

KNOWLEDGE AND APPLICATION OF INFECTION PREVENTION AND CONTROL PRACTICES AMONG MEDICAL INTERNS IN A TERTIARY CARE TEACHING HOSPITAL: AN ANALYTICAL CROSS-SECTIONAL STUDY

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ABSTRACT

Infection prevention and control (IPC) practices are essential for reducing healthcare-associated infections and antimicrobial resistance, particularly among medical interns involved in direct patient care. This analytical cross-sectional study assessed knowledge, perceptions, self-reported application of IPC practices, and factors associated with application among medical interns in a tertiary care teaching hospital from January to June 2025. Universal sampling was used, and 73 eligible interns participated. Data were collected using a structured electronic questionnaire with expert content review and pilot testing. The median-based nonparametric tests and Spearman correlation were used for analysis. The mean knowledge score was 9.51 ± 1.38 out of 12, while mean perception and application scores were 52.50 ± 4.52 out of 60 and 54.03 ± 6.40 out of 60, respectively. Knowledge gaps were identified in transmission-based precautions (39.7%) and recommended bleach concentration for surface disinfection (41.1%). Knowledge and application were not significantly correlated ($p=0.147$, $p=0.215$), whereas perception showed a moderate positive correlation with application ($p=0.490$, $p<0.001$). Application scores differed significantly across clinical departments ($p=0.007$). The most frequently reported barriers were lack of time (58.9%) and fatigue/workload (46.6%). Medical interns demonstrated relatively good knowledge, positive perceptions, and satisfactory self-reported application of IPC practices, but specific knowledge and behavioral gaps remain. Regular refresher training, simulation-based learning, supervision, and audit-feedback may help reinforce consistent IPC practices.

KEYWORDS: Infection prevention and control; Medical interns; Healthcare-associated infections; Infection control practices; Knowledge; Perception; Self-reported application; Antimicrobial resistance; Cross-sectional study.

ABBREVIATIONS: AMR - Antimicrobial Resistance; HAI - Healthcare-Associated Infection; IPC - Infection Prevention and Control; WHO - World Health Organization; NCDC - National Centre for Disease Control; PPE - Personal Protective Equipment; NSI - Needle-Stick Injury; PEP - Post-Exposure Prophylaxis; VAP - Ventilator-Associated Pneumonia; SSI - Surgical Site Infection; CAUTI - Catheter-Associated Urinary Tract Infection; BMW - Biomedical Waste; SD - Standard Deviation; IQR - Interquartile Range; SPSS - Statistical Package for the Social Sciences; α - Cronbach's Alpha; ρ - Spearman's Rank Correlation Coefficient; P - P value.

INTRODUCTION

Healthcare-associated infections (HAIs) are a major cause of preventable morbidity, mortality, prolonged hospitalization, increased healthcare costs, and the spread of antimicrobial resistance (AMR). The World Health Organization (WHO) recognizes Infection Prevention and Control (IPC) as one of the most cost-effective strategies to reduce HAIs and improve patient safety. IPC comprises evidence-based practices, including hand hygiene, standard precautions, appropriate use of personal protective equipment (PPE), injection safety, environmental cleaning, sterilization and disinfection, biomedical waste management, and safe sharps handling, to prevent the transmission of infectious agents and protect both patients and healthcare workers.¹

The WHO identifies education and training of healthcare workers as a core component of effective IPC programmes. However, implementation gaps persist, particularly in low- and middle-income countries, where resource limitations, inadequate infrastructure, and poor adherence to standard precautions hinder effective infection prevention.^{1,3}

Medical interns represent a critical group as they transition from undergraduate training to independent clinical practice. Their active involvement in patient care and invasive procedures increases the risk of occupational exposure and healthcare-associated transmission, making adequate knowledge and application of IPC practices essential. In India, IPC is integrated into the Competency-Based Medical Education (CBME) curriculum and reinforced through institutional training. However, studies continue to report deficiencies in adherence to standard precautions, including hand hygiene, appropriate use of personal protective equipment, post-exposure prophylaxis, and biomedical waste management, indicating the need for continuous competency-based reinforcement.⁴

Application of IPC practices may be influenced by factors such as knowledge, institutional support, resource availability, and workload. Therefore, assessing knowledge alone may not adequately reflect preparedness for safe clinical practice. Simultaneous evaluation of knowledge, perceptions, and self-reported application can help identify areas requiring targeted educational reinforcement, particularly in the context of rising antimicrobial resistance.^{1,2}

Although several studies have assessed IPC knowledge and practices among healthcare workers and medical students, evidence focusing specifically on medical interns in Indian tertiary care teaching hospitals remains limited. Furthermore, the relationship between IPC knowledge and its application has been insufficiently explored in the context of competency-based medical education.

Therefore, this analytical cross-sectional study was undertaken to assess the knowledge, perceptions, and self-reported application of Infection Prevention and Control practices among medical interns in a tertiary care teaching hospital, identify factors associated with IPC application, and determine areas requiring educational reinforcement to promote safe clinical practice.

Aim

To assess the knowledge, perceptions, and self-reported application of Infection Prevention and Control practices among medical interns in a tertiary care teaching hospital and to identify the difficulties in the IPC practices.

MATERIALS AND METHODS

Study Design and Setting

This cross-sectional analytical study was conducted in the Department of Microbiology, Panimalar Medical College Hospital & Research Institute. The study was carried out over a period of 6 months, from January 2025 to June 2025, after obtaining approval (PMCH & RI/ IHEC/2025/362) from the Institutional Human Ethical Committee.

Study Population

Medical interns undergoing compulsory rotatory internship at Panimalar Medical College Hospital & Research Institute during the study period.

Inclusion criteria

- Interns who had completed the mandatory institutional Infection Prevention and Control (IPC) orientation/training.
- Interns who were currently on clinical duty and involved in patient care during the study period

Exclusion criteria

- Interns who declined to provide informed consent.
- Interns who were not involved in patient care during the data collection period.

Sampling Technique

- Universal sampling was adopted, and all eligible medical interns were invited to participate. A total of 73 completed responses were included in the final analysis.

Study Instrument

Data were collected using a structured, self-administered electronic questionnaire developed after reviewing the World Health Organization (WHO) Infection Prevention and Control guidelines¹⁻³ and National Centre for

Disease Control (NCDC) guidelines.⁵ The questionnaire was designed to assess medical interns' knowledge and application of IPC practices in routine clinical settings.

The questionnaire consisted of five sections:

1. Demographic characteristics including gender, previous formal IPC training (defined as any IPC training received in addition to the mandatory institutional orientation), and current departmental posting.
2. Knowledge regarding IPC practices.
3. Perceptions related to IPC.
4. Self-reported application of IPC practices.
5. Perceived barriers and suggestions for improving IPC implementation.

The knowledge section comprised 12 multiple-choice questions covering standard precautions, hand hygiene, personal protective equipment, transmission-based precautions, biomedical waste management, needle-stick injury management, post-exposure prophylaxis, and prevention of device-associated infections. The perception and application sections each consisted of 12 statements measured using five-point Likert scales.

Questionnaire Development and Content Validation

The questionnaire was independently reviewed by experts in Microbiology, Infection Prevention and Control, and Preventive and Social Medicine to assess content validity. A pilot study was conducted among 20 medical interns who were not included in the final analysis to evaluate the clarity, comprehensibility, and feasibility of the questionnaire. Necessary modifications were incorporated based on expert and participant feedback before final administration.⁶

Data Collection

The questionnaire was administered electronically using Google Forms. The survey link was distributed through institutional communication channels to eligible medical interns. Participants were informed about the objectives of the study, and electronic informed consent was obtained before questionnaire completion. Participation was voluntary, and responses were collected anonymously to maintain participant confidentiality.

Scoring of the Questionnaire

The knowledge domain was scored by assigning one mark for each correct response and zero for incorrect responses, yielding a total knowledge score ranging from 0 to 12. Higher scores indicated better knowledge of IPC practices.

Perceptions regarding IPC were assessed using 12 statements rated on a five-point Likert scale ranging from Strongly disagree (1) to Strongly agree (5). These responses were summarized descriptively and explored as explanatory variables where appropriate.

Application of IPC practices was assessed using 12 self-reported items rated on a five-point Likert scale ranging from Never (1) to Always (5). A composite application score ranging from 12 to 60 was calculated, with higher scores indicating better self-reported application of IPC practices.

Statistical Analysis

Data were exported to Microsoft Excel and analysed using IBM SPSS Statistics version 26.0

Categorical variables were summarized as frequencies and percentages, while continuous variables were expressed as mean $\pm$ standard deviation (SD) or median with interquartile range (IQR), depending on the distribution of the data. Normality of continuous variables was assessed using the Shapiro-Wilk test.⁷

Internal consistency of the perception and application domains was assessed using Cronbach's alpha. Comparisons between two groups were performed using the Mann-Whitney U test, and comparisons across multiple groups using the Kruskal-Wallis test. Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test, as appropriate. The relationships between knowledge, perception, and application scores were assessed using Spearman's rank correlation coefficient. A two-sided P value <0.05 was considered statistically significant. Since knowledge, perception, and application scores were not normally distributed based on the Shapiro-Wilk test, non-parametric methods (Spearman correlation and Kruskal-Wallis test) were preferred where appropriate.

RESULTS

Participant Characteristics

A total of 73 medical interns participated in the study. Of the participants, 45 (61.6%) were female and 28 (38.4%) were male. Thirty-eight (52.1%) participants reported having received previous formal training in Infection Prevention and Control (IPC), whereas 35 (47.9%) had not received previous formal IPC training.

Based on the department in which the interns were posted at the time of data collection, 26 (35.6%) were posted in Laboratory Medicine, 11 (15.1%) in Medicine, 7 (9.6%) in Surgery, 4 (5.5%) in Pediatrics, 3 (4.1%) in Obstetrics and Gynecology, 11 (15.1%) in Community Medicine, and 11 (15.1%) in other departments. To facilitate statistical analysis, departmental postings with similar clinical functions were grouped into standardized categories. The demographic and professional characteristics of the participants are presented in Table 1.

Table 1. Demographic and IPC Training Characteristics of Study Participants (N = 73)

Characteristic	n (%)
Gender	

Female	45 (61.6)
Male	28 (38.4)
Currently posted department	
Laboratory Medicine	26 (35.6)
Medicine*	11 (15.1)
Surgery	7 (9.6)
Pediatrics	4 (5.5)
Obstetrics & Gynecology	3 (4.1)
Community Medicine	11 (15.1)
Other Departments†	11 (15.1)
Previous formal IPC training	
Yes	38 (52.1)
No	35 (47.9)

*Medicine includes General Medicine, Respiratory Medicine, and Emergency Medicine.

†Other Departments includes ENT, Dermatology, Psychiatry, Forensic Medicine, DVL, Radiology, CRMI, and Anesthesia.

Knowledge Regarding Infection Prevention and Control

The mean knowledge score among the participants was 9.51 ± 1.38 out of a maximum possible score of 12. The knowledge scores ranged from 6 to 12.

The highest proportion of correct responses was observed for questions related to the most effective method for preventing healthcare-associated infections, immediate management following a needle-stick injury, initiation of HIV post-exposure prophylaxis following high-risk exposure, and appropriate timing of hand hygiene. The lowest proportions of correct responses were observed for transmission-based precautions (39.7%) and the recommended bleach concentration for hospital surface disinfection (41.1%), identifying important knowledge gaps.

The item-wise distribution of responses to the knowledge questions is presented in **Table 2**.

Table 2. Item-wise Knowledge Regarding Infection Prevention and Control Among Medical Interns (N = 73)

Knowledge item	Correct responses, n (%)
Most effective method for preventing healthcare-associated infections	72 (98.6)
Correct statement regarding transmission precautions	29 (39.7)
Appropriate timing of hand hygiene	71 (97.3)
Correct order for donning PPE	44 (60.3)
Recommended bleach concentration for hospital surface disinfection	30 (41.1)
Component not included in standard precautions	51 (69.9)
Application of standard precautions to all patients	68 (93.2)
Immediate action following a needle-stick injury	72 (98.6)
Prevention of device-associated infections	66 (90.4)
Blood-borne infection with highest risk of transmission following NSI	52 (71.2)
Recommended timing for initiation of HIV PEP following high-risk exposure	72 (98.6)
Immediate action following body fluid splash to the eyes	71 (97.3)

Perceptions Regarding Infection Prevention and Control

The mean perception score was 52.50 ± 4.52 out of a maximum possible score of 60. Most participants agreed or strongly agreed that infection control was essential in all healthcare settings and that adherence to IPC practices reduces healthcare-associated infections. A high proportion also agreed that regular infection surveillance improves patient safety and that all healthcare workers, including interns, have a responsibility for appropriate biomedical waste disposal.

A proportion of participants perceived IPC guidelines as time-consuming during busy clinical shifts, while many reported a perceived risk of needle-stick injury during internship. Overall, participants demonstrated positive attitudes towards IPC; however, uncertainty persisted regarding implementation of specific practices such as ventilator-associated pneumonia prevention, and a proportion perceived IPC measures as time-consuming during busy clinical shifts. The perception domain showed good internal consistency, with a Cronbach's α of 0.85. Item-wise responses are presented in Table 3.

Table 3. Perceptions Regarding Infection Prevention and Control Among Medical Interns (N = 73)

Perception statement	Strongly disagree, n (%)	Disagree, n (%)	Neutral, n (%)	Agree, n (%)	Strongly agree, n (%)
Infection control is essential in all healthcare settings	0	0	3 (4.1)	12 (16.4)	58 (79.5)
Confident in ability to follow IPC guidelines	0	1 (1.4)	8 (11.0)	34 (46.6)	30 (41.1)
Following IPC practices reduces HAIs	0	0	3 (4.1)	20 (27.4)	50 (68.5)
IPC guidelines are too time-consuming during busy shifts	11 (15.1)	15 (20.5)	19 (26.0)	17 (23.3)	11 (15.1)
Significant risk of needle-stick injury during internship	5 (6.8)	2 (2.7)	16 (21.9)	29 (39.7)	21 (28.8)
Regular infection surveillance improves patient safety	0	0	4 (5.5)	18 (24.7)	51 (69.9)
All healthcare workers, including interns, are responsible for biomedical waste disposal	0	0	4 (5.5)	15 (20.5)	54 (74.0)
Posters, charts, labels, and color codes reinforce waste segregation	0	0	3 (4.1)	19 (26.0)	51 (69.9)
Device insertion and maintenance should be guided by checklists/protocols	0	0	4 (5.5)	24 (32.9)	45 (61.6)
Confident in understanding VAP prevention protocols	0	4 (5.5)	14 (19.2)	28 (38.4)	27 (37.0)
Preoperative antibiotic prophylaxis can prevent many SSIs	0	0	4 (5.5)	23 (31.5)	46 (63.0)
Antimicrobial overuse is a major cause of antimicrobial resistance	0	1 (1.4)	4 (5.5)	22 (30.1)	46 (63.0)

Self-Reported Application of Infection Prevention and Control Practices

The mean application score was 54.03 ± 6.40 out of a maximum possible score of 60, with scores ranging from 36 to 60. The highest self-reported adherence was observed for safe disposal of used sharps in puncture-proof containers, with 50 (68.5%) participants reporting that they always followed this practice. Similarly, 52 (71.2%) participants reported always following biomedical waste color-coding guidelines, and 47 (64.4%) reported always practicing aseptic techniques during procedures such as intravenous cannulation and catheterization. Hand hygiene practices were frequently reported, with 45 (61.6%) participants reporting that they always performed hand hygiene using antiseptic or alcohol-based hand rub before and after examining patients, while 39 (53.4%) reported always following all steps of hand hygiene.

Regular attendance at IPC updates or training was comparatively less consistent, with 37 (50.7%) participants reporting that they always attended such sessions. Overall, the application domain demonstrated high internal consistency, with a Cronbach's α of 0.94.

Table 4. Self-Reported Application of Infection Prevention and Control Practices Among Medical Interns (N = 73)

Application item	Never, n (%)	Rarely, n (%)	Sometimes, n (%)	Often, n (%)	Always, n (%)
Hand hygiene before and after examining patients	0	0	8 (11.0)	20 (27.4)	45 (61.6)
Follow all steps of hand hygiene	0	0	7 (9.6)	27 (37.0)	39 (53.4)
Use appropriate PPE according to infection status	0	1 (1.4)	10 (13.7)	25 (34.2)	37 (50.7)
Follow correct steps for donning and doffing PPE	0	0	11 (15.1)	22 (30.1)	40 (54.8)
Practice cough etiquette and respiratory hygiene	0	0	5 (6.8)	26 (35.6)	42 (57.5)
Safely dispose of used sharps in puncture-proof containers	0	0	3 (4.1)	20 (27.4)	50 (68.5)
Follow aseptic techniques during invasive procedures	0	0	5 (6.8)	21 (28.8)	47 (64.4)
Understand importance of early detection/isolation of MDROs	0	0	3 (4.1)	18 (24.7)	52 (71.2)
Promptly report exposure to blood/body fluids	0	0	3 (4.1)	22 (30.1)	48 (65.8)
Follow color-coding guidelines for biomedical waste disposal	0	0	2 (2.7)	19 (26.0)	52 (71.2)
Attend IPC updates or training regularly	2 (2.7)	5 (6.8)	6 (8.2)	23 (31.5)	37 (50.7)
Follow WHO guidelines for infection control practices	0	0	6 (8.2)	29 (39.7)	38 (52.1)

Association of Participant Characteristics With Knowledge and Application Scores

No statistically significant differences in knowledge scores were observed according to gender or previous formal IPC training. The mean knowledge score was 9.50 ± 1.60 among male participants and 9.51 ± 1.24 among female participants ($P = .903$). Participants who had received previous formal IPC training had a mean knowledge score of 9.58 ± 1.46 compared with 9.43 ± 1.29 among those without previous training ($P = .734$). Similarly, the mean application score was higher among male participants than female participants (55.43 ± 5.06 vs 53.16 ± 7.03), although the difference was not statistically significant ($P = .158$). Participants with previous IPC training also had higher mean application scores than those without previous training (54.97 ± 6.17 vs 53.00 ± 6.58), but this difference was not statistically significant ($P = .170$).

When knowledge and application scores were compared according to current departmental posting, the mean knowledge score was highest among interns posted in Laboratory Medicine (10.15 ± 1.38) and lowest among those posted in Obstetrics and Gynecology (7.67 ± 2.08). However, the difference in knowledge scores across the seven departmental groups was not statistically significant (Kruskal-Wallis $P = .064$).

The mean application score was also highest among interns posted in Laboratory Medicine (56.69 ± 4.83), whereas the lowest score was observed among those posted in Obstetrics and Gynecology (41.33 ± 5.51). A statistically significant difference in application scores was observed across the seven departmental groups (Kruskal-Wallis $P = .007$). Although departmental differences in application scores reached statistical significance, these findings should be interpreted cautiously because of the small sample size in certain departments, particularly Obstetrics and Gynecology ($n = 3$). The association of participant characteristics and current departmental posting with knowledge and application scores is presented in Table 5.

Table 5. Association of Participant Characteristics With Knowledge and Application Scores Among Medical Interns (N = 73)

Participant characteristic	Knowledge score, Mean $\pm$ SD	P value	Application score, Mean $\pm$ SD	P value
Gender				
Male	9.50 ± 1.60	.903	55.43 ± 5.06	.158
Female	9.51 ± 1.24		53.16 ± 7.03	
Previous formal IPC training				
Yes	9.58 ± 1.46	.734	54.97 ± 6.17	.170
No	9.43 ± 1.29		53.00 ± 6.58	
Currently posted department				
Laboratory Medicine (n = 26)	10.15 ± 1.38		56.69 ± 4.83	
Medicine* (n = 11)	9.55 ± 1.13		55.91 ± 4.81	
Surgery (n = 7)	8.86 ± 1.35		55.14 ± 5.37	
Pediatrics (n = 4)	9.00 ± 0.82		55.25 ± 5.85	
Obstetrics & Gynecology (n = 3)	7.67 ± 2.08		41.33 ± 5.51	
Community Medicine (n = 11)	9.55 ± 1.29		51.64 ± 7.68	
Other Departments† (n = 11)	9.00 ± 1.00		50.55 ± 5.41	
Overall comparison across departments		.064‡		.007‡

*Medicine includes General Medicine, Respiratory Medicine, and Emergency Medicine.

†Other Departments includes CRMI, ENT, Forensic Medicine, Psychiatry, Dermatology, DVL, Radiology, and Anesthesia.

‡Overall P value from the Kruskal-Wallis test.

Correlation Between Knowledge, Perception, and Application

A weak positive correlation was observed between knowledge and application scores, although the association was not statistically significant (Spearman's $\rho = 0.147$, $P = .215$). Similarly, knowledge score showed a weak positive correlation with perception score that did not reach statistical significance ($\rho = 0.187$, $P = .113$).

In contrast, perception score demonstrated a moderate positive correlation with application score, which was statistically significant ($\rho = 0.490$, $P < .001$).

Table 6. Correlation Between Knowledge, Perception, and Application Scores Among Medical Interns (N = 73)

Variable	Knowledge score	Perception score	Application score
Knowledge score	1.00	$\rho = 0.187$; $P = .113$	$\rho = 0.147$; $P = .215$
Perception score	$\rho = 0.187$; $P = .113$	1.00	$\rho = 0.490$; $P < .001$
Application score	$\rho = 0.147$; $P = .215$	$\rho = 0.490$; $P < .001$	1.00

ρ : Spearman rank correlation coefficient.

Barriers to Effective Infection Prevention and Control Practices

The predominant barriers were lack of time (58.9%) and fatigue/workload (46.6%), whereas fewer participants identified inadequate knowledge (15.1%) or low perceived risk (12.3%) as barriers.

Table 7. Reported Barriers to Effective Infection Prevention and Control Practices (N = 73)

Barrier	n (%)
Lack of time	43 (58.9)
Fatigue or workload	34 (46.6)
Inadequate PPE availability	19 (26.0)
Lack of supervision	18 (24.7)
Lack of knowledge	11 (15.1)
Low perceived risk	9 (12.3)

Note: Multiple responses were permitted; therefore, percentages do not total 100%.

Suggestions for Improving Infection Prevention and Control Practices

Thematic analysis of the open-ended responses indicated that participants most frequently recommended regular IPC refresher training, simulation-based learning, enhanced supervision, periodic audits with feedback, and improved availability of PPE and hand hygiene facilities.

DISCUSSION

The study included 73 medical interns representing diverse clinical postings, with a predominance of female participants (61.6%). A female predominance was observed in studies among Indian medical undergraduates and interns, reflecting the current gender distribution in many medical colleges. Although gender differences were not associated with knowledge or application scores in the present study, inclusion of participants from multiple clinical departments enhanced the representativeness of the findings across different clinical learning environments.

Approximately half of the participants (52.1%) reported having received formal IPC training before the study. Bano et al. similarly highlighted that previous educational exposure alone does not necessarily translate into optimal clinical practice, emphasizing the need for continuous reinforcement.⁹ The inclusion of interns from a broad range of clinical postings further enabled evaluation of IPC practices under varied patient-care settings, providing a more comprehensive assessment of undergraduate IPC competency.

The present study demonstrated a high overall knowledge score (9.51 ± 1.38), indicating satisfactory understanding of Infection Prevention and Control (IPC) principles among medical interns. Similar findings were reported by Ancy et al.⁸, who observed significant improvement in interns' IPC knowledge following a structured e-learning intervention. Likewise, Radhakrishnan et al.⁹ reported good overall IPC knowledge among healthcare professionals despite gaps in specific practices, while Jemal et al.¹⁰ found that formal IPC training was associated with better knowledge and adherence to infection prevention practices. Collectively, these findings underscore the importance of structured competency-based IPC education and continuous reinforcement in strengthening infection prevention knowledge.

The present study demonstrated highly positive perceptions towards IPC (mean score: 52.50 ± 4.52), with most interns recognizing the importance of infection prevention, surveillance, biomedical waste management, and standard precautions. However, uncertainty regarding ventilator-associated pneumonia prevention and the perception that IPC measures are time-consuming indicate areas requiring further reinforcement. Similar findings were reported by Thazha et al., who observed positive IPC attitudes while emphasizing the need for continuous training and institutional support.¹¹ Likewise, Sharma and Bachani reported that despite favorable attitudes, workload and practical implementation challenges persisted.¹² These findings highlight the importance of regular competency-based training and supportive workplace environments to strengthen IPC compliance.

The present study demonstrated a high self-reported application score (54.03 ± 6.40), indicating good adherence to IPC practices among medical interns, particularly for biomedical waste segregation, safe sharps disposal, aseptic techniques, and hand hygiene. Similar findings were reported by Wadekar et al.,¹³ who observed good compliance with universal safety precautions among interns despite deficiencies in hand hygiene technique and adherence to certain practices. The high application scores observed in the present study may reflect the benefits of structured IPC training, competency-based medical education, and regular supervision, highlighting the importance of continuous reinforcement of IPC practices.

No significant association was observed between gender or previous formal IPC training and knowledge or application scores. However, application scores differed significantly by departmental posting, suggesting that the clinical learning environment and practical reinforcement influence IPC practices more than theoretical knowledge alone. These findings highlight the importance of supportive supervision and competency-based training in improving IPC compliance.

The present study found no significant correlation between knowledge and IPC application, whereas perception showed a moderate positive correlation with application. Similarly, Wang et al. reported that positive attitudes directly influenced IPC practices, while knowledge affected practice indirectly through attitudes and perceived barriers.¹⁴ These findings highlight the importance of competency-based training that fosters positive attitudes and behavioural change alongside theoretical knowledge.

The most frequently reported barriers to IPC implementation were lack of time, workload, inadequate PPE availability, and insufficient supervision, highlighting the influence of organizational factors on IPC compliance. Similar findings have been reported by George et al.,¹⁵ who identified institutional and PPE-related factors as key determinants of compliance, and by Das et al.,¹⁶ who emphasized the adverse impact of workload and resource constraints. These findings underscore the need for sustained administrative support, adequate resources, regular supervision, and continuous training to strengthen IPC practices.

The findings have important implications for undergraduate medical education. Integrating competency-based IPC training with simulation exercises, periodic refresher sessions, audit and feedback, and supervised clinical practice may improve translation of knowledge into routine behaviour. Strengthening these educational strategies is essential to prepare future physicians for safe clinical practice and antimicrobial resistance containment.

CONCLUSION

Medical interns demonstrated good knowledge, positive perceptions, and satisfactory application of Infection Prevention and Control (IPC) practices. However, knowledge gaps persisted in transmission-based precautions and hospital surface disinfection. While knowledge was not significantly associated with IPC application, positive perceptions showed a moderate positive correlation with practice, underscoring the importance of behavioural factors. These findings support the incorporation of regular competency-based IPC training, behavioural reinforcement, and supportive clinical environments to strengthen IPC compliance and improve patient safety.

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