

The Efficacy of a Structured Health Education Intervention on Improving Infection Prevention and Control Awareness Among Healthcare Workers

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ABSTRACT

Background: Healthcare-associated infections (HAIs) pose a significant global health challenge. Effective infection prevention and control (IPC) practices are fundamental to patient safety and positive health outcomes. Despite this, a gap in awareness and adherence to IPC guidelines persists among healthcare workers (HCWs). This study aimed to assess the impact of a structured educational intervention on IPC awareness among HCWs.

Methods: This was a single-group, pre- and post-intervention study conducted at a tertiary care teaching hospital in Nashik, India. The study included a convenience sample of 56 HCWs (doctors, interns, and nurses). A validated, self-structured questionnaire was used to assess knowledge before and after a two-hour educational intervention comprising interactive lectures, videos, and demonstrations. Data were analyzed using descriptive statistics, the paired t-test for score changes, and the chi-square test for categorical variables.

Results: The mean pre-intervention score was 28.32 (SD=6.33), which significantly increased to 34.33 (SD=5.88) post-intervention ($t=5.1562$, $p<0.01$). Before the intervention, 57.14% of participants had a good awareness score, which dramatically increased to 83.33% post-intervention ($\chi^2=9.9017$, $p<0.01$). Significant score improvements were observed across all occupational groups and both genders. While doctors and interns showed higher post-intervention scores, all groups demonstrated a significant positive change.

Conclusion: The structured educational intervention effectively and significantly improved IPC awareness among HCWs. The findings underscore the importance of continuous, multifaceted training to enhance HCW knowledge and adherence to infection prevention practices, ultimately contributing to a reduction in HAIs and improved patient safety.

Keywords: Health education, Infection prevention and control, Healthcare workers, Awareness, Tertiary care hospital, India, Intervention, Training.

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INTRODUCTION

Healthcare-associated infections (HAIs), also known as nosocomial infections, represent a significant global health challenge, causing considerable morbidity and mortality. These infections are acquired during healthcare delivery, often through patient-to-patient transmission, staff-to-patient transmission, or via contaminated equipment and surfaces.¹ The World Health Organization (WHO) estimates an average annual prevalence of approximately 5–10 % among patients.^{2,3}

Effective infection prevention and control (IPC) practices, including adherence to standard precautions, proper hand hygiene, and correct use of personal protective equipment (PPE), are crucial for mitigating this risk. However, studies consistently report low or inadequate compliance among HCWs, highlighting a critical knowledge and practice gap.^{4,5}

The objective of this study was to address this gap by evaluating the effectiveness of a structured educational intervention on enhancing HCWs' awareness of fundamental IPC practices. We aimed to assess the impact of this

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intervention on their knowledge and to determine if there was a significant increase in the proportion of participants with a good level of awareness following the program.

Table 1: Comparison of pre- and post-intervention mean scores for all study participants. The bar chart clearly illustrates the significant increase in awareness scores following the educational intervention.

	Score BT * Pre/ Post	Mean	Std Dev	Min	Max	t-statistics	p-value
All Participant	Pre	28.32	6.33	12	38	5.1562	< 0.01
	Post	34.33	5.88	14	40		

METHODOLOGY

Study Design and Setting: This was a single-group, before-and-after intervention study conducted in 2024 at SMBT Institute of Medical Sciences, a tertiary care teaching hospital in the district of Nashik, India.

Study Population and Sampling: The study population included different cadres of healthcare professionals at the hospital. A convenience sample of 56 participants was recruited.

Inclusion criteria: doctors, interns, and nursing staff currently working at the institution.

Exclusion criteria: members of the hospital's infection prevention and control committee and undergraduate medical or paramedical students. The sample size of 53 was calculated based on a prior study by Mehta *et al.*,²¹ which showed an increase in the proportion of participants with a good score from 10 % to 36 %. To account for a 5 % non-participation rate or loss to follow-up, 3 additional subjects were included, bringing the total to 56.

Intervention and Data Collection: A self-structured questionnaire, validated for face and content relevance by experts, was administered both before (pre-test) and after (post-test) the educational intervention. The questionnaire, which consisted of closed-ended, multiple-choice questions, assessed awareness of IPC practices based on WHO guidelines. The intervention consisted of a two-hour session divided into combined discussions, interactive lectures, videos, and demonstrations. This multimodal approach was designed to cater to various learning styles. A scoring system was used, with 2 points awarded for each correct answer. Scores were categorized as good ($\geq 75\%$), moderate (50-74%), or poor ($< 50\%$).

Statistical Analysis: Data were entered and analyzed using EPI Input software version 7.2. Descriptive statistics (mean, median, standard deviation, frequencies, and percentages) were used to summarize demographic variables and scores. The Shapiro-Wilk test was applied to check for data normality. The paired t-test was used to compare mean scores before and after the intervention. Chi-square tests were used to assess the change in awareness categories (poor, moderate, good) and to compare this change across different demographic groups (gender and occupation). A *p-value* of < 0.05 was considered statistically significant.

RESULTS

Demographics: The study included 56 participants. The sample was diverse in terms of gender (58.93% female, 41.07%

male) and occupation (28.57% doctors, 37.50% interns, 33.93% nurses). The mean age of female participants was 26.23 years (SD=2.88), and the mean age for males was 26.02 years (SD=2.13). A t-test showed no significant difference in mean age between genders ($t=0.4011$, $p=0.6891$).

Impact of Intervention on Overall Scores: The educational intervention led to a statistically significant improvement in awareness scores. The mean score for all participants increased from 28.32 (SD=6.33) in the pre-test to 34.33 (SD=5.88) in the post-test. The paired t-test confirmed this difference was highly significant ($t=5.1562$, $p<0.01$).

Shift in Awareness Categories: The intervention caused a remarkable shift in participants' awareness levels. The proportion of individuals in the "Good" awareness category (scores $\geq 75\%$) increased from 57.14% to 83.33%. Conversely, the percentage of those with "Poor" awareness decreased from 12.50% to 1.85%. This change was statistically significant ($\chi^2 = 9.9017$, $p<0.01$).

Impact Across Demographic Groups: The intervention was effective across all analyzed groups.

- **Gender:** Both female and male participants showed significant increases in their mean scores ($p<0.01$ for both). While a slight difference in mean scores was observed, a chi-square test showed no significant association between gender and post-intervention awareness categories ($p=0.6538$), indicating the intervention was equally effective regardless of gender.
- **Occupation:** All three occupational groups (doctors, interns, and nurses) demonstrated significant score improvements ($p<0.01$ for all). Doctors and interns achieved the highest post-intervention scores (means of 37.50 and 37.37, respectively), with all participants in these groups reaching the "Good" awareness category. Nurses, while starting with lower baseline scores, also showed significant improvement, with 52% reaching the "Good" category post-intervention. A chi-square test confirmed a significant association between occupation and post-intervention awareness levels ($\chi^2 = 19.89$, $p<0.01$).

DISCUSSION

The results of this study clearly demonstrate the effectiveness of a structured, multimodal health education intervention in enhancing IPC awareness among HCWs in a tertiary care setting. Our findings are consistent with a vast body of literature that supports the use of educational programs to improve IPC knowledge and practices.^{10,14,15} The use of a blended approach—interactive lectures, videos, and

demonstrations—proved to be effective in addressing various learning styles and reinforcing key messages, a finding that aligns with previous research on multimodal interventions.¹⁷

A particularly important finding was the significant improvement observed across all occupational groups. While doctors and interns demonstrated higher post-intervention scores, the nurses, who started with a lower baseline awareness, showed a substantial increase in their scores. This highlights the value of targeted training, especially for frontline staff like nurses who have been shown to have a crucial role in infection control.^{13,19} The disparity in pre-test scores, with nurses scoring lower than doctors and interns, is a critical finding that suggests a baseline knowledge gap that must be addressed through continuous, role-specific training.^{11,20}

Despite the clear success of the intervention, it is essential to acknowledge potential limitations. The single-group, before-and-after design lacks a control group, which restricts our ability to attribute the observed improvements solely to the intervention. The study was also conducted at a single site with a relatively small sample size, which may limit the generalizability of the findings to other healthcare settings. Furthermore, this study only measured short-term knowledge change, and we cannot confirm the long-term sustainability of the improvements in both awareness and practice.

CONCLUSION

This study provides compelling evidence that a structured health education intervention can significantly enhance awareness of infection prevention and control practices among healthcare workers. The results highlight the importance of continuous, multifaceted training programs to improve IPC knowledge, especially among frontline staff. While the intervention was highly effective in the short term, future research should focus on addressing barriers to sustained compliance and implementing longitudinal studies to evaluate the long-term impact on behavior and HAI rates. By investing in such educational initiatives, healthcare institutions can significantly enhance patient safety and mitigate the burden of healthcare-associated infections.

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