

KNOWLEDGE, ATTITUDE AND PRACTICE OF NURSES REGARDING THE CONTROL AND PREVENTION OF NOSOCOMIAL INFECTION IN A TERTIARY CARE HOSPITAL IN SWAT, PAKISTAN: A CROSS-SECTIONAL STUDY

Gauhar Ayub¹, Nadia Gauhar², Muhammad Arif³, Irfan Ullah⁴, Saman Batool⁵, Shahid Ullah⁶, Azhar Ayub^{*7}

^{1,3,4} Shoukat Khanum Memorial Hospital, Lahore

² Khyber Medical University, Peshawar

^{5,6,*7} Superior University, Lahore

^{7*} ayubazhar9@gmail.com

DOI: <https://doi.org/10.5281/zenodo.23257085>

Keywords

nosocomial infection; healthcare-associated infection; nurses; knowledge; attitude; practice; infection control; Pakistan.

Article History

Received: 25 June 2026

Accepted: 16 September 2026

Published: 09 October 2026

Copyright @Author

Corresponding Author: *
Azhar Ayub

Abstract

Background: Nosocomial (healthcare-associated) infections threaten patient safety and place a heavy burden on health systems, particularly in low- and middle-income countries. Nurses have the most continuous contact with patients, so their knowledge, attitudes and practices (KAP) are central to infection prevention.

Objective: To assess the knowledge, attitude and practice of registered nurses regarding the prevention and control of nosocomial infection at the Saidu Group of Teaching Hospitals (SGTH), Swat, Pakistan.

Methods: A descriptive cross-sectional study was conducted over 16 weeks (1 March to 6 June 2022). Seventy-eight registered nurses providing direct patient care were recruited by convenience sampling (Raosoft estimate: 95% confidence, 10% margin of error, population of 400). Data were collected with an adapted, self-administered 27-item English questionnaire (Cronbach's alpha 0.823) and analysed descriptively in SPSS version 22.

Results: All 78 nurses responded (100%). Most were male (61.5%), aged 21–30 years (57.7%), and held a BSc in Nursing (71.8%). The proportion giving the correct response to individual knowledge items ranged from 62.8% to 96.2% (unweighted mean 78.6%). A favourable attitude was recorded in 89.7% of nurses, and 61.5% showed good practice. Practice was weakest for changing masks between patients (51% agreed this is a control measure), always changing gloves and washing hands before a new patient (62% each), and discarding infectious material according to guidelines (47% always).

Conclusion: Nurses at SGTH showed generally good knowledge and a favourable attitude, but practice lagged behind, leaving a knowledge–practice gap. Regular in-service training, supervised audit of hand hygiene, glove and mask use and waste segregation, and reliable supply of protective equipment are recommended.

INTRODUCTION

Nosocomial infections, also called hospital-acquired or healthcare-associated infections (HAIs), are infections that patients acquire during care in a healthcare facility, typically appearing at least 48 hours after admission or within 30 days after surgery [1,2]. Bacteria, viruses and fungi are the usual causative agents. They spread from healthcare worker to patient, between patients, and through contaminated surfaces, air and shared materials [3].

The burden falls disproportionately on low- and middle-income countries. Reported prevalence in these settings ranges from about 5.7% to 19.1%, compared with 5.7% to 7.5% in high-income countries, and HAIs lengthen hospital stay, raise cost and increase morbidity and mortality [4,5]. The COVID-19 pandemic further highlighted the importance of standard operating procedures for infection prevention and control (IPC) in healthcare settings.

Nurses spend more time in direct contact with patients than any other professional group, which makes them both a potential vehicle for transmission and the most important line of defence. Hand hygiene, appropriate use of personal protective equipment (PPE), safe handling of sharps and correct disposal of infectious waste are the core nursing practices for preventing HAIs. Knowledge alone does not guarantee compliance, and studies from Africa, Asia and Europe have repeatedly reported gaps between what healthcare workers know, how they feel about IPC, and what they do [1,3,6,7].

Pakistani studies suggest similar problems. A study of nurses in tertiary hospitals in Peshawar found that about three-quarters had correct knowledge of standard precautions [8], hand-hygiene knowledge and practice among Pakistani health professionals have been examined in several settings [9,10], and a tertiary-hospital study in Karachi documented frequent needle-stick injuries among healthcare workers [11]. Local evidence on nosocomial infection prevention among nurses in the Swat district appears limited, and the Saidu Group of Teaching Hospitals (SGTH) is a public tertiary care teaching hospital serving this population.

This study therefore assessed the knowledge, attitude and practice of registered nurses regarding the control and prevention of nosocomial infection at SGTH, to identify the areas where training and system support are most needed.

1.1 Objectives

The general objective was to assess nurses' knowledge, attitude and practice regarding nosocomial infection control and prevention. The specific objectives were (a) to assess knowledge of nosocomial infection and standard and transmission-based precautions; (b) to assess attitudes towards infection prevention measures; and (c) to describe self-reported infection control practices of nurses at SGTH.

2. METHODS**2.1 Study design, setting and period**

A descriptive cross-sectional study was carried out at the Saidu Group of Teaching Hospitals, a public tertiary care facility in Swat, Khyber Pakhtunkhwa, Pakistan. Nurses working in the hospital's clinical units were approached. Data collection took 16 weeks, from 1 March to 6 June 2022.

2.2 Study population and sampling

The target population was the roughly 400 registered nurses working at SGTH. The required sample was estimated with the Raosoft calculator (95% confidence level, 10% margin of error, population of 400), giving 78 participants. Participants were recruited by convenience sampling.

Registered nurses were eligible if they were directly involved in patient care, present during the data-collection period, and willing to take part. Nurses without direct patient-care duties, management staff, nursing students and nurses on leave or off duty during data collection were excluded.

2.3 Data collection instrument

Data were collected with a structured, self-administered questionnaire written in English and adapted from previously published KAP instruments on hospital-acquired infection. It had four sections: socio-demographic characteristics

(gender, age, education, years of experience, marital status), knowledge (10 items), attitude (6 items) and practice (6 items), 27 items in total. Knowledge and attitude items were answered as agree, disagree, not sure or no knowledge; practice items were rated as always, often, sometimes or not at all. Data collectors and supervisors were trained before fieldwork, and each respondent was briefed on the purpose of the study when the questionnaire was handed out.

2.4 Outcome definitions

Knowledge, attitude and practice were scored as the percentage of correct or desirable responses. Good knowledge and good practice were defined as a score above 70%, and a favourable attitude as a score above 60%; lower scores were classified as poor knowledge, poor practice or unfavourable attitude, respectively.

2.5 Reliability

Internal consistency of the 27-item instrument was assessed with Cronbach's alpha before analysis. Alpha was 0.823 (0.830 based on standardised items), which indicates good reliability.

2.6 Data analysis

Data were entered and analysed in IBM SPSS Statistics version 22, and charts were prepared in Microsoft Excel. Responses were summarised descriptively as frequencies and percentages. No inferential tests were performed.

2.7 Ethical considerations

Ethical clearance was obtained from the National College of Nursing, Swat [approval reference number], and permission was obtained from the hospital director and heads of departments. All participants gave written informed consent after a verbal explanation of the study. Questionnaires were coded and carried no personal identifiers, and responses were kept confidential.

3. RESULTS

3.1 Participant characteristics

All 78 nurses approached completed the questionnaire (response rate 100%). Table 1 shows their characteristics. Most were male (61.5%), aged 21–30 years (57.7%), married (76.9%) and held a BSc in Nursing (71.8%). Almost half (44.9%) had 0–4 years of clinical experience.

Table 1. Socio-demographic characteristics of the nurses (N = 78).

Characteristic	n	%
Gender		
Male	48	61.5
Female	30	38.5
Age (years)		
21–30	45	57.7
31–40	33	42.3
Education		
Diploma in Nursing	22	28.2
BSc Nursing	56	71.8
Clinical experience (years)		
0–4	35	44.9
5–10	22	28.2
11–15	18	23.1

Characteristic	n	%
16 or more	3	3.8
Marital status		
Married	60	76.9
Unmarried	18	23.1

3.2 Knowledge

Table 2 and Figure 1 present item-level results. Correct responses were highest for the role of the hospital environment in nosocomial infection (96.2%), hand washing before and after patient contact (87.2%) and N95 mask use for airborne infection (87.2%). They were lowest for

recognizing the organisms commonly implicated in nosocomial infection (62.8%) and for the use of surgical masks during surgical procedures (67.0%). Across the ten items the unweighted mean proportion of correct responses was 78.6%, and eight of ten items exceeded the 70% threshold.

Table 2. Responses to knowledge items (N = 78).

Item	Correct (%)	Other responses (%)
Nosocomial infection is favored by the hospital environment	96.2	About 3 had no knowledge
Nosocomial infection includes VAP, TB, UTI, and gastroenteritis	79.5	12.8 not sure; 7.7 no knowledge
HBV, HCV, S. aureus, and P. aeruginosa are common causative organisms	62.8	25.6 not sure; 11.6 no knowledge
Gloves should always be worn under contact precautions	71.8	28.2 disagreed
Standard precautions include PPE and frequent hand washing	84.6	12.8 not sure; 2.6 other
Diagnosis influences the choice of PPE	73.1	20.5 disagreed; 6.4 no knowledge
Patient history influences the choice of PPE	76.9	23.1 not sure
Washing hands before and after handling patients prevents infection	87.2	5.1 not sure; 7.7 no knowledge
Surgical masks are vital during surgical procedures	67.0	9 disagreed; 2 no knowledge (rest not reported)
N95 mask is important for airborne infection	87.2	6.4 not sure; 6.4 no knowledge

Percentages in the "other responses" column that are not stated in the original figures were obtained by subtraction. VAP, ventilator-associated pneumonia; TB, tuberculosis; UTI, urinary tract infection; PPE, personal protective equipment.

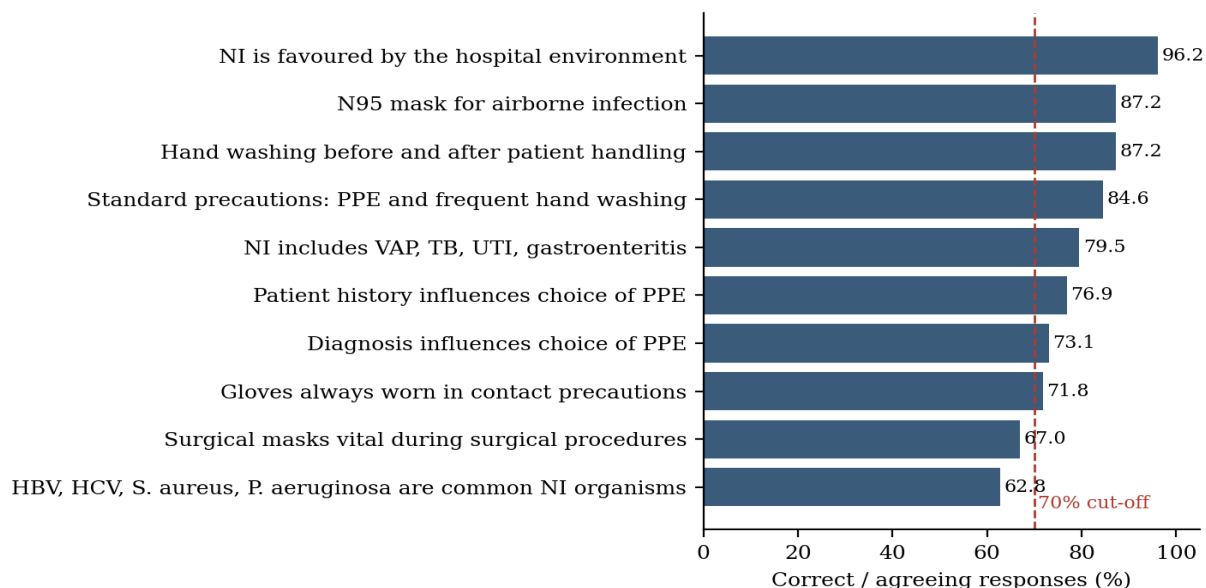


Figure 1. Proportion of correct responses to each knowledge item. The dashed line marks the 70% threshold for good knowledge.

Descriptively, BSc nurses gave more correct answers than diploma nurses. However, the BSc group was about 2.5 times larger (56 versus 22),

and no test of association was performed, so this observation was not interpreted further.

3.3 Attitude

Table 3 shows attitude responses. Agreement was strongest for categorising waste before disposal (89.7%) and for antiseptic use (88.5%). It was weakest for changing masks between patients (51.0% agreed, 33.0% disagreed) and for the

statement that invasive procedures are a risk factor for multidrug-resistant organisms (64.0%). Overall, 89.7% of nurses had a favourable attitude and 7.7% an unfavourable attitude; the remaining 2.6% were not classified in the source data.

Table 3. Attitude of nurses towards nosocomial infection prevention (N = 78).

Statement	Agree (%)	Disagree (%)	Not sure / no knowledge (%)
Hospital waste should be categorised before disposal	89.7	7.7	2.6
Hand hygiene after removing gloves is an infection control measure	74.4	17.9	7.7
Use of antiseptics is necessary to prevent nosocomial infection	88.5	9.0	2.6
Invasive procedures are a risk factor for multidrug-resistant organisms	64.0	19.0	17.0

Statement	Agree (%)	Disagree (%)	Not sure / no knowledge (%)
Healthcare workers' hands are a vehicle for transmitting pathogens	66.7	25.6	7.7
Changing the mask before the next patient is a control measure	51.0	33.0	16.0

The last column was obtained by subtraction from the reported agree and disagree percentages where it was not stated directly.

3.4 Practice

Self-reported practice is summarised in Table 4 and Figure 2. Hand washing before starting work was reported as "always" by 74.4% of nurses, but only 62% always washed their hands or changed gloves before handling a new patient. Mask use with TB-suspected patients was always practised by

79%. The least consistent practices were use of laboratory safety cabinets (60% always) and disposal of infectious material and left-over samples according to guidelines (47% always, 8% not at all). Overall, 48 nurses (61.5%) were classified as having good practice and 30 (38.5%) as having poor practice.

Table 4. Frequency of infection prevention practices (N = 78).

Practice	Always (%)	Often (%)	Sometimes (%)	Not at all (%)
Hand washing before starting work	74.4	7.7	17.9	-
Hand washing before handling a new patient	62	28	10	-
Changing gloves before handling a new patient	62	24	14	-
Wearing a mask with TB-suspected patients	79	4	17	-
Using safety cabinets in the laboratory	60	19	18	2
Discarding infectious material and left-over samples per guideline	47	22	23	8

Percentages for safety-cabinet use sum to 99 because of rounding in the source data.

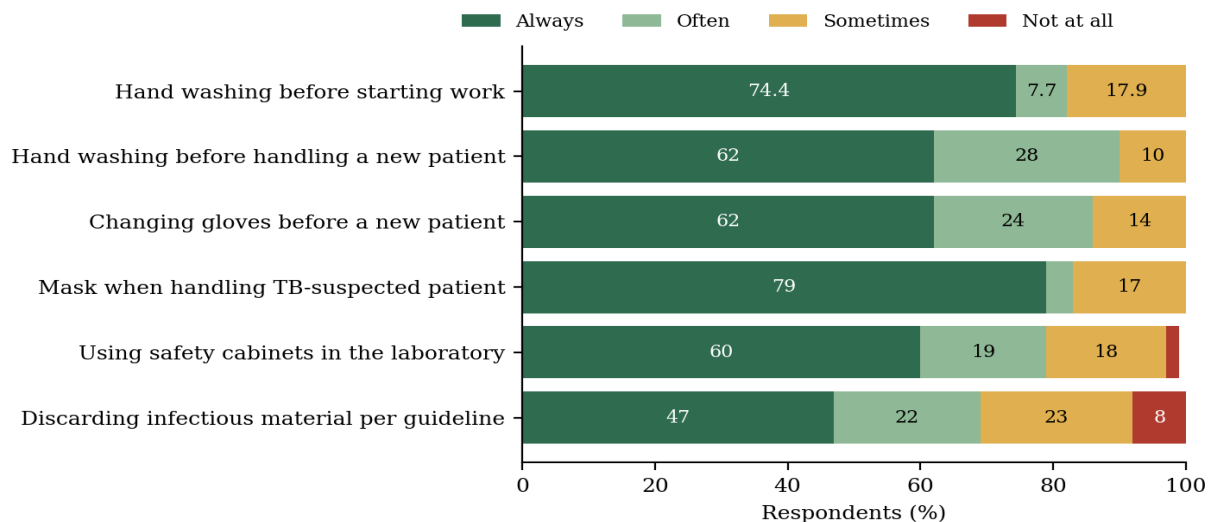


Figure 2. Self-reported frequency of infection prevention practices among nurses.

DISCUSSION

This study examined the knowledge, attitude, and practice of nurses regarding nosocomial infection control at a public tertiary hospital in Swat. Nurses showed good knowledge on most items (mean 78.6% correct), and a predominantly favorable attitude (89.7%), but only 61.5% were classified as having good practice. This pattern, in which knowledge and attitude exceed practice, is a recurring finding in the IPC literature.

The knowledge level is comparable to reports of about 90% knowledge among healthcare workers at the University of Gondar Hospital in Ethiopia [1] and about 92% among registered nurses in another study [12]. It exceeds the 76% of nurses with correct knowledge of standard precautions reported from Peshawar [8]. Our lowest-scoring knowledge item was the identification of organisms commonly responsible for nosocomial infection (62.8%), which suggests that training has concentrated on procedures such as hand washing and masks rather than on microbiology and transmission.

Practice was less consistent than knowledge. Only about three in five nurses always washed their hands or changed gloves before attending a new patient, even though 87.2% knew that hand washing before and after patient contact prevents

infection. Published studies describe the same gap. Hand-hygiene knowledge and practice of roughly 58–67% was reported in Peshawar and Faisalabad [10], nursing staff scored lower than students on the five moments of hand hygiene in a tertiary hospital in Karad [13], and in Dhaka many nurses omitted hand hygiene before patient contact despite having received training [7]. Zambian nurses likewise combined a good attitude with weak practice [6]. Protective-equipment use was reasonably good here, with masks for TB-suspected patients always used by 79%. By contrast, a study in Tripura, India, found poor adherence to protective equipment (about 47%) [14].

Two findings deserve attention because they point to systems problems as well as individual behavior. First, only 51% of nurses agreed that masks should be changed between patients, and 28.2% did not agree that gloves should always be worn under contact precautions. The investigators attribute the latter to limited supplies, and shortages of gloves, masks and hand-hygiene materials have been described as a barrier to compliance in other low-resource hospitals [7]. Second, only 47% always discarded infectious material and left-over samples according to guidelines. Waste-management knowledge gaps have been documented elsewhere [15], and in this study

89.7% of nurses agreed that waste should be categorized before disposal, again showing willingness without consistent implementation.

The gap between a favorable attitude and imperfect practice suggests that further didactic teaching alone is unlikely to be enough. Interventions that combine reminders, supervision, feedback and reliable supplies are more promising. For example, an education-based text-messaging programme improved KAP scores among intensive-care nurses in Iran [16].

4.1 Strengths and limitations

The study achieved a 100% response rate, used an instrument with good internal consistency (alpha 0.823) and addressed a topic for which local data appear limited. Several limitations should be considered. The design was cross-sectional and single-Centre, and the sample of 78 nurses was recruited by convenience sampling from about 400, so the findings may not generalize to all nurses or to private or non-teaching hospitals. Practice was self-reported and may be overstated because of social desirability. The questionnaire was adapted but not formally validated for this setting beyond reliability testing. Only descriptive statistics were used, so associations between KAP and age, education or experience could not be tested. Finally, data were collected during the COVID-19 period, when attention to IPC may have been heightened.

5. CONCLUSION

Nurses at SGTH, Swat, had good knowledge of nosocomial infection prevention and mostly favourable attitudes, but their practice was less consistent, particularly for glove and mask changes between patients, hand washing before patient contact, and disposal of infectious material. Closing this knowledge-practice gap should be a priority.

Recommendations

Based on these findings we recommend (1) regular in-service IPC training that covers causative organisms and transmission routes as well as

procedures; (2) routine supervised audit with feedback on hand hygiene, glove and mask changes and waste segregation; (3) a dependable supply of gloves, masks, antiseptics and safety equipment at ward level; (4) a dedicated infection prevention and control team or focal person at the hospital; and (5) larger multi-centre studies that use probability sampling, include private-sector nurses, and test associations between KAP and nurses' characteristics, ideally with direct observation of practice.

DECLARATIONS

Conflict of interest: No conflict of interest

Funding: None

Acknowledgements

The authors thank all study participants for their cooperation, as well as the data collection team and healthcare administration for their support.

Author Contributions

All authors contributed equally to the study's conceptualization, methodology, data curation, validation, and manuscript preparation, and approved the final version.

REFERENCES

- Bayleyegn B, Mehari A, Damtie D, Negash M. Knowledge, attitude and practice on hospital-acquired infection prevention and associated factors among healthcare workers at University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia. *Infect Drug Resist.* 2021;14:259.
- Mohandass B, Kaur A, Timsy HK, Kaur N, Choden P, Thakur A. Assess the knowledge, practice and attitude regarding nosocomial infections and their prevention among health care staff. *Medico Legal Update.* 2021;21(1):168-173.
- Gruda A, Sopjani I. The knowledge, attitudes and practices of nurses toward management of hospital-acquired infections in the University Clinical Center of Kosovo. *Mater Sociomed.* 2017;29(2):84.

- Wu W, Wang W, Yuan Y, Lin L, Tan Y, Yang J, et al. Knowledge, attitude and practice concerning healthcare-associated infections among healthcare workers in Wuhan, China: cross-sectional study. *BMJ Open*. 2021;11(1):e042333.
- Čović I. Knowledge and attitude on prevention of nosocomial infections of students of University of Mostar Faculty of Health Studies. *Zdravstveni glasnik*. 2021;7(2):73-82.
- Chitimwango PC. Knowledge, attitudes and practices of nurses in infection prevention and control within a tertiary hospital in Zambia [dissertation]. Stellenbosch: Stellenbosch University; 2017.
- Kabir AA, Akhter F, Sharmin M, Akhter K, Begum MB, Saha AK, et al. Knowledge, attitude and practice of staff nurses on hospital acquired infections in tertiary care hospital of Dhaka city. *Northern Int Med Coll J*. 2018;10(1):347-350.
- Khattak IU, Ghani S, Zaman T. Knowledge and practice of standard precautions of infection control among nurses at tertiary care hospitals in Peshawar of Khyber Pakhtunkhwa. *Diverse J Multidiscip Res*. 2020;2(1):10-15.
- Salman M, Raza MH, Mustafa ZU, Shrestha S, Ali M, Asif N, et al. Knowledge, attitudes and practices of hand hygiene among Pakistani health professionals: a cross-sectional study. *J Infect Dev Ctries*. 2018;12(1):63-66.
- Uzair M, Khalid U, Shahbaz M, Khan N, Ali N, Sher F, et al. Knowledge, attitude and practices of healthcare providers regarding infection control at tertiary care hospital.
- Zafar A, Aslam N, Nasir N, Meraj R, Mehraj V. Knowledge, attitudes and practices of health care workers regarding needle stick injuries at a tertiary care hospital in Pakistan. *J Pak Med Assoc*. 2008;58(2):57.
- Kamunge EW. Exploring knowledge, attitudes and practices of registered nurses regarding the spread of nosocomial infections. 2013.
- Shinde MB, Mohite VR. A study to assess knowledge, attitude and practices of five moments of hand hygiene among nursing staff and students at a tertiary care hospital at Karad. *Int J Sci Res*. 2014;3(2):311-321.
- Nag K, Datta A, Karmakar N, Chakraborty T. Knowledge, attitude and practice about hospital acquired infection among health care personnel in a tertiary care hospital of Tripura. *Int J Res Med Sci*. 2018;6(10):3303-3308.
- Parida A, Capoor MR, Bhowmik KT. Knowledge, attitude, and practices of Bio-medical Waste Management rules, 2016; Bio-medical Waste Management (amendment) rules, 2018; and Solid Waste Rules, 2016, among health-care workers in a tertiary care setup. *J Lab Physicians*. 2019;11(4):292-296.
- Saffari M, Sanaeinasab H, Masoumbeigi H, Pakpour AH, O'Garra KN, Koenig HG. An education-based text messaging program to improve nurses' knowledge, attitude, and practice related to nosocomial infections in intensive care settings. *J Contin Educ Nurs*. 2019;50(5):211-217.