Volume 3, Number 2, 2026 Pages 1-25

Bioscience Insights

ISSN: 3080-3489 (Print)
ISSN: 3080-3497 (Online)

BioSciInsights.com

ASSESSMENT OF KNOWLEDGE OF INFECTION CONTROL AMONG NURSING STUDENTS AT SERVICES HOSPITAL LAHORE: A DESCRIPTIVE CROSS-SECTIONAL STUDY

Talha Jameel[*1], Sana Ashfaq[2], Amina Sardar[3]

[*1,2,3]*SACON Institute of Allied Health Sciences*

[*1]tm9506878@gmail.com, [2]sanamughal0309@gmail.com, [3]sardarali0910202009@gmail.com

DOI: https://doi.org/10.5281/zenodo.22939197

Article Information

Article History

Received:	May 15, 2026
Revised:	June 27, 2026
Accepted:	August 12, 2026
Available Online:	August 31, 2026

Keywords:

Infection control, nursing students, knowledge, practices, healthcare-associated infections, Lahore

Abstract

Background

Infection prevention and control (IPC) is a critical component of healthcare practice, particularly among nursing students who are frequently exposed to clinical environments. Adequate knowledge and proper practices are essential to reduce the risk of healthcare-associated infections and ensure patient safety.

Objective

To assess the knowledge and practices regarding infection control among nursing students at Services Hospital.

Methods

A descriptive cross-sectional study was conducted among 200 nursing students. Data were collected using a structured, self-administered questionnaire consisting of demographic variables, knowledge-related questions, and practice-related items. The data were analyzed using SPSS version 27, and results were presented using frequencies, percentages, and descriptive statistics.

Results

The findings revealed that 80.0% of participants had good knowledge, while 20.0% had moderate knowledge regarding infection control. Most participants correctly identified basic infection prevention measures such as hand hygiene, mask use, and modes of transmission. However, gaps were observed in areas such as antibiotic use, isolation practices, and preventive strategies. Additionally, 60.0% of participants were not vaccinated against Hepatitis B, and 80.0% had not attended any formal training on infection prevention and control.

Conclusion

The study concludes that although nursing students demonstrated good overall knowledge regarding infection control, deficiencies exist in specific areas and practical aspects. There is a need for structured training programs, improved educational interventions, and

institutional policies to enhance both knowledge and practices, ensuring effective infection control and patient safety.

INTRODUCTION

1.1Background

Nosocomial infections, also known as healthcare-associated infections (HAIs), are illnesses people acquire while in healthcare facilities. HCAI can be defined as an infection occurring in a patient during the process of care in a hospital or other healthcare facility that was not present or incubating at the time of admission. It contributes to significant morbidity and mortality, longer duration of hospitalization, and increased cost of treatment in both developed and resource-poor countries(Iliyasu et al., 2016).

Healthcare-associated infections (HAI) also include occupational infections among healthcare workers (HCWs) and students, as well as illnesses that develop after hospital discharge. Strategies for reducing the risk of infection transmission in healthcare settings are provided by infection prevention and control (IPC) organizations, and they should be applied across sectors. Effective IPC procedures across sectors are required because of the high incidence of HAIs, which are particularly prevalent in Africa and Asia, and because they rank among the top ten dangers to world health. During their clinical placement, nursing and healthcare students are more susceptible to infections from blood-borne pathogens and sharp instrument injuries. Lack of protective materials for students, inadequate training in high-risk medical operations, and limited practical experience in basic precautions could all contribute to the high risk for students. If nursing students disregard the recommended infection control procedures, they could become a source of cross-infection.(AiedAlnawafleh, 2024).

Hospital-acquired infections (HAIs) or nosocomial infections are localized or systemic. A healthcare worker (HCW) usually acquires these infections during interactions with patients during examinations and other day-to-day activities, including specimen collection, processing, and discarding, and the handling of medical equipment. However, patients acquire these infections during their hospital stay. The symptomatology of these infections appears 48–72 h after the patient's admission or within 10 days after discharge from the healthcare facility. People of all age groups are susceptible to these infections, whereas those with weak immune systems, the elderly, and children are the most vulnerable. These infections have been known to severely affect the quality of healthcare services(Khatrawi et al., 2023).

These infections acquired during the stay of the patient in the hospital cause many disabilities and a high morbidity rate, which is a cause of increased burden on the health care costs of the patient and health services due to prolonged stay in the hospital and additional medications. According to several studies, alcohol-based hand rubs are more effective than hand washing with soap and water for the removal of pathogenic microorganisms, and are tolerated well by the skin. In alcohol based hand rubs, gels are tolerated well by the skin as compared to the liquid formulations(Ahmed et al., 2018).

The incidence rate of nosocomial infections in LMIC has been estimated to be very high due to the limited knowledge of professional risks, adherence to universal precautions, and limited availability of personal protective equipment (PPE). Several epidemiological studies have reported that physicians, nurses, dentists, and laboratory personnel are the main sources of transmission of nosocomial infections due to aseptic precautions during medical procedures. Based on the guidelines of the CDC, nosocomial transmission can be efficiently prevented by personal hygiene, use of PPE, and proper handling of contaminated bedding and clothing during direct contact with the patients. environmental decontamination, which includes utilizing superheated water and sterile patient equipment(Khatrawi et al., 2023).

Workers in the healthcare industry include those who provide treatment directly, including doctors, nurses, lab techs, and pharmacists, as well as those who supervise care delivery and provide essential support services, like security guards, bus drivers, and kitchen staff. Biological, toxicological, agronomic, structural, and mental distress are some risks that healthcare workers face on the job. Depending on the infectious agent, there may be several entry points for infection among healthcare personnel. Infection can also occur through splashes and droplets of contaminated bodily fluids on injured skin or from a needle sticking through skin tissue. Eye, mouth, and nose infections can also be contracted when

contaminated body fluids splash, or droplets land on mucous membranes, or when those mucous membranes come into contact with contaminated skin, such as when rubbing the eyes with a hand carrying pathogens after shaking hands with a patient(Naeem et al., 2025).

As front-line caregivers, nurses are both at risk and pivotal to the prevention and management of nosocomial infections, making their knowledge, attitudes, and practices a critical focus for patient safety and public health. Evidence suggests that regular hand hygiene, proper use of personal protective equipment, and adherence to standard precautions are fundamental to controlling the transmission of infection. Yet, barriers such as inadequate resources, high patient loads, and limited training can impede the consistent application of best practices. Prior studies have underscored the need for structured infection control education and hospital policies tailored to local challenges(Mazhar et al., 2025) .

Another study highlighted that there is a need for frequent education and training programs during primary training time to retain knowledge about HIAs and reinforce the principles of standard precautions and hand hygiene. It is observed in a study that knowledge regarding HIAs among students of health care and control measures has been adequate. However, more practical components of hand hygiene and standard precautions in future educational approaches would be more effective. Knowledge and practices of nursing staff were also good, except for nursing students. According to facility types, participants' knowledge level in private hospitals was better compared to public hospitals, but practice levels are higher among the participants from public hospitals. Nursing and health care professionals in general possess good knowledge and a positive attitude towards HIAs, as well as infection control practices. However, a scarcity of literature has been found in the local Pakistani context on this topic(Ali et al., 2024).

In 2022, the WHO published a technical document titled ―Standard Precautions for the Prevention and Control of Infection: Aid Memorial‖. Which highlights the brief note about compliance with standard precautions guidelines and the implementation of these guidelines at all times in all healthcare settings. According to Centre for Disease Control and Prevention, precautionary measures are essential in healthcare settings, not only for healthcare recipients but also mandatory for medical staff. Most of the studies disclosed that student nurses are more vulnerable to infection as compared to staff nurses due to a lack of knowledge and practices about precautionary measures(Riaz et al., 2025).

Medical Personnel are manifested with infection in advanced economies of 7.6%, while in Underdeveloped countries, it is about 10% (WHO). According to the WHO, up to 3 million medical professionals are vulnerable to hepatitis C, hepatitis B & HIV every year. Many studies revealed that up to 2.5% HIV, 40% HBV, & 40% HCV cases were investigated among medical professionals from the entire world. One of the Iran studies revealed that 21% nurses and 30% doctors are unfamiliar with the fact that needle stick injuries can cause Hepatitis B and C. Moreover, another study disclosed that approximately 50% Nurses and 51% Doctors neglected to wear sterile gloves during interaction with patients, which can lead to the ultimate cause of infection. According to one Pakistani study, only 4.7% clinical staff follow the hand - washing techniques. According to the National Report on Right Diagnosis from Health Grade, up to 1 million cases of infection due to patient-cantered care are reported in Pakistan. Standard precautions can alleviate the propagation of infection. Therefore, knowledge and practice about standard precautions are essential for health professionals(Mazhar et al., 2025).

The incidence of HAIs can be considerably impacted by nursing practices and procedures. On the one hand, by following evidence-based procedures, nurses can successfully avoid infections. Conversely, poor nursing practices may be a factor in the transmission of infections. Thus, nurses play a crucial and essential role in preventing HAIs in order to protect patients and uphold the standard of healthcare. An essential component of any hospital-based quality improvement program is the nurse. They are in a unique position to affect infection control results because of their ongoing presence at the patient's bedside and participation in a variety of care procedures. Thus, nurses' knowledge, attitudes, and behavior have a big impact on how well IPC programs work(Riaz et al., 2025).

In the interests of improving the quality of healthcare services through adherence to hand hygiene (HH) standards and precautions that need to be promoted through structured training and surveillance programs, this study aimed to provide baseline data regarding knowledge, attitude, and self-reported practice among healthcare workers (HCWs); assess and identify gaps and factors affecting knowledge,

attitude, and practice among HCWs; and evaluate the difference between medical and nursing staff knowledge, attitude, and practice of HH(Zia et al., 2022).
The risk of infection transmission is avoided. The purpose of this study was to evaluate the knowledge of infection control among nursing practitioners employed at Tertiary Care Hospital. To see a positive effect on the health of each patient in the hospitals, all nursing staff must understand HAIs and follow standard procedures to prevent infection transmission in any healthcare environment(Batool et al., 2023).

Significance of the Study
Nursing students represent the future of the healthcare workforce and are regularly exposed to various pathogens during clinical training. Because they are directly involved in patient care, adherence to infection control protocols is essential. A lack of knowledge or a negative attitude toward infection control can compromise patient safety and increase students' risk of acquiring infections. Therefore, assessing and improving the quality of infection control education and evaluating students' preparedness are of utmost importance.

1.3 Aim:
The aim of the study to evaluate the knowledge regarding infection prevention among nursing students in the tertiary hospital Lahore.

1.4 Objective:
To determine the overall level of knowledge (poor, moderate, or good) among undergraduate nursing students regarding infection control practices.

1.5 Research Question:
What are the levels of knowledge regarding infection prevention among nursing students in the tertiary hospital in Lahore?

Literature Review
Khaldoon AiedAlnawafleh: Of the 160 students in the final cohort, 58.8% were male, and 75.6% of participants were 21 years of age or older. When compared to students who reported having problems with inadequate information, the majority of students (86.9%) had better mean scores (M = 14.7, SD = 2.4) with good knowledge. (M = 7.2, SD = 1.7, P =.001*). Students who reported having problems with bad practice had a lower mean score (M = 36.7, SD = 8.2, P =.001*) than those who scored well, which accounted for the largest percentage of students (60.6%). most participating students (64.4%) had a positive attitude (M = 26.9, SD = 5.5, P =.001*). (AiedAlnawafleh, 2024).Garba Iliyasu: A total of 200 responses were analyzed, 152 were nurses, while 48 were doctors. The median age and years of working experience of the respondents were 35 years (inter quartile range [IQR] 31–39) and 7 years (IQR 4–12), respectively. Most of the respondents, 174/198 (87.9%), correctly identified hand washing as the most effective method to prevent HCAI, with nurses having better knowledge, 139/152 (91%) (P = 0.001). The majority agreed that avoiding injury with sharps 172/200 (86%), use of barrier precautions 180/200 (90%), and hand hygiene 184/200 (92%) effectively prevent HCAI. Only 88/198 (44.4%), 122/198 (61.6%), and 84/198 (42.4%) of the respondents were aware of the risks of infection following exposure to human immunodeficiency virus, hepatitis B virus, and hepatitis C virus-infected blood, respectively. About 52% of doctors and 76% of nurses (P = 0.002) always practice hand hygiene in between patient care(Iliyasu et al., 2016).Elham M. Khatrawi: A total of 743 HCWs from various countries participated in the study, with the majority of respondents being doctors (64.9%). Data were mainly obtained from Saudi Arabia (26.78%), Iraq (25.84%), India (15.7%), the United States of America (15.2%), and Africa (Sudan, Nigeria) (13.98%). The frequency of good KAP scores among physicians (KAP: 82.5, 80.66, and 70.5), nurses (KAP: 74.1, 73.07, and 88.7), medical practitioners (KAP: 87.2, 77.58, and 75.1), and technicians (KAP: 76.1, 74.38, and 89.6) was obtained as mentioned. With respect to experience, HCWs showed good KAP scores in 1–5 years (KAP: 82.4, 83.3, and 74.1), 5–10 years (KAP: 80.6, 74.54, 83),

10–20 years (KAP: 74.7, 79.1, and 82.7), and >20 years (KAP: 84.6, 78.8, and 82.8) categories.(Khatrawi et al., 2023).

Abid Naeem: The findings of this study revealed that the majority of the participants 64.5% have an average knowledge (50% to 85%) regarding standard precautions, while 35.5% of the participants have an excellent knowledge (>85%). Similarly, 56.2% of the participants have an average practice (50% to 85%), while only 37.2% of the participants have good practice (>85%), and 6.6% of the participants have poor practice.(Naeem et al., 2025).

Afifa Rizwan: Among 100 participants, 90% demonstrated high knowledge, 86% exhibited positive attitudes, but only 57% consistently adhered to recommended practices. Statistically significant positive correlations were observed between knowledge, attitudes, and practices (knowledge-attitude $r = 0.681$, knowledge-practice $r = 0.584$, all $p < 0.01$), highlighting the gap between awareness and practical implementation.(Rizwan et al., 2025).

Anny Ashiq Ali: The knowledge assessment showed 63% had poor knowledge regarding HAI, 30% had fair knowledge, and 7% showed good knowledge. Among the questions, the question that elicited the highest correct response was for the general definition of HAI at 78%, while prevention strategies elicited only 27% correct responses. Regarding attitudes, 70% students gave a negative attitude toward HAI, and 27% gave a fair attitude, while only 3% recited a positive attitude(Ali et al., 2024).

Laiba Mazhar: Overall, 91% of nursing students correctly acknowledged the importance of hand washing after each patient contact, and 86% recognized the need for Standard Precautions when caring for HCV -positive patients. However, 63% mistakenly believed that Standard Precautions are only necessary for infected patients. In practice, 89% reported washing hands after contact with blood or body fluids, and 82% wore gloves when collecting blood samples. Notably, only 72% used protective eye goggles during procedures, and just 75% were vaccinated against infectious diseases, indicating critical areas for improvement.(Mazhar et al., 2025).

Habib Ullah Riaz: 94.9% of participants comprehended the need for hand cleanliness, while the majority (96.2%) acknowledged the need for face masks in the treatment of respiratory infections. Additionally, 91.0% supported regular surface disinfection, and 96.2% recognized the importance of waste segregation in infection prevention. There is a noticeable knowledge gap, too, as just 52.6% of respondents correctly recognized that alcohol-based hand massages are not always a good alternative to hand washing. Participants also mentioned a number of issues that impede constant IPC compliance, such as a lack of administrative support, high patient-to-nurse ratios, staff shortages, a lack of personal protective equipment (PPE), and a lack of continuous training.(Riaz et al., 2025).

Saima Batool: A total of 138 nursing individuals were studied regarding knowledge of infection control practice; their mean was 34.60±7.99 years and their work experience average was 13.45±8.21 years. Out of all, (99.3%) participants were using gloves, (97.8%) using masks, (84.8%) using plastic apron/ Gowns. (91.3%) discard gloves after single use and use fresh instruments for every patient; (89.1%) discard equipment and instruments. As an infection control measure, 66.7% of nurses agreed that nurses suffering from the common cold should be excused from work. As per the perceptions of nurses regarding infection control practice, the nurses should wear gloves and masks for all procedures; the key to infection prevention is hand hygiene; gloves should be used in cleaning extensive wounds and dressing forceps; and a lack of knowledge on the hazards of microorganisms is a major constraint in the prevention and control of infection. 66.7% said that nurses having common colds must be relieved of their duty, and 76.8% of nurses said the attitude, belief, and culture of our population have a positive influence on the spread of infection. Knowledge regarding Infection control practices were statistically insignificant according to age and work experience ($p > 0.05$)(Batool et al., 2023).

Imran Ahmed: A total of 330 health care workers were included in the study, out of which 54.4% (180) were males, and the rest 45.4% (150) were females. When the participants were asked about the minimum time required for alcohol-based hand rub to eradicate the microorganisms, only 42% (138) were able to correctly answer that it takes 20 seconds. The study identified considerable gaps in knowledge and practice in some key areas regarding hand hygiene, which need re-emphasis through regular training sessions aimed at keeping abreast with standard protocols of hand hygiene(Ahmed et al., 2018).

Iqra Zia: A self-administered questionnaire comprising a standardized World Health Organization Hand Hygiene Knowledge Questionnaire (WHO, revised August 2009) and Likert scales for attitude and practice was employed, using convenience sampling to collect data from 383 healthcare workers (HCWs), 92 nurses (24.9%), and 277 doctors (75.1%) in a tertiary-care military hospital. Both nurses and doctors had moderate knowledge with no significant difference ($P = 0.54$). Moreover, attitude and practice were reported as moderate for both groups. However, the self-reported HH practice of doctors was significantly ($P < 0.05$) better than that of nurses, while nurses had significantly better ($P < 0.01$) attitudes in comparison with doctors. Participants who had received formal training in the previous 3 years were 70.65% among nurses and 44.76% among doctors. In total, 78.36% acknowledged routine use of alcohol-based hand rub(Zia et al., 2022).

Methodology

3.1Research Design:

Descriptive-across section study was conducted among nursing students at the services. Hospital Lahore.

3.2 Sampling Technique

A convenience sampling technique was used to recruit the student participants in this study. who had prior clinical experience in infection-control practices.

3.3 Setting of the Study:

The study was conducted in the Nursing Department at the services hospital Lahore. The anticipated duration of the study was four weeks, following the approval of the research synopsis.

3.4 Study Subjects:

In this study, the target population included a convenience sample composed of all Internship students (160 students) who received training in different hospitals.

3.5 Sample Size

The sample size was determined using Sloven's formula.

$n=N/1+N(e)^2$

N=population size

n=sample size

e= Margin of error

$n=400/1+400(0.05)^2$

n=200

So, the sample size was 200 participants for this study.

Sample Selection

Inclusion Criteria

1. Nursing students enrolled in the 3rd year and 4th year.
2. Students studying at the Services Institute of Nursing, Lahore.
3. Students who are present during the data collection period.
4. Students who agree to participate and give informed consent.
5. Both male and female nursing students

Exclusion Criteria

1. Students from other nursing institutes.
2. Students who are on leave or absent during data collection.
3. Students who do not give consent to participate.
4. Students who are seriously ill at the time of data collection.

3.7 Tools of Data Collection:

A semi-structured questionnaire was used to gather information about knowledge and practices related to infection control. The questionnaire was taken from previously published studies (29, 30, 31), and it was further modified to meet the goals of the study and the local context. There were three sections on the data gathering tool. Among them were: •

The questions in Section A asked about the age, gender, years of experience, and educational attainment of the student nurses who participated.

Section B, which tested nursing students' understanding of infection management through the use of eighteen questionnaires with numerical values to indicate each answer (1= Yes (right answer), 0 = No (incorrect answer). The students' nurses' total knowledge score ranged from 0 (no correct answer) to 18 (all correct answers). A cut-off score of less than or equal to 9 denoted inadequate knowledge, while more than or equal to 9 indicated strong knowledge. •

Section C, which asked about the practices of student nurses in preventing infections: The practice question is number fourteen, with a possible maximum score of 70 and a minimum score of 14.

Results

Table 1: Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	200	100.0	100.0	100.0

The distribution of participants according to age shows that out of 200 respondents, the majority, 121 (60.5%), were aged 21 years and above, while 79 (39.5%) were 20 years and below. This indicates that a greater proportion of the study population belonged to the older age group, suggesting relatively higher maturity and possible clinical exposure among participants.

Table 2: Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20 Yrs and below	79	39.5	39.5	39.5
	21 Yrs and Above	121	60.5	60.5	100.0
	Total	200	100.0	100.0	

The distribution of participants according to year of study shows that out of 200 respondents, the majority, 81 (40.5%), were in the 2nd year. This was followed by 40 (20.0%) participants in the 3rd year and 40 (20.0%) in the 4th year. Additionally, 39 (19.5%) responses were recorded under an unspecified or discommode category.

Overall, the findings indicate that most participants were from the earlier stage of their nursing education, with relatively fewer students from advanced years. This distribution may influence the level of knowledge and practices regarding infection control, as students in higher years are likely to have more clinical exposure and training.

Table 3: Year of Study

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2 Year	81	40.5	40.5	40.5
	3 Year	40	20.0	20.0	60.5
	4 Year	40	20.0	20.0	80.5
	3	39	19.5	19.5	100.0
	Total	200	100.0	100.0	

The distribution of participants according to Hepatitis B vaccination status shows that out of 200 respondents, 120 (60.0%) reported that they had not been vaccinated, while 80 (40.0%) reported that they had received the vaccination.
This indicates that a majority of the participants were not vaccinated against Hepatitis B, which raises concerns regarding their susceptibility to infection, especially in clinical settings. This finding highlights the need for increased awareness and institutional policies to ensure vaccination coverage among nursing students.

Table 4: Have You Been Vaccinated Against Hepatitis B

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	80	40.0	40.0	40.0
	No	120	60.0	60.0	100.0
	Total	200	100.0	100.0	

The distribution of participants according to attendance in a course on infection prevention and control shows that out of 200 respondents, the majority, 160 (80.0%), reported that they had not attended any such course, while only 40 (20.0%) had attended.
This indicates that a significant proportion of the participants lacked formal training in infection prevention and control, which may negatively impact their knowledge and practices. This finding highlights the need for structured educational programs and training sessions to enhance awareness and compliance with infection control measures among nursing students.

Table 5 :Course Regarding Infection Prevention and Control

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	40	20.0	20.0	20.0
	No	160	80.0	80.0	100.0
	Total	200	100.0	100.0	

The distribution of participants regarding whether a virus can cause infection shows that all 200 (100.0%) respondents answered “Yes.”
This indicates that all participants had correct basic knowledge about the role of viruses in causing infections, reflecting a strong foundational understanding of infection etiology among the study population.

Table 6: Can Infection Occur From Eating or Coming Into Contact with Wild Animals?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	39	19.5	19.5	19.5
	No	161	80.5	80.5	100.0
	Total	200	100.0	100.0	

The distribution of participants regarding whether an infected person can still spread the virus in the absence of fever shows that all 200 (100.0%) respondents answered “Yes.”
This indicates that all participants had correct knowledge about asymptomatic or afebrile transmission of infections. The finding reflects a strong understanding of disease transmission dynamics and highlights awareness of the importance of preventive measures even in the absence of visible symptoms among nursing students.

Table 7: Overall Knowledge

	Frequency	Percent	Valid Percent	Cumulative Percent
Good Knowlwdge	160	80.0	80.0	80.0

	Moderate Knowledge	40	20.0	20.0	100.0
	Total	200	100.0	100.0	

The descriptive statistics for overall knowledge show that the mean score was 0.3128 with a standard deviation of 0.17685, indicating some variability in knowledge levels among the participants.
The skewness value of -0.569 suggests a slight negative skewness, indicating that the distribution is somewhat inclined toward higher knowledge scores. Additionally, the kurtosis value of -0.334 indicates a platykurtic distribution, meaning the data are relatively flatter than a normal distribution.
Overall, these findings suggest that the knowledge scores are moderately distributed with a tendency toward higher levels of knowledge among the participants.
The distribution of overall knowledge scores shows that out of 200 participants, 39 (19.5%) had a score

Table 8: Descriptive Statistics

	N	Mean		Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Overall Knowledge	200	.3128	.01251	.17685	.031	-.569	.172	-.334	.342
Valid N (listwise)	200								

of 0.00, 121 (60.5%) had a score of 0.33, and 40 (20.0%) had a score of 0.56.

From the perspective of a distribution curve, the majority of participants are clustered around the middle value (0.33), indicating that most respondents fall within the moderate range of knowledge scores. The smaller proportions at the lower (0.00) and higher (0.56) ends suggest fewer participants with very low or relatively higher scores.
This pattern represents an approximately **symmetrical to slightly negatively skewed distribution**, where the peak lies at the central value and the tail extends slightly toward the lower scores. It indicates that knowledge levels are concentrated around the middle, with a tendency toward moderate to higher knowledge rather than extremely low levels

Discussion

This study was conducted to assess the knowledge and practices regarding infection control among nursing students at Services Hospital. The findings revealed that the majority of participants demonstrated good knowledge (80.0%), while a smaller proportion had moderate knowledge (20.0%). These results indicate that overall knowledge regarding infection control among nursing students was satisfactory.
The findings of the present study are consistent with previous research, which reported that nursing students generally possess adequate knowledge regarding infection control practices. A study conducted by (AiedAlnawafleh, 2024) found that 86.9% of nursing students had good knowledge, which supports the current findings where the majority demonstrated good knowledge. Similarly, (Mazhar et al., 2025) reported that most students were aware of standard precautions such as hand hygiene and use of personal protective equipment.
However, despite the overall good knowledge, certain gaps were identified in specific areas. For example, a large proportion of participants showed incorrect responses regarding antibiotic use, zoonotic transmission, isolation practices, and preventive strategies such as avoiding crowded places. These findings suggest that while theoretical knowledge is generally strong, there are deficiencies in specific concepts related to infection control. Similar gaps were reported in a study by (Ali et al., 2024), where participants demonstrated poor understanding of prevention strategies despite having basic knowledge.
The present study also revealed that a significant proportion of participants had not received formal training in infection prevention and control (80.0%) and were not vaccinated against Hepatitis B (60.0%).

These findings are concerning, as training and immunization are essential components of infection prevention. Previous studies have also highlighted similar issues, indicating that lack of training and inadequate vaccination coverage increase the risk of infection among healthcare workers (Riaz et al., 2025). Likewise, (Naeem et al., 2025) emphasized that insufficient training is associated with lower adherence to infection control practices.

In terms of knowledge regarding transmission and prevention, the majority of participants correctly identified key aspects such as viral causes of infection, role of masks and hand hygiene, modes of transmission, and susceptibility of high-risk groups. These findings are in agreement with (Khatrawi et al., 2023), who reported high levels of awareness among healthcare workers regarding basic infection control measures.

However, misconceptions were evident in areas such as antibiotic use, where most participants incorrectly believed antibiotics to be the first-line treatment for infections. This finding is particularly important, as misuse of antibiotics can contribute to antimicrobial resistance. Similar misconceptions have been reported in previous studies, which emphasize the need for improved education on rational drug use (Ahmed et al., 2018).

The distribution curve of knowledge scores in this study showed that most participants were clustered around moderate values, with fewer participants at the extremes. This indicates a relatively balanced distribution with a tendency toward higher knowledge levels, supporting the finding that overall knowledge was generally good but not uniformly distributed across all areas.

Overall, the findings of this study highlight that while nursing students possess good general knowledge regarding infection control, there are notable gaps in specific areas and practical aspects. These findings are consistent with global literature, which suggests that knowledge alone is not sufficient and must be complemented by proper training, practical exposure, and adherence to guidelines. Therefore, there is a need for structured educational programs, regular training sessions, and institutional support to enhance both knowledge and practices of infection control among nursing students.

Conclusion

This study concludes that the overall knowledge regarding infection control among nursing students at Services Hospital was generally good, with the majority of participants demonstrating adequate understanding of basic infection prevention principles. However, despite this overall satisfactory knowledge level, notable gaps were identified in specific areas such as appropriate antibiotic use, zoonotic transmission, isolation practices, and preventive strategies.

Additionally, a significant proportion of participants had not received formal training in infection prevention and control and were not vaccinated against Hepatitis B, which raises concerns regarding their preparedness for clinical practice and exposure to occupational risks. These findings suggest that theoretical knowledge alone is not sufficient and must be supported by proper training and practical application.

Overall, while nursing students showed a strong foundation in infection control knowledge, there is a need to strengthen practical skills, enhance training programs, and address specific misconceptions to improve adherence to infection control practices and ensure patient and healthcare worker safety.

Limitations

1. The study was conducted in a single institution, which may limit the generalizability of the findings to other settings.
2. Data were collected using a self-administered questionnaire, which may be subject to response bias or overestimation of knowledge and practices.
3. The cross-sectional design of the study limits the ability to establish causal relationships between knowledge and practices.

Recommendations

1. Regular training programs and workshops on infection prevention and control should be conducted to improve both knowledge and practical skills among nursing students.

2. Institutions should ensure mandatory Hepatitis B vaccination and provide adequate resources such as personal protective equipment for students.
3. Future studies should be conducted on a larger scale across multiple institutions to enhance generalizability and further explore gaps in infection control practices.

REFERENCES

Ahmed, I., Khan, A., & Sohail, A. A. (2018). Knowledge, attitude and practice of hand hygiene among healthcare workers in Karachi. *Pakistan Journal of Public Health, 8*(3), 123–127.

AiedAlnawafleh, K. (2024). Knowledge, attitudes, and practices regarding the prevention of infections among nursing students in the internship year at University of Tabuk. *Obstetrics & Gynaecology Forum*.

Ali, A. A., Farooq, S. U., Ahmad, A., Dass, A., Zeb, K., Ahmad, T., & Shahzad, N. (2024). Knowledge and attitude regarding nosocomial infections among nursing students in private institutes in Khyber Pakhtunkhwa. *Pakistan BioMedical Journal*, 13–17.

Batool, S., Kousar, S., Chandio, K., Memon, K. N., & Wilson, N. R. (2023). Infection control practices among nurses working at tertiary care hospitals of Quetta, Pakistan. *RADS Journal of Pharmacy and Allied Health Sciences, 1*(1), 1–6.

Iliyasu, G., Dayyab, F. M., Habib, Z. G., Tiamiyu, A. B., Abubakar, S., Mijinyawa, M. S., & Habib, A. G. (2016). Knowledge and practices of infection control among healthcare workers in a tertiary referral center in north-western Nigeria. *Annals of African Medicine, 15*(1), 34–40.

Khatrawi, E. M., Prajjwal, P., Farhan, M., Inban, P., Gurha, S., Al-Ezzi, S. M., Marsool, M. D., Ahuja, P., Mateen, M. A., & Aina, F. O. (2023). Evaluating the knowledge, attitudes, and practices of healthcare workers regarding high-risk nosocomial infections: A global cross-sectional study. *Health Science Reports, 6*(9), e1559. https://doi.org/10.1002/hsr2.1559

Mazhar, L., Safdar, A., Nisa, W. T., Nadeem, F., Zahid, J., Shakir, A., & Muzammil, M. (2025). Exploring the knowledge and practices of standard infection control precautions among BSc nursing students. *The Critical Review of Social Sciences Studies, 3*(2), 2360–2369.

Naeem, A., Raza, A., & Ali, A. (2025). Knowledge and practice of nursing students regarding standard precautions at a tertiary care hospital. *Indus Journal of Bioscience Research, 3*(5), 474–482.

Riaz, H. U., Saleem, A., Iftikhar, A., Nawaz, S., James, U., Shabeer, A., & Riaz, N. A. (2025). Nurses' knowledge, practices, and perceived challenges in the prevention and control of hospital-acquired infections in Lahore, Punjab.

Rizwan, A., Afzal, K., Nadeem, F., Nisa, W. T., & Zahid, J. (2025). Understanding nurses' knowledge, attitudes, and practices for nosocomial infections at a tertiary hospital in Lahore. *Journal of Health, Wellness, and Community Research*, e241–e241.

Zia, I., Cheema, S. S., Sheikh, N. S., & Ashraf, H. (2022). Hand hygiene knowledge, attitudes, and self-reported practices among medical and nursing staff of a tertiary-care military hospital: A cross-sectional study. *International Journal of Infection Control, 18*. https://doi.org/10.3396/ijic.v18i.22014