

A Cross-Sectional Study of Knowledge and Infection Control Practices among Under- Graduate Nursing Students

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DOI: <https://doi.org/10.51244/IJRSI.2026.1308000139>

Received: 24 August 2026; Accepted: 29 August 2026; Published: 10 September 2026

ABSTRACT

Background: Infection prevention and control (IPC) is essential for ensuring patient and healthcare worker safety. Nursing students, who begin clinical exposure early in their education, must possess adequate knowledge and practice of IPC to prevent healthcare-associated infections (HAIS). Aim of this study was to assess the knowledge and practices of infection control among nursing students.

Methods: A descriptive cross-sectional study was conducted among 169 BSc nursing students from 2nd, 4th, and 6th semesters of a selected college in Kannur district. Tools included a demographic proforma, a 24-item knowledge questionnaire, and a 20-item self-reported practice scale. Data were analyzed using descriptive statistics, chi-square tests, and Pearson correlation.

Results: Most students demonstrated excellent (40.23%) or good (42.01%) knowledge. Practice scores were high, with 89.34% reporting excellent practices. A moderate positive correlation was found between knowledge and practice ($r = 0.44$, $p < 0.05$). Knowledge showed significant association with age, semester of study, and clinical exposure, while practice did not significantly associate with any demographic variable.

Conclusion: Nursing students displayed generally strong knowledge and excellent self-reported practice regarding infection control. However, knowledge-practice gaps persist, emphasizing the need for ongoing skill reinforcement, simulation training, and structured educational interventions. A sim was developed to support these needs.

Keywords: Knowledge; Practice; Infection control practices; Cross Sectional Study; Nursing Students.

INTRODUCTION

Infection prevention and control (IPC) is a fundamental aspect of healthcare delivery, designed to safeguard patients, healthcare workers, and the wider community from healthcare-associated infections (HAIS). These practices form the backbone of clinical safety protocols and are especially critical in environments where patients are vulnerable, such as hospitals and other healthcare settings. Nursing professionals play a vital role in implementing and maintaining these practices, making their knowledge and compliance essential in preventing infections and promoting patient safety.

Nursing students, as future healthcare providers, are frequently involved in direct patient care during their clinical training. They are exposed to a variety of clinical settings where adherence to infection control guidelines is vital. However, several studies have indicated that gaps often exist between theoretical knowledge and practical application of infection control measures. These gaps may arise due to insufficient training, lack of awareness,

or inadequate supervision during clinical postings. As a result, nursing students may inadvertently contribute to the transmission of infections, highlighting the need for regular assessment and reinforcement of infection control education.¹

Infection control practices encompass a wide range of activities including hand hygiene, use of personal protective equipment (PPE), safe injection practices, proper handling and disposal of biomedical waste, sterilization and disinfection of equipment, and respiratory hygiene. Hand hygiene, in particular, is recognized as the most effective measure in reducing the spread of infections. Despite this, compliance remains suboptimal in many healthcare settings, especially among students and new professionals.²

The world health organization (WHO) and the centers for disease control and prevention (CDC) have issued detailed guidelines on infection prevention and control, aimed at reducing HAIs. These guidelines emphasize the importance of continuous education and training, monitoring compliance, and promoting a culture of safety within healthcare institutions. In the Indian context, where healthcare facilities often face challenges such as overcrowding, limited resources, and high patient loads, strict adherence to IPC protocols becomes even more critical.³

Globally, healthcare-associated infections (HAIs) affect one in ten hospitalized patients, and in low- and middle-income countries, the rate rises to 15%⁴. Nursing students are particularly vulnerable due to frequent clinical exposure and inconsistent adherence to infection control measures. A study in South Korea found that nursing students had an average IPC knowledge score of 54.5%⁵. In India, 85% of nursing students demonstrated theoretical knowledge about hand hygiene, yet less than 30% consistently practiced it, and only 25% correctly defined standard precautions⁶.

In nursing education, both theoretical and practical components are essential for developing competent healthcare providers. While most nursing curricula include infection control as a topic, the extent to which students retain and apply this knowledge in clinical practice can vary. Hence, a study aimed at assessing the knowledge and practices of BSc. Nursing students regarding infection control is crucial. It not only helps identify existing knowledge gaps but also guides educators in refining instructional methods and training strategies.⁷

The present study seeks to assess the current level of knowledge and the actual implementation of infection control practices among BSc. Nursing students. By understanding students' awareness and behaviours, this research can contribute to the development of targeted interventions to improve infection control adherence. This is particularly important in the post-covid-19 era, where infection prevention has taken on heightened significance, and healthcare professionals are expected to be more vigilant than ever.

Need and significance of the study

In the wake of recent public health challenges, including the covid-19 pandemic, the importance of effective infection control has become more evident. Nursing students, during their clinical postings, are at an increased risk of exposure to infectious diseases. If they do not adhere to infection control protocols adequately, it not only puts their own health at risk but also compromises the safety of patients and the broader hospital environment.

Assessing the knowledge and practices of nursing students helps educators and administrators to identify specific areas that require intervention. This, in turn, leads to the development of targeted educational programs, workshops, and simulations that can enhance both cognitive and practical competencies. Moreover, early correction of improper practices ensures that students develop safe and ethical professional habits before entering the healthcare workforce.⁸

Furthermore, multiple reports have indicated a persistent gap between knowledge and actual practice among nursing students, especially in high-risk clinical areas. Factors such as lack of consistent supervision, insufficient role modeling, and limited hands-on exposure can hinder effective learning. Reinforcing infection control protocols through continuous monitoring, mentorship, and practical evaluation during clinical postings is vital. Such measures not only ensure immediate patient safety but also help nurture a generation of nurses who are competent, confident, and committed to best practices in infection prevention and control.

Despite the inclusion of infection control content in nursing curricula, periodic assessments and refreshers are necessary due to the evolving nature of infectious diseases and the continuous emergence of new pathogens. A descriptive study of this nature can provide evidence-based insights that are crucial for curriculum development and policy-making in nursing education

Major Objectives of the Study,

- To assess the level of knowledge and practice regarding infection control practices among Under-Graduate nursing students.
- To identify the relationship between knowledge and practice of infection control among Under- graduate nursing students
- To determine the association between knowledge and practice among under-graduate nursing students with selected demographic variables.

RESEARCH METHODOLOGY

Research Approach and Design

A quantitative research approach was adopted to assess the level of knowledge and practice regarding infection control among Bachelor of Science in Nursing (B.Sc. Nursing) students. A descriptive cross-sectional research design was employed, as the study aimed to assess the existing knowledge and reported infection-control practices of nursing students at a specific point in time without introducing any intervention or manipulation of study variables.

Study Variables

The primary study variables were knowledge and practice regarding infection control. Knowledge referred to the students' understanding of infection-control principles, standard precautions, transmission-based precautions, hand hygiene, personal protective equipment, biomedical waste management, and related infection-prevention measures. Practice referred to the extent to which students reported following recommended infection-control measures in their academic and clinical activities.

Demographic and Background Variables

The demographic and background variables included age, gender, semester of study, type of institution, current residence, area of residence before joining college, formal training received on infection control, workshops or seminars attended, clinical exposure, hepatitis B vaccination status, history of chronic illness, and source of information regarding infection control. These variables were included to describe the characteristics of the study participants and to examine their potential association with knowledge and practice related to infection control.

Setting of the Study

The study was conducted at Selected College of Nursing, Kannur district, Kerala, among students enrolled in the B.Sc. Nursing programme. The study specifically included students studying in the 2nd, 4th, and 6th semesters. These academic levels were selected to include students with varying levels of theoretical learning and clinical exposure related to infection prevention and control.

Study Population

The study population consisted of all B.Sc. Nursing students studying at Selected College of Nursing who fulfilled the predetermined eligibility criteria.

Sample Size, Technique and Criteria

The sample comprised 169 B.Sc. Nursing students from the 2nd, 4th, and 6th semesters who met the inclusion criteria and participated in the study. A non-probability convenience sampling technique was used for participant

recruitment. Students who met the eligibility criteria, were available during the period of data collection, and were willing to participate were invited to participate in the study until the required sample size of 169 was achieved.

Inclusion Criteria

- Were currently enrolled in the 2nd, 4th, or 6th semester of the B.Sc. Nursing programme.
- Were willing to participate in the study and provide informed consent.
- Were present during the period of data collection.

Exclusion Criteria

- Were absent during the period of data collection.
- Were unwilling to participate or did not provide informed consent.

Data Collection Tools and Instruments

Data were collected using three structured tools developed to assess the demographic characteristics, knowledge, and infection-control practices of the participants.

Tool 1: Demographic and Background Proforma

The first tool consisted of a structured demographic and background proforma. It collected information regarding age, gender, semester of study, type of institution, current residence, area of residence before joining college, formal training received, participation in workshops or seminars, clinical exposure, hepatitis B vaccination status, history of chronic illness, and source of information regarding infection control.

Tool 2: Knowledge Questionnaire

The second tool was a structured knowledge questionnaire consisting of 24 multiple-choice questions (MCQs) designed to assess the participants' knowledge regarding infection control. Each correct response was awarded one mark, while an incorrect or unanswered response received zero marks. Thus, the possible total score ranged from 0 to 24, with higher scores indicating better knowledge regarding infection-control measures. The knowledge scores were categorized as follows:

Knowledge score	Interpretation
20–24	Excellent
15–19	Good
10–14	Satisfactory
5–9	Needs improvement
<5	Poor

Tool 3: Practice Questionnaire

The third tool assessed infection-control practices using a 20-item, five-point Likert-scale questionnaire. The items assessed the frequency or consistency with which students reported following recommended infection-control practices in their academic and clinical settings. The total possible score ranged from 0 to 80, with higher scores indicating better reported infection-control practices. The practice scores were categorized as follows:

Practice score	Interpretation
65–80	Excellent
50–64	Good

35–49	Moderate
<35	Poor

Validity of the Tools

The content validity of the study instruments was established through expert review. The tools were submitted to experts in nursing and statistics for evaluation of their relevance, clarity, comprehensiveness, and appropriateness in relation to the study objectives. The suggestions and recommendations provided by the experts were considered and incorporated into the final versions of the instruments before data collection.

Data Collection Procedure

Prior permission to conduct the study was obtained from the concerned institutional authorities of Selected College of Nursing, Kannur district. The participants were informed about the purpose and objectives of the study, the nature of their participation, and the importance of providing accurate responses. Participation was voluntary, and informed consent was obtained from each participant before commencement of data collection.

Data were collected electronically using Google Forms. The questionnaire link was shared with eligible participants during the designated data-collection period. Participants completed the demographic proforma, knowledge questionnaire, and practice questionnaire independently. The completed responses were retrieved on the same day for data management and analysis.

Appropriate measures were taken to maintain the confidentiality and privacy of the participants' responses. The collected data were subsequently organized and prepared for statistical analysis in accordance with the objectives of the study.

Ethical Considerations

Participation in the study was voluntary, and informed consent was obtained from all participants before data collection. Participants were informed of the purpose of the study and their right to decline participation. Confidentiality of the information provided by the participants was maintained throughout the study, and the collected data were used solely for research purposes.

Results and Major findings of the Study

Demographic characteristics

Most students were aged 20–22 years (53.84%) and female (79.88%). Semester distribution included 2nd semester (35.50%), 4th semester (36.09%), and 6th semester (28.40%). More than half (63.90%) had clinical exposure in high-risk areas, and 62.72% had formal ipc training.

Table No.1. Depicts level of the Knowledge among Nursing Students

Category	Score range	N (%)
Excellent	20–24	68 (40.23%)
Good	15–19	71 (42.01%)
Satisfactory	10–14	20 (11.83%)
Needs improvement	5–9	9 (5.32%)
Poor	<5	1 (0.59%)

Mean knowledge score = 17.69 ± 3.89

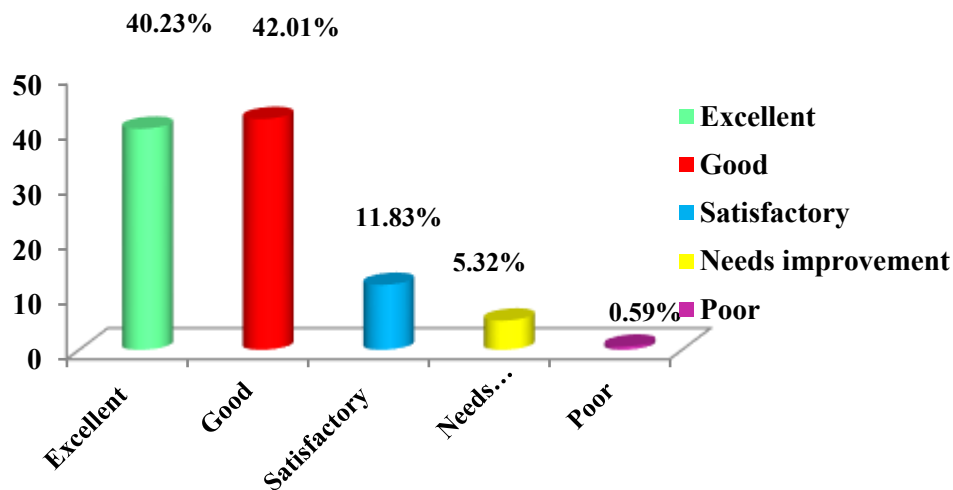


Figure 1. Distribution of Nursing Students based on knowledge level

Table No. 2 Projection of levels of Practice among nursing students.

Category	Score range	N (%)
Excellent	65–80	151 (89.34%)
Good	50–64	7 (4.14%)
Moderate	35–49	10 (5.91%)
Poor	<35	1 (0.59%)

Mean practice score = 74.2 ± 11.11

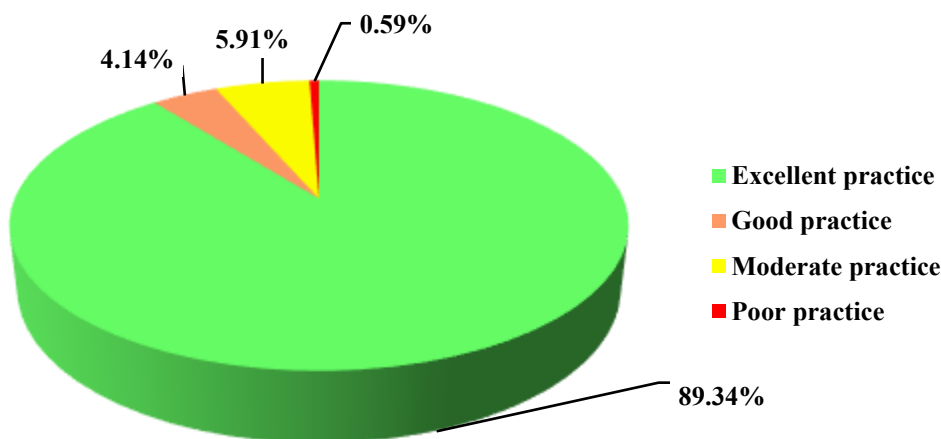


Figure No. 2. Distribution of Nursing Students based on practice level

Correlation between knowledge and practice

A moderate positive correlation was observed between knowledge and practice regarding infection control among B.Sc. Nursing students (Pearson's correlation coefficient, $r = 0.44$). This indicates that students with higher levels of knowledge regarding infection-control measures tended to demonstrate better infection-control

practices. The correlation was statistically significant ($p < 0.05$), indicating that the observed association between knowledge and practice was unlikely to have occurred by chance.

However, the correlation of 0.44 represents a moderate association and does not establish a causal relationship between knowledge and practice. Thus, while improved knowledge appears to be associated with better infection-control practices, other factors may also influence students' actual practices.

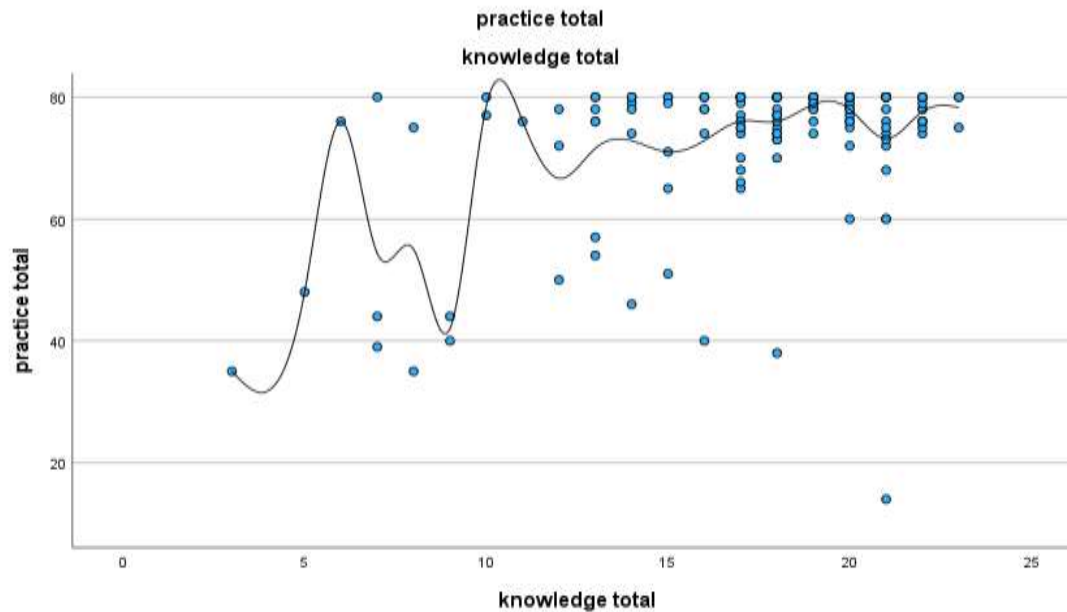


Figure No.3 Scatter plot diagram showing correlation between knowledge and practice score

Association of Knowledge and Practice with demographic variables

Analysis of the association between selected demographic variables and knowledge regarding infection control revealed that age, semester of study, and clinical exposure were significantly associated with the level of knowledge among the B.Sc. Nursing students. A statistically significant association was observed between age and knowledge ($p = 0.038$), indicating that knowledge levels differed significantly across age groups. Similarly, semester of study showed a significant association with knowledge ($p = 0.017$), suggesting that students at different stages of their nursing education demonstrated differences in infection-control knowledge. Clinical exposure was also significantly associated with knowledge ($p = 0.005$), indicating that students with different levels of clinical exposure had significantly different levels of knowledge regarding infection-control practices. Since all three p-values were less than 0.05, these associations were considered statistically significant.

In contrast, the analysis of infection-control practice revealed no statistically significant association between practice scores and any of the demographic or background variables assessed in the study. This indicates that the reported infection-control practices of the nursing students did not differ significantly according to their age, gender, semester of study, residence, training received, workshop or seminar participation, clinical exposure, hepatitis B vaccination status, history of chronic illness, or source of information. Thus, within the study population, demographic and selected background characteristics did not appear to have a statistically significant influence on reported infection-control practices.

The findings suggest that knowledge regarding infection control was influenced by certain educational and experiential characteristics, particularly age, semester of study, and clinical exposure, whereas reported infection-control practice remained relatively independent of the demographic and background characteristics examined.

DISCUSSION

The study found that the majority of B.Sc Nursing students demonstrated good to excellent knowledge regarding infection control practices. This aligns with earlier evidence indicating that nursing curricula and heightened IPC awareness particularly following the covid-19 pandemic have strengthened theoretical understanding among students.

Practice scores were notably higher than knowledge scores, with nearly 90% of students reporting excellent practice. While encouraging, this disparity may reflect tendencies in self-reported data rather than objective observation, a phenomenon noted in previous research from Nepal and Wuhan. Students may follow practices through routine institutional reinforcement even when deeper conceptual understanding varies.

The moderate positive correlation ($r = 0.44$) between knowledge and practice suggests that improved knowledge contributes to better practice, but knowledge alone is insufficient to ensure consistent compliance. Behavioral practice is often influenced by workload, supervision, institutional policies, and resource availability.

Significant associations between knowledge and demographic variables including age, semester, and clinical exposure-underscore the role of progressive academic learning and practical experience. However, practice did not vary significantly across demographic groups, suggesting that sustained practice behavior depends more on system-level support and clinical culture than on personal attributes.

These findings emphasize the need for structured educational approaches, ongoing reinforcement, simulation-based training, and competency assessments to bridge the knowledge-practice gap and

SUMMARY AND CONCLUSION

The study concludes that while the knowledge level regarding infection control was generally adequate, the actual practice of infection control measures was found to be inconsistent and inadequate among the participants. This gap between knowledge and practice indicates a pressing need for structured, frequent, and practical training programs.

Strengthening the nursing curriculum, improving clinical supervision, and fostering a strong infection prevention culture are essential steps in ensuring that nursing students are well equipped to prevent healthcare-associated infections. Effective infection control practices are vital not only for patient safety but also for the protection of healthcare workers themselves.

Nursing Implication of the Study

The findings of the study have important implications for nursing education, practice, administration, and research. Nursing education should emphasize infection-control principles through a combination of theoretical teaching, simulation-based training, role plays, and continuing education program. In nursing practice, strict adherence to standardized infection-control protocols should be promoted, with adequate availability of personal protective equipment, hand-hygiene facilities, and appropriate waste-disposal systems. Nursing administrators and nurse leaders should strengthen infection-control policies through regular supervision, audits, feedback, and accountability mechanisms to foster a culture of patient and staff safety. Furthermore, nursing research should focus on evaluating the effectiveness of educational interventions, comparing infection-control practices across institutions, and identifying barriers to compliance to support evidence-based infection-control policies and practices.

Recommendations

- Regular in-service training programmes on infection prevention and control should be conducted and made mandatory for all nursing personnel to ensure continued competency and adherence to recommended practices.

- Practical demonstrations, simulation-based learning, and hands-on workshops should be incorporated alongside theoretical instruction to strengthen the application of infection-control principles.
- Nursing students should be encouraged and supervised to consistently apply standard infection-control precautions during clinical postings and patient-care activities.
- Further research should be undertaken to identify the individual, organizational, and environmental factors influencing poor adherence to infection-control measures and to develop targeted interventions for improving compliance.

Source of funding: Self-funded project within the Institution.

Conflict of Interest: The authors declare that there is no conflict of interest.

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