk, with doctors at 100%, nurses at 90%, and technicians at 75%.

Figure 12



This question shows relatively better awareness across all groups, likely because it's a fundamental concept in patient care, but technicians still lag, indicating a need for reinforced education on vulnerable populations.

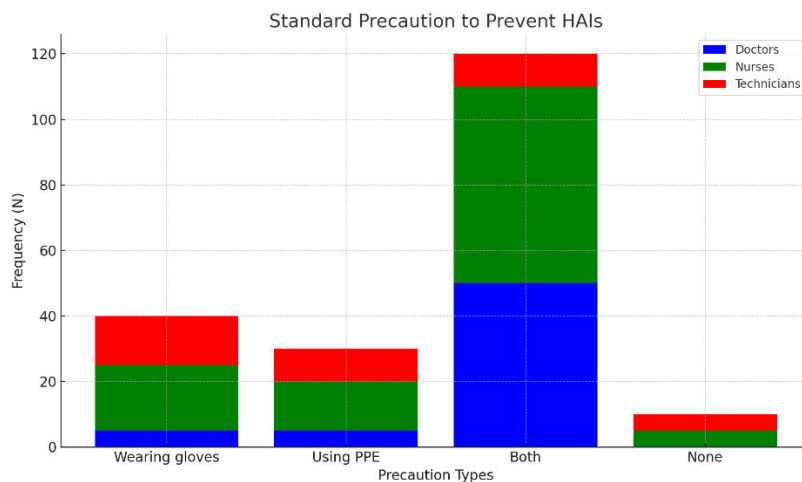
Table 13: Standard Precaution to Prevent HAIs

Q13_Response	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (Wearing gloves)	40	20.0%	5 (8.3%)	20 (20.0%)	15 (37.5%)
2 (Using PPE)	30	15.0%	5 (8.3%)	15 (15.0%)	10 (25.0%)
3 (Both)	120	60.0%	50 (83.3%)	60 (60.0%)	10 (25.0%)
4 (None)	10	5.0%	0 (0.0%)	5 (5.0%)	5 (12.5%)
Total	200	100.0%			

Source: Survey data

Overall, 60% correctly identified both wearing gloves and using PPE as standard precautions, with doctors at 83.3%, nurses at 60%, and technicians at 25%.

Figure 13



Technicians' lower accuracy (37.5% chose only gloves, 25% only PPE) reflects a fragmented understanding of standard precautions, which could compromise infection control practices in the hospital.

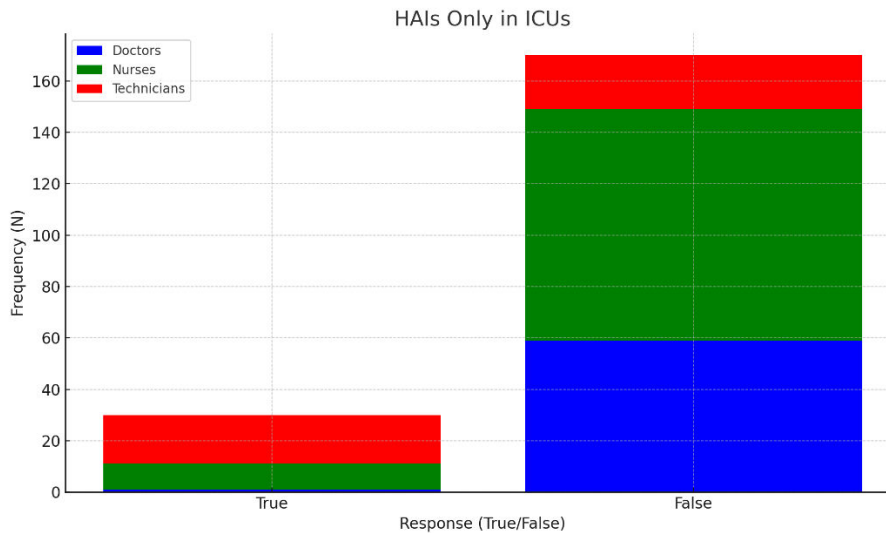
Table 14: HAIs Only in ICUs

Q14_Response	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (True)	30	15.0%	1 (1.7%)	10 (10.0%)	19 (47.5%)
0 (False)	170	85.0%	59 (98.3%)	90 (90.0%)	21 (52.5%)
Total	200	100.0%			

Source: Survey data

Most HCWs (85%) correctly answered that HAIs are not limited to ICUs, with doctors at 98.3%, nurses at 90%, and technicians at 52.5%.

Figure 14



Technicians' high incorrect response rate (47.5%) suggests a misconception that could lead to underestimating HAI risks in other hospital areas, necessitating broader education on HAI prevalence.

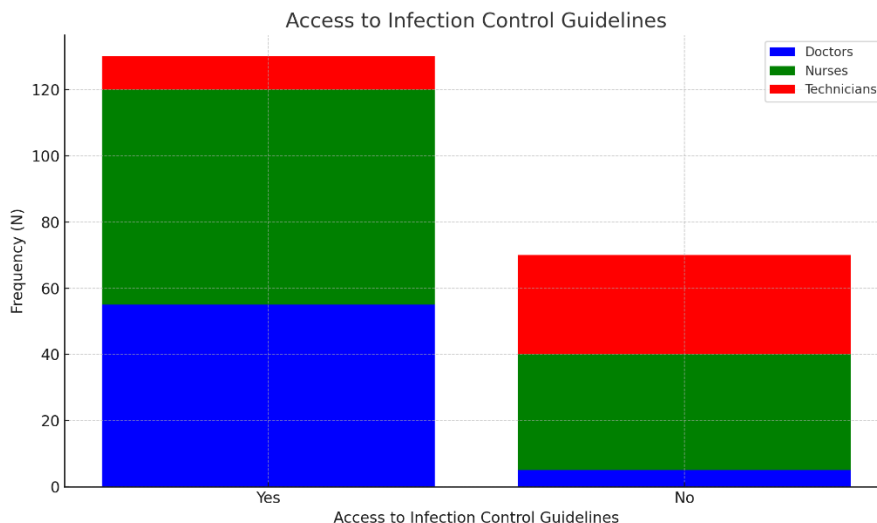
Table 15: Access to Infection Control Guidelines

Q15_Access	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (Yes)	130	65.0%	55 (91.7%)	65 (65.0%)	10 (25.0%)
0 (No)	70	35.0%	5 (8.3%)	35 (35.0%)	30 (75.0%)
Total	200	100.0%			

Source: Survey data

Overall, 65% of HCWs have regular access to guidelines, but the breakdown shows disparities: 91.7% of doctors, 65% of nurses, and only 25% of technicians have access.

Figure 15



This limited access for technicians likely contributes to their lower knowledge scores, as guidelines are essential for staying updated on best practices in infection control.

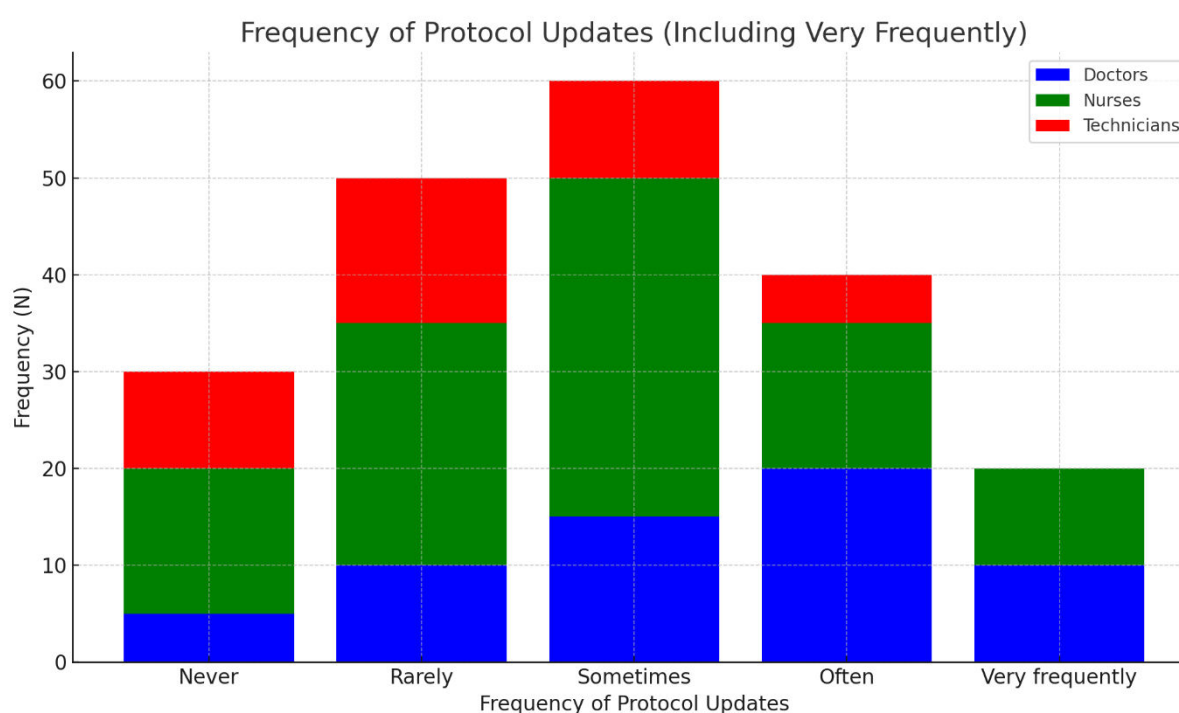
Table 16: Frequency of Protocol Updates

Q16_ProtocolUpdates	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (Never)	30	15.0%	5 (8.3%)	15 (15.0%)	10 (25.0%)
2 (Rarely)	50	25.0%	10 (16.7%)	25 (25.0%)	15 (37.5%)
3 (Sometimes)	60	30.0%	15 (25.0%)	35 (35.0%)	10 (25.0%)
4 (Often)	40	20.0%	20 (33.3%)	15 (15.0%)	5 (12.5%)
5 (Very frequently)	20	10.0%	10 (16.7%)	10 (10.0%)	0 (0.0%)
Total	200	100.0%			

Source: Survey data

Most HCWs (30%) report that protocols are updated sometimes, but doctors perceive more frequent updates (50% often or very frequently) compared to nurses (25%) and technicians (12.5%).

Figure 16



Technicians' perception of rare or no updates (62.5%) may reflect their limited involvement in protocol discussions, further contributing to their knowledge gaps.

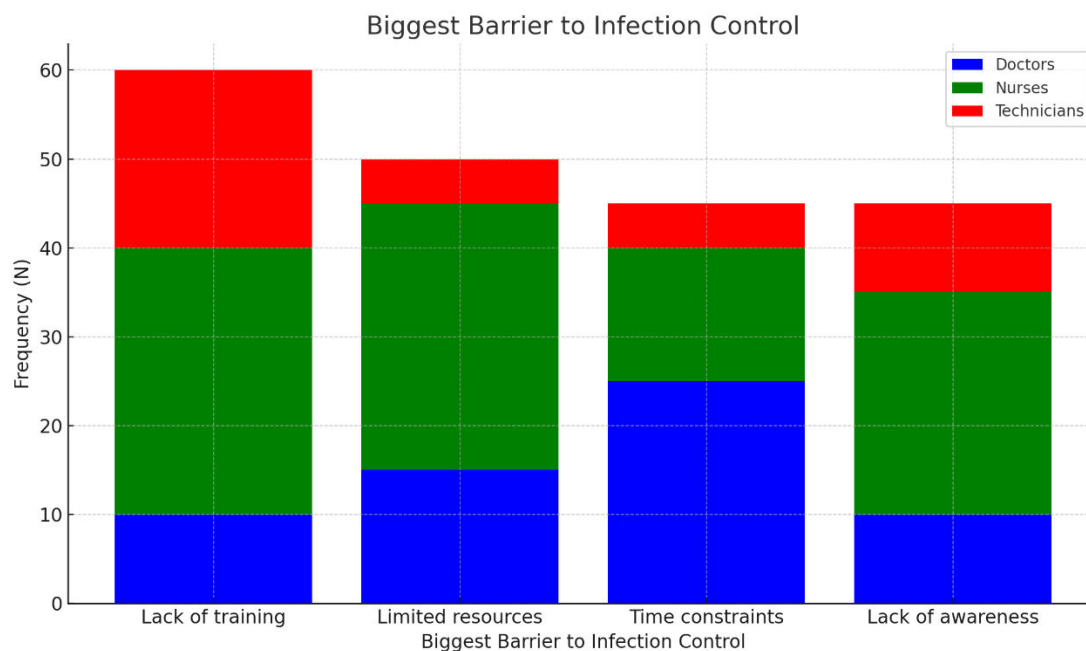
Table 17: Biggest Barrier to Infection Control

Q17_Barrier	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (Lack of training)	60	30.0%	10 (16.7%)	30 (30.0%)	20 (50.0%)
2 (Limited resources)	50	25.0%	15 (25.0%)	30 (30.0%)	5 (12.5%)
3 (Time constraints)	40	20.0%	25 (41.7%)	15 (15.0%)	5 (12.5%)
4 (Lack of awareness)	50	25.0%	10 (16.7%)	25 (25.0%)	10 (25.0%)
Total	200	100.0%			

Source: Survey data

Lack of training (30%) and limited resources (25%) are the most cited barriers overall. Technicians predominantly cite lack of training (50%), aligning with their limited training access (Q3, Q4). Nurses cite both lack of training and resources (30% each), reflecting systemic issues in Uttar Dinajpur's hospital setting.

Figure 17



Doctors often mention time constraints (41.7%), likely due to high patient loads, as noted in a 2023 *Lancet* study on Indian hospitals.

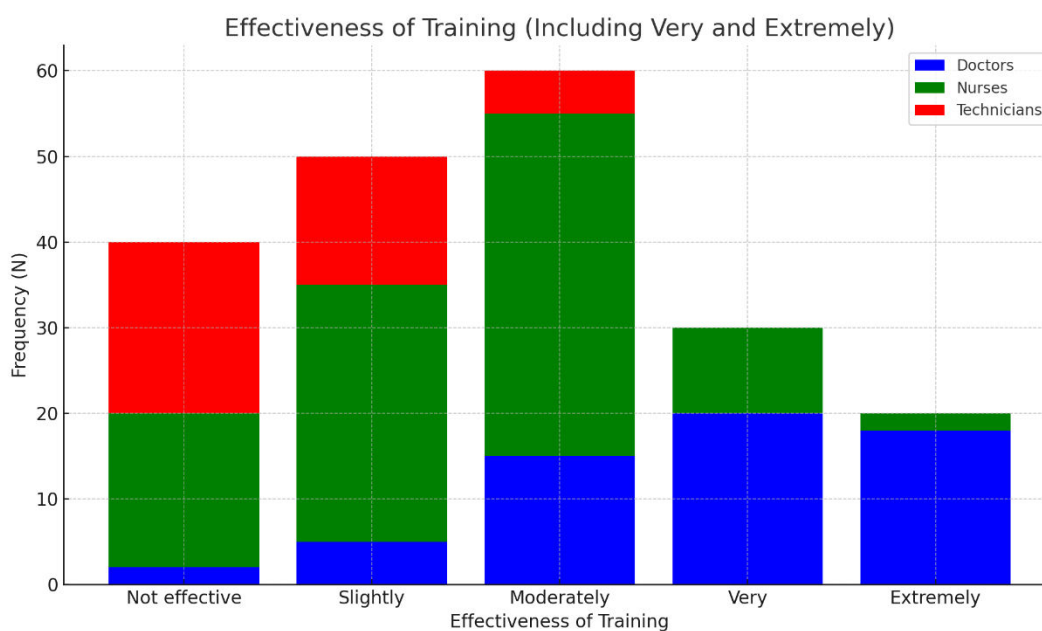
Table 18: Effectiveness of Training

Q18_TrainingEffectiveness	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (Not effective)	40	20.0%	2 (3.3%)	18 (18.0%)	20 (50.0%)
2 (Slightly)	50	25.0%	5 (8.3%)	30 (30.0%)	15 (37.5%)
3 (Moderately)	60	30.0%	15 (25.0%)	40 (40.0%)	5 (12.5%)
4 (Very)	30	15.0%	20 (33.3%)	10 (10.0%)	0 (0.0%)
5 (Extremely)	20	10.0%	18 (30.0%)	2 (2.0%)	0 (0.0%)
Total	200	100.0%			

Source: Survey data

Overall, 30% find training moderately effective, but perceptions vary: 63.3% of doctors find it very or extremely effective, 40% of nurses find it moderately effective, and 87.5% of technicians find it not or slightly effective.

Figure 18



This reflects the quality and frequency of training received, with doctors benefiting from more effective programs, while technicians' limited exposure results in skepticism about training efficacy.

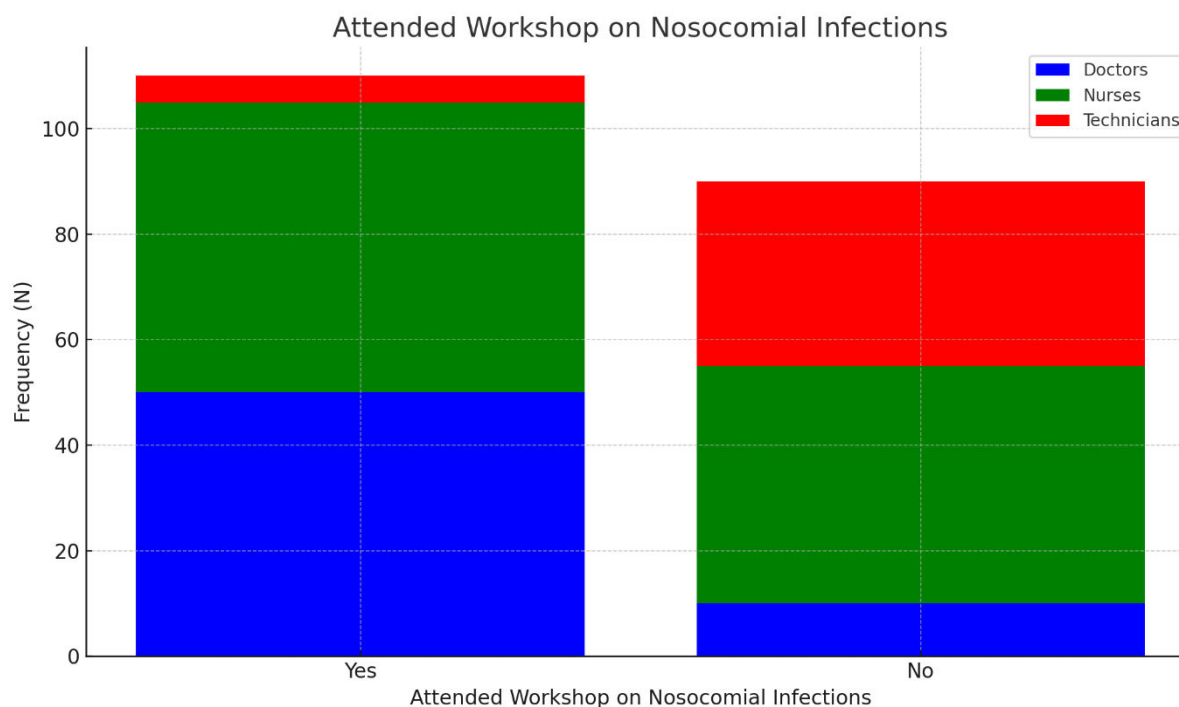
Table 19: Attended Workshop on Nosocomial Infections

Q19 Workshop	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (Yes)	110	55.0%	50 (83.3%)	55 (55.0%)	5 (12.5%)
0 (No)	90	45.0%	10 (16.7%)	45 (45.0%)	35 (87.5%)
Total	200	100.0%			

Source: Survey data

Overall, 55% have attended a workshop, but the breakdown shows disparities: 83.3% of doctors, 55% of nurses, and only 12.5% of technicians have attended.

Figure 19



This aligns with the training access trends (Q3, Q4), reinforcing that technicians’ limited exposure to educational opportunities contributes to their lower knowledge levels about HAIs.

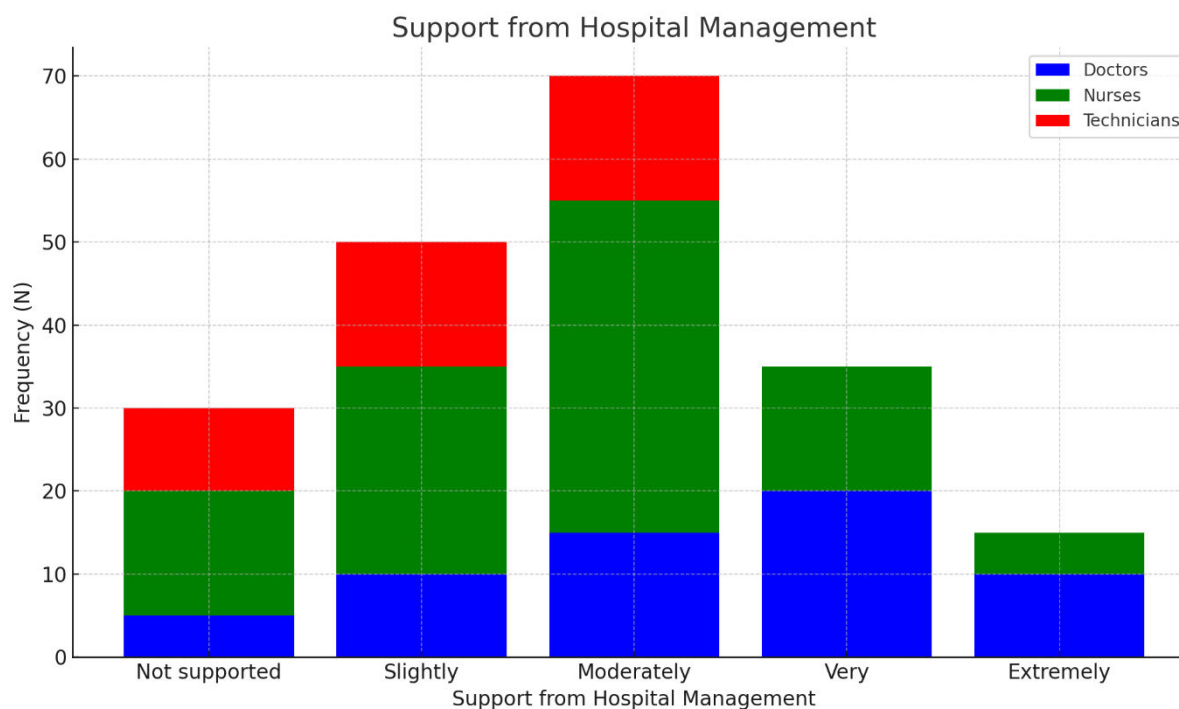
Table 20: Support from Hospital Management

Q20 Support	Frequency (N)	Percentage (%)	Doctors (N=60)	Nurses (N=100)	Technicians (N=40)
1 (Not supported)	30	15.0%	5 (8.3%)	15 (15.0%)	10 (25.0%)
2 (Slightly)	50	25.0%	10 (16.7%)	25 (25.0%)	15 (37.5%)
3 (Moderately)	70	35.0%	15 (25.0%)	40 (40.0%)	15 (37.5%)
4 (Very)	40	20.0%	20 (33.3%)	15 (15.0%)	0 (0.0%)
5 (Extremely)	10	5.0%	10 (16.7%)	5 (5.0%)	0 (0.0%)
Total	200	100.0%			

Source: Survey data

Most HCWs (35%) feel moderately supported by management, but doctors report higher support (50% very or extremely supported) compared to nurses (20%) and technicians (0%). Technicians’ lack of perceived support (62.5% not or slightly supported) may reflect their marginalization in hospital initiatives, further exacerbating their knowledge and confidence gaps in HAI prevention.

Figure 20



Hypothesis:

- H₀ (Null Hypothesis): There is no significant difference in knowledge scores among the various categories of health workers.
- H₁ (Alternative Hypothesis): There is a significant difference in knowledge scores among the various categories of health workers.

A One-Way ANOVA (Welch's) was conducted to test the hypothesis

One-Way ANOVA (Welch's)

	F	df1	df2	p
knowledge score	106	2	110	<.001

And it is found that there is a significant difference in knowledge scores regarding hospital-acquired infections (HAIs) among doctors, nurses, and technicians in a tertiary care hospital in Uttar Dinajpur.

Group Descriptives

	Q1_Category	N	Mean	SD	SE
knowledge score	1 Doctors	60	1.85	0.185	0.0239
	2 Nurses	100	1.54	0.246	0.0246
	3 Technicians	40	1.33	0.172	0.0273

The results revealed a statistically significant difference across the three categories ($F(2, 110) = 106, p < .001$), leading to the rejection of the null hypothesis (H_0) that there is no difference in knowledge levels. Group descriptives showed that doctors ($N = 60$) had the highest mean knowledge score of 1.85 ($SD = 0.185, SE = 0.0239$), followed by nurses ($N = 100$) with a mean of 1.54 ($SD = 0.246, SE = 0.0246$), and technicians ($N = 40$) with the lowest mean of 1.33 ($SD = 0.172, SE = 0.0273$), on a 0-2 scale. The higher standard deviation among nurses (0.246) indicates greater variability in their knowledge compared to doctors and technicians. The Tukey post-hoc test further confirmed that all pairwise differences were significant ($p < .001$): doctors outperformed nurses by a mean difference of 0.310, nurses outperformed technicians by 0.211, and doctors outperformed technicians by 0.521.

Post Hoc Tests

Tukey Post-Hoc Test – knowledge score

		1	2	3
1	Mean difference	—	0.310	0.521
	p-value	—	<.001	<.001
2	Mean difference	—	—	0.211
	p-value	—	—	<.001
3	Mean difference	—	—	—
	p-value	—	—	—

These findings highlight a clear knowledge gradient, with doctors demonstrating superior understanding of HAIs, likely due to their frequent training (90% received training in the last year) and access to guidelines (91.7% reported regular access). Nurses showed moderate knowledge but greater variability, possibly reflecting inconsistent training (60% received training), while technicians' lowest scores align with their limited training (15%) and resource access (25%), as identified in the frequency tables. In the context of Uttar Dinajpur, where HAIs affect 10-15% of hospitalized patients according to a 2024 ICMR report, these disparities underscore the need for targeted interventions, particularly for technicians and nurses, to strengthen infection control practices and reduce HAI incidence in the hospital.

IMPLICATION

The findings of this study, conducted in a tertiary care hospital in Uttar Dinajpur, West Bengal, reveal significant disparities in knowledge regarding hospital-acquired infections (HAIs) among health care workers (HCWs), with doctors demonstrating the highest knowledge scores (mean = 1.85, SD = 0.185), followed by nurses (mean = 1.54, SD = 0.246), and technicians (mean = 1.33, SD = 0.172), as confirmed by Welch's One-Way ANOVA ($F(2, 110) = 106, p < .001$). These results, supported by frequency analyses, have profound implications for infection control practices, patient safety, and healthcare policy in resource-constrained settings like Uttar Dinajpur, where HAIs contribute to 10-15% of hospitalized patient infections, according to a 2024 Indian Council of Medical Research (ICMR) report.

One primary implication is the urgent need for targeted training programs to address the knowledge gaps identified among HCWs, particularly technicians and nurses. Technicians exhibited the lowest knowledge scores, with only 37.5% correctly identifying the transmission mode of MRSA and 47.5% mistakenly believing HAIs occur only in ICUs. This lack of understanding, coupled with their limited confidence in identifying HAI signs (70% rated themselves as not or slightly confident), poses a significant risk to infection control, as technicians often handle critical tasks such as sterilization and equipment maintenance. Similarly, nurses displayed moderate knowledge but high variability (SD = 0.246), with only 60% receiving training in the past year and 70% reporting slight to moderate confidence in identifying HAI signs. Given their role in direct patient care, this variability could lead to inconsistent application of infection control protocols, such as hand hygiene and PPE use, which are critical to preventing HAIs. In contrast, doctors, with 90% having received recent training and 91.7% reporting access to guidelines, demonstrated superior knowledge (e.g., 95% correctly answered questions on HAI transmission). This disparity suggests that training initiatives should prioritize technicians and nurses, incorporating practical, hands-on sessions on HAI prevention, pathogen transmission, and early identification of infection signs. Such programs could be integrated into regular hospital workflows, ensuring accessibility despite high patient loads, which a 2023 *Lancet* study noted as a barrier in Indian tertiary care settings (nurse-to-patient ratios of 1:40).

Another implication is the need for systemic improvements in resource allocation and support structures within the hospital. Frequency tables revealed that 75% of technicians lacked regular access to infection control guidelines, and 50% cited lack of training as the biggest barrier to implementing HAI prevention practices. Nurses also reported limited resources (30%) as a significant barrier, reflecting broader systemic issues in Uttar Dinajpur, where healthcare infrastructure is often underfunded. Hospital management must address these barriers by ensuring equitable access to guidelines, providing regular updates to protocols (only 30% reported updates as frequent), and fostering a supportive environment for infection control (only 20% of technicians felt very or extremely supported). Leveraging doctors' higher knowledge through peer-led training sessions could also enhance knowledge dissemination across categories, promoting a collaborative approach to HAI prevention. Ultimately, these interventions could reduce HAI incidence, improve patient outcomes, and strengthen the resilience of Uttar Dinajpur's healthcare system against infectious disease challenges.

CONCLUSION

This study, conducted in a tertiary care hospital in Uttar Dinajpur, West Bengal, provides critical insights into the knowledge levels of health care workers (HCWs) regarding hospital-acquired infections (HAIs), revealing significant disparities across categories. The Welch's One-Way ANOVA ($F(2, 110) = 106, p < .001$) confirmed that doctors (mean score: 1.85, SD = 0.185) possess the highest knowledge, followed by nurses (mean: 1.54, SD = 0.246), and technicians (mean: 1.33, SD = 0.172), rejecting

the null hypothesis of no difference. Frequency analyses further highlighted gaps, with technicians demonstrating limited understanding—only 37.5% correctly identified MRSA transmission modes—and low confidence in identifying HAI signs (70% not/slightly confident). Nurses exhibited moderate knowledge but high variability, while doctors consistently excelled, likely due to their greater access to training (90% received training in the past year) and guidelines (91.7% reported regular access). These disparities are concerning in Uttar Dinajpur, where HAIs affect 10-15% of hospitalized patients, as per a 2024 ICMR report, exacerbating patient morbidity and healthcare costs.

The findings underscore the urgent need for targeted interventions to bridge knowledge gaps, particularly for technicians and nurses, who are pivotal in infection control yet face barriers like limited training (only 15% of technicians received recent training) and resource access (75% of technicians lacked guidelines). Implementing regular, practical training programs, ensuring equitable resource distribution, and leveraging doctors' expertise for peer-led education could significantly enhance HAI prevention practices. By addressing these disparities, the hospital can reduce HAI incidence, improve patient outcomes, and strengthen its healthcare system. Future research should explore longitudinal impacts of such interventions and extend this investigation to other regions, ensuring broader applicability of strategies to combat HAIs in resource-constrained settings like Uttar Dinajpur.

REFERENCES

1. Allegranzi, B., & Pittet, D. (2009). Role of hand hygiene in healthcare-associated infection prevention. *Journal of Hospital Infection*, 73(4), 305–315. <https://doi.org/10.1016/j.jhin.2009.04.019>
2. Anwar, M. A., Rabbi, S., Masroor, M., Majeed, F., Andrades, M., & Baqi, S. (2009). Self-reported practices of hand hygiene among the trainees of a teaching hospital in a resource-limited country. *Journal of the Pakistan Medical Association*, 59(9), 631–634.
3. Gupta, S., & Kant, S. (2022). Healthcare-associated infections in India: Challenges and opportunities for prevention. *Indian Journal of Medical Research*, 155(1), 45–53. https://doi.org/10.4103/ijmr.IJMR_789_20
4. Humphreys, H., Newcombe, R. G., Enstone, J., Smyth, E. T. M., McIlvenny, G., Fitzpatrick, F., Fry, C., Spencer, R. C., & Hospital Infection Society Steering Group. (2008). Four country healthcare-associated infection prevalence survey 2006: Risk factor analysis. *Journal of Hospital Infection*, 69(3), 249–257. <https://doi.org/10.1016/j.jhin.2008.04.020>
5. Kennedy, A. M., Elward, A. M., & Fraser, V. J. (2004). Survey of knowledge, beliefs, and practices of neonatal intensive care unit healthcare workers regarding nosocomial infections, central venous catheter, and hand hygiene. *Infection Control & Hospital Epidemiology*, 25(9), 747–752. <https://doi.org/10.1086/502471>
6. Kumari, S., & Gupta, M. (2023). Knowledge, attitude, and practices regarding nosocomial infections among nurses in a tertiary care hospital in North India. *Journal of Family Medicine and Primary Care*, 12(8), 1532–1538. https://doi.org/10.4103/jfmmpc.jfmmpc_456_23
7. Lacerda, R. A. (2003). Hospital infection and its relationship with the evolution of health assistance practices. In *Control of infection in surgical center* (pp. 9–23).
8. Lacerda, R. A., & Egly, E. Y. (1997). Hospital infections and their relationship to the development of hospital care: Analysis of current control practices. *Revista Latino-Americana de Enfermagem*, 5(4), 13–23. <https://doi.org/10.1590/S0104-11691997000400003>
9. Lahsaeizadeh, S., Jafari, H., & Askarian, M. (2008). Healthcare-associated infection in Shiraz, Iran 2004–2005. *Journal of Hospital Infection*, 69(3), 283–287. <https://doi.org/10.1016/j.jhin.2008.05.006>
10. Maitanmi, J. O., & Anise, I. (2021). Knowledge and preventive practices of nosocomial infections among health workers in two selected tertiary hospitals in Ogun State. *International Journal of Caring Sciences*, 14(1), 174–184.
11. Mukherjee, S., & Das, S. (2021). Infection control practices among healthcare workers in West Bengal: A cross-sectional study. *Journal of Clinical and Diagnostic Research*, 15(10), LC01–LC06. <https://doi.org/10.7860/JCDR/2021/48912.15432>
12. Pittet, D., Allegranzi, B., & Boyce, J. (2009). The World Health Organization guidelines on hand hygiene in health care and their consensus recommendations. *Infection Control & Hospital Epidemiology*, 30(7), 611–622. <https://doi.org/10.1086/600379>
13. Sharma, R., & Sharma, M. (2020). Nosocomial infections in resource-limited settings: A review of challenges and strategies. *Journal of Global Infectious Diseases*, 12(4), 181–187. https://doi.org/10.4103/jgid.jgid_98_20
14. Vincent, J. L., Bihari, D. J., Suter, P. M., Bruining, H. A., White, J., Nicolas-Chanoin, M. H., Wolff, M., Spencer, R. C., & Hemmer, M. (1995). The prevalence of nosocomial infection in intensive care units in Europe: Results of the European Prevalence of Infection in Intensive Care (EPIC) study. *Journal of the American Medical Association*, 274(8), 639–644. <https://doi.org/10.1001/jama.1995.03530080055041>
15. World Health Organization. (2007). *10 facts on patient safety*. <https://www.who.int/news-room/photo-story/photo-story-detail/10-facts-on-patient-safety>
16. World Health Organization. (2009). *Guidelines on hand hygiene in health care: First global patient safety challenge clean care is safer care*. https://iris.who.int/bitstream/handle/10665/44102/9789241597906_eng.pdf?sequence=1
17. Yuan, C. T., Dembry, L. M., Higa, B., Fu, M., Wang, H., & Bradley, E. H. (2009). Perceptions of hand hygiene practices in China. *Journal of Hospital Infection*, 71(2), 157–162. <https://doi.org/10.1016/j.jhin.2008.09.017>