

Level of Knowledge, Attitude and Practices of Nurses Regarding Nosocomial Infection at Saidu Group of Teaching Hospital (SGTH), Swat

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ABSTRACT

Background: Healthcare-associated infections increase morbidity, mortality, length of hospitalization, and healthcare expenditure. Nurses have a central role in interrupting their transmission through appropriate infection-prevention practices. **Objective:** To determine the level of knowledge, attitudes, and self-reported practices of nurses regarding nosocomial infections at Saidu Group of Teaching Hospital, Swat, Pakistan. **Methods:** This descriptive cross-sectional survey was conducted from August to November 2024. Participants were recruited through convenience sampling, and data were collected using a self-administered 33-item knowledge, attitude, and practice questionnaire scored on a seven-point Likert scale. Descriptive statistics were calculated using IBM SPSS Statistics version 22.0. **Results:** Of 206 collected questionnaires, 197 were eligible for analysis, giving a valid response proportion of 95.6%. The mean raw knowledge, attitude, and practice scores were 63.71 ± 10.90 of 77 (82.7%), 42.69 ± 7.33 of 56 (76.2%), and 77.44 ± 11.82 of 98 (79.0%), respectively. Awareness of handwashing guidelines was reported by 178 nurses (90.4%), while 180 (91.4%) agreed that they understood safe equipment disposal and fomite transmission. Most participants recognized serious patient outcomes (90.4%) and reported hand hygiene when handling body-fluid samples (92.4%) and urinary catheters (91.9%). However, 145 (73.6%) considered hand cleaning after every contact unrealistic, 154 (78.2%) reported reduced compliance during increased workload or emergencies, and 83 (42.1%) acknowledged occasionally using nail polish or artificial nails. **Conclusion:** Nurses demonstrated high overall raw knowledge, attitude, and practice scores, but specific behavioural and workload-related gaps remained. Infection-prevention programs should therefore emphasize consistent application of hand hygiene and standard precautions under routine and high-workload conditions. **Keywords:** Healthcare-Associated Infections; Nosocomial Infections; Nurses; Knowledge; Attitudes; Practices; Hand Hygiene

INTRODUCTION

Healthcare-associated infections, traditionally referred to as nosocomial or hospital-acquired infections, are infections that develop during the delivery of healthcare and were neither present nor incubating at the time of admission. Such infections frequently become clinically apparent 48 hours or more after hospital admission and may affect patients, healthcare professionals, and hospital visitors. They are

associated with increased morbidity, mortality, length of hospital stay, antimicrobial use, and healthcare expenditure, particularly in healthcare systems with limited infection-prevention resources (1,2).

Healthcare-associated infections may be transmitted through direct contact, contaminated equipment, environmental surfaces, invasive devices, or inadequate adherence to standard infection-prevention precautions. Nurses are particularly important in interrupting these transmission pathways because they maintain frequent and prolonged contact with patients and routinely perform procedures involving wounds, vascular access devices, urinary catheters, biological specimens, and potentially contaminated equipment. Appropriate hand hygiene, safe disposal of sharps and biohazardous materials, use of personal protective equipment, environmental decontamination, and compliance with isolation precautions are therefore fundamental components of nursing practice (1–3).

Knowledge alone may not ensure consistent infection-prevention behaviour. Nurses' attitudes toward institutional guidelines, perceived professional responsibility, workload, availability of resources, supervision, and organizational support may also influence adherence to recommended practices. Previous studies have reported generally favourable awareness of hand hygiene and infection-control principles among nurses, while also identifying deficiencies in the correct use of alcohol-based hand rubs, management of contaminated equipment, isolation procedures, and adherence during emergencies or periods of increased workload (3–6). Educational interventions, role modelling, regular monitoring, and feedback have been shown to strengthen infection-prevention knowledge and improve compliance among healthcare personnel (4).

Studies conducted in Pakistan and comparable healthcare settings have demonstrated variation in nurses' knowledge, attitudes, and practices regarding healthcare-associated infections. These differences may reflect variations in professional education, clinical experience, institutional policies, access to infection-control materials, staff workload, and the availability of continuing professional development programs (1–3). However, limited evidence was available regarding the knowledge, attitudes, and self-reported practices of nurses working in the diverse clinical units of Saidu Group of Teaching Hospital in Swat.

The present study was therefore conducted to determine the level of knowledge, attitudes, and practices of nurses regarding the prevention and transmission of nosocomial infections at Saidu Group of Teaching Hospital, Swat, Pakistan.

MATERIALS AND METHODS

A hospital-based descriptive cross-sectional survey was conducted at Saidu Group of Teaching Hospital in Swat, Pakistan, from August to November 2024. The hospital is a multispecialty teaching institution with approximately 440 nursing staff members working across medical, surgical, emergency, intensive care, paediatric, obstetric, and other specialized clinical units. The study population comprised male and female nursing personnel working in different departments and duty shifts at the hospital.

Nurses were eligible to participate if they had completed a recognized nursing education program, were providing direct patient care at Saidu Group of Teaching Hospital, had at least one year of professional nursing experience, and voluntarily agreed to participate. Nurses with less than one year of professional experience, those who declined participation, individuals who did not meet the eligibility requirements, and those who returned incomplete questionnaires were excluded. Participants were recruited through non-probability convenience sampling according to their availability during the study period.

The required sample size was calculated using OpenEpi on the basis of an estimated source population of 440 nurses, a 95% confidence level, and a 5% margin of error. The resulting required sample was 206 participants. A total of 206 completed questionnaires were initially collected. Five questionnaires were excluded because they were incomplete, and four were excluded because the respondents did not fulfil

the eligibility criteria. Consequently, 197 questionnaires, representing 95.6% of the collected responses, were included in the final analysis.

Data were collected using a self-administered questionnaire adopted from the study entitled “Exploring Knowledge, Attitudes and Practices of Registered Nurses Regarding the Spread of Nosocomial Infections” by Kamunge (5). The instrument consisted of four sections. The first section collected demographic and professional information, including sex, age, educational qualification, years of professional experience, clinical department, and duty shift. The remaining sections assessed knowledge, attitudes, and self-reported practices related to the transmission and prevention of nosocomial infections. The knowledge domain contained 11 items, the attitude domain contained eight items, and the practice domain contained 14 items.

Each knowledge, attitude, and practice statement was rated on a seven-point Likert scale ranging from 1, indicating strong disagreement, to 7, indicating strong agreement. The maximum possible raw scores were 77 for the knowledge domain, 56 for the attitude domain, and 98 for the practice domain. Domain-level percentage scores were calculated by expressing the observed mean total score as a proportion of the maximum possible score for the respective domain. The previously reported Cronbach's alpha coefficients for the questionnaire were 0.66 for knowledge, 0.60 for attitudes, and 0.65 for practices.

Following ethical approval from Khyber Medical University, Institute of Health Sciences, Swat, and the administration of Saidu Group of Teaching Hospital, eligible nurses were approached in their respective clinical units and invited to participate. Participants were informed about the purpose of the study, the voluntary nature of participation, and their right to decline participation. They were provided with the questionnaire for physical completion and return. Voluntary submission of the completed questionnaire was considered evidence of informed consent. The same standardized questionnaire and instructions were used for all participants to promote consistency in data collection.

Returned questionnaires were reviewed for completeness and eligibility before data entry. Questionnaires with incomplete responses or those completed by ineligible participants were excluded, and the remaining questionnaires were analysed using a complete-case approach. Responses were coded and entered into IBM SPSS Statistics version 22.0. Categorical variables were summarized using frequencies and percentages, while continuous and domain-level scores were summarized using means and standard deviations. Item-level Likert responses were presented as frequencies and percentages together with their corresponding means and standard deviations. As the study was designed to provide a descriptive assessment of nurses' knowledge, attitudes, and practices, no inferential statistical tests were applied.

RESULTS

A total of 206 questionnaires were collected. Five were excluded because of incomplete responses and four because the respondents did not meet the eligibility criteria. The final analysis therefore included 197 questionnaires, corresponding to 95.6% of the collected responses.

Of the 197 participants, 113 (57.4%) were men and 84 (42.6%) were women. The mean age was 35.0 ± 5.28 years, and 113 participants (57.4%) were aged 25–35 years. Post-RN qualifications were the most frequently reported educational category, held by 85 participants (43.1%), followed by Bachelor of Science in Nursing qualifications among 61 (31.0%). The mean professional experience was eight years, and 88 nurses (44.7%) had between 6 and 11 years of experience. Department and duty-shift information was available for 196 participants. Medical and emergency units each accounted for 33 participants (16.8%), while 30 (15.3%) worked in surgical units. Morning, evening, and night shifts were distributed almost equally.

The mean knowledge score was 63.71 ± 10.90 of a possible 77 points, equivalent to 82.7% of the maximum raw score. The mean attitude score was 42.69 ± 7.33 of 56 points (76.2%), while the mean practice score was 77.44 ± 11.82 of 98 points (79.0%).

Table 1. Demographic and Professional Characteristics of Participants

Characteristic	Category	n (%)
Sex	Male	113 (57.4)
	Female	84 (42.6)
Age, years	25–35	113 (57.4)
	36–45	79 (40.1)
	46–55	5 (2.5)
	Mean $\pm$ SD	35.0 ± 5.28
Educational qualification	Diploma in Nursing	48 (24.4)
	Post-RN	85 (43.1)
	Bachelor of Science in Nursing	61 (31.0)
	Master of Science in Nursing	3 (1.5)
	Mean	8.0
Professional experience, years	6–11 years	88 (44.7)
	Mean	8.0
Clinical department ¹	Medical unit	33 (16.8)
	Emergency department	33 (16.8)
	Surgical unit	30 (15.3)
	Paediatrics	16 (8.2)
	Obstetrics and gynaecology	12 (6.1)
	Neonatal intensive care unit	11 (5.6)
	Pulmonology	10 (5.1)
	Neuro-intensive care unit	8 (4.1)
	Coronary care unit	7 (3.6)
	Ear, nose, and throat unit	6 (3.1)
	Medical intensive care unit	6 (3.1)
	General intensive care unit	6 (3.1)
	Intensive care unit	6 (3.1)
	Orthopaedic unit	6 (3.1)
	Ophthalmology	4 (2.0)
	Burn unit	2 (1.0)
	Mean	8.0
Duty shift ¹	Morning	66 (33.7)
	Evening	65 (33.2)
	Night	65 (33.2)

¹Department and duty-shift percentages were calculated using the reported denominator of 196.

Table 2. Summary of Knowledge, Attitude, and Practice Scores

Domain	Number of items	Possible score	Mean $\pm$ SD	Percentage of maximum score
Knowledge	11	11–77	63.71 ± 10.90	82.7
Attitudes	8	8–56	42.69 ± 7.33	76.2
Practices	14	14–98	77.44 ± 11.82	79.0

Agreement with knowledge statements was generally high. Awareness of handwashing guidelines was reported by 178 participants (90.4%). A total of 180 participants (91.4%) agreed that they understood safety precautions for disposing of used medical equipment, and the same number recognized that contaminated objects could transmit nosocomial infections. Knowledge was comparatively lower for microorganisms not effectively eradicated by alcohol-based products, although 150 participants (76.1%) still selected one of the three agreement responses. Recognition of appropriate opportunities for hand hygiene was reported by 153 participants (77.7%).

Most participants recognized the potential consequences of nosocomial infections. A total of 178 nurses (90.4%) agreed that these infections could lead to serious patient outcomes, and 171 (86.8%) reported serving as role models for adherence to infection-control practices. Rewarding healthcare workers for compliance was supported by 176 participants (89.3%). Nevertheless, 145 respondents (73.6%) agreed with the negatively worded statement that expecting healthcare workers to clean their hands after every

patient contact was unrealistic. Agreement with sanctions for noncompliance was lower, at 131 participants (66.5%).

Table 3. Nurses' Knowledge Regarding Nosocomial Infections

Item	Knowledge statement	Agreement, n (%)	Mean ± SD
K1	Awareness of handwashing guidelines	178 (90.4)	6.25 ± 1.62
K2	Awareness of observation or supervision during handwashing	155 (78.7)	5.36 ± 1.62
K3	Knowledge that healthcare facilities harbour transmissible pathogens	171 (86.8)	5.90 ± 1.50
K4	Knowledge of the correct use of biohazard bags or containers	175 (88.8)	5.84 ± 1.53
K5	Knowledge of correct biohazard disposal procedures	168 (85.3)	5.79 ± 1.55
K6	Knowledge of precautions for disposing of needles, syringes, and catheters	180 (91.4)	6.15 ± 1.36
K7	Knowledge that fomites can transmit nosocomial infections	180 (91.4)	6.03 ± 1.42
K8	Knowledge of isolation procedures for neutropenic or communicable patients	167 (84.8)	5.51 ± 1.51
K9	Knowledge of microorganisms not eradicated by alcohol-based products	150 (76.1)	5.25 ± 1.42
K10	Knowledge of appropriate opportunities for hand hygiene	153 (77.7)	5.52 ± 1.73
K11	Knowledge of guidelines for alcohol-based hand hygiene formulations	179 (90.9)	6.11 ± 1.33

Agreement was defined as a response of 5, 6, or 7 on the seven-point scale.

Table 4. Nurses' Attitudes Regarding Nosocomial Infections

Item	Attitude statement	Agreement, n (%)	Mean ± SD
A1	Nosocomial infections can lead to serious patient outcomes	178 (90.4)	5.98 ± 1.40
A2	Healthcare workers may personally transmit nosocomial infections	148 (75.1)	5.01 ± 1.70
A3	Nurses respond negatively when colleagues do not comply with guidelines	125 (63.5)	4.80 ± 1.71
A4	Compliance increases while training newly appointed staff	166 (84.3)	5.52 ± 1.39
A5	Nurses serve as role models for recommended infection-control practices	171 (86.8)	5.53 ± 1.39
A6	It is unrealistic to clean hands after every patient contact ¹	145 (73.6)	4.98 ± 1.80
A7	Healthcare workers should be sanctioned for noncompliance	131 (66.5)	4.91 ± 1.58
A8	Healthcare workers should be rewarded for compliance	176 (89.3)	5.96 ± 1.35

Agreement was defined as a response of 5, 6, or 7.

¹A6 was negatively worded; agreement therefore reflects a potential barrier to recommended practice.

Self-reported adherence was highest for hand hygiene before and after manipulating body-fluid samples, with 182 participants (92.4%) selecting an agreement response. Hand hygiene in relation to insertion of an indwelling urinary catheter was reported by 181 participants (91.9%), and 177 (89.8%) reported handwashing when moving from a contaminated body site to a clean site. General adherence to alcohol-based hand-hygiene guidelines was reported by 169 participants (85.8%).

Table 5. Nurses' Self-Reported Practices Regarding Nosocomial Infections

Item	Practice statement	Agreement, n (%)	Mean ± SD
P1	Follow recommended guidelines for alcohol-based hand hygiene	169 (85.8)	5.94 ± 1.53
P2	Use alcohol-based antiseptics before opening vascular-access equipment	173 (87.8)	5.90 ± 1.43
P3	Use an alcohol-based solution or antiseptic between patient contacts	173 (87.8)	5.56 ± 1.51
P4	Perform hand hygiene after activities such as bed bathing or perineal care	171 (86.8)	5.69 ± 1.44
P5	Perform hand hygiene after contact with patient-care equipment	166 (84.3)	5.58 ± 1.38
P6	Perform hand hygiene before and after handling body-fluid specimens	182 (92.4)	6.14 ± 1.25
P7	Perform hand hygiene before and after contact with intact skin	172 (87.3)	5.67 ± 1.39
P8	Perform hand hygiene before and after urinary-catheter insertion	181 (91.9)	6.19 ± 1.29
P9	Perform hand hygiene when moving from a contaminated to a clean body site	177 (89.8)	5.79 ± 1.46
P10	Occasionally use nail polish or artificial fingernails ¹	83 (42.1)	4.06 ± 1.78
P11	Become less compliant during increased workload or emergencies ¹	154 (78.2)	5.31 ± 1.53
P12	Perform hand hygiene after touching objects in the patient's surroundings	168 (85.3)	5.73 ± 1.36
P13	Use charts or computer keyboards during busy patient-care episodes	103 (52.3)	4.29 ± 1.96
P14	Remove rings, watches, or bracelets before hand hygiene	168 (85.3)	5.59 ± 1.54

Agreement was defined as a response of 5, 6, or 7.

¹P10 and P11 were negatively worded; agreement reflects potentially unsafe practice or a barrier to compliance.

Important behavioural gaps were also identified. Eighty-three participants (42.1%) agreed that they occasionally polished their fingernails or wore artificial nails. Furthermore, 154 (78.2%) agreed that their compliance decreased during episodes of increased workload or emergency care. Only 103 participants (52.3%) selected an agreement response for the item concerning the use of charts or computer keyboards during busy patient-care episodes.

DISCUSSION

This study assessed the knowledge, attitudes, and self-reported practices of nurses regarding nosocomial infections at Saidu Group of Teaching Hospital. The participants obtained relatively high raw scores in all three domains, with knowledge showing the highest percentage of the maximum possible score, followed by practices and attitudes. Nevertheless, item-level analysis identified clinically relevant gaps concerning organisms not eradicated by alcohol-based formulations, recognition of all opportunities for hand hygiene, the perceived feasibility of hand hygiene after every patient contact, compliance during periods of increased workload, and the use of nail polish or artificial fingernails. These findings indicate that favourable aggregate scores should not be interpreted as uniform compliance across all infection-prevention behaviours.

The knowledge findings were broadly consistent with earlier studies involving nurses and other healthcare workers. Awareness of handwashing guidelines was reported by 90.4% of participants, closely corresponding with the 90.3% reported by Kamunge among registered nurses (5). Knowledge of safe disposal precautions and fomite transmission was also high. Studies conducted in Lahore and Rawalpindi similarly found substantial awareness of hand hygiene and hospital-acquired infection prevention, although gaps remained between knowledge and actual practice (2,6). Gezie et al. reported good knowledge among 86.4% of healthcare workers in an Ethiopian referral hospital, whereas Khan et al. reported good knowledge among approximately half of nurses working in public and private hospitals in Islamabad (7,8). Differences among studies may reflect variation in instruments, scoring criteria, professional composition, institutional training, and access to infection-control resources.

Knowledge was comparatively weaker for the limitations of alcohol-based hand rubs and for identifying all appropriate hand-hygiene opportunities. These findings are important because alcohol-based products are highly effective for routine hand decontamination but are not equally effective against all organisms or clinical contamination conditions. Infection-prevention education should therefore distinguish between situations requiring alcohol-based hand rub and those requiring washing with soap and water rather than treating the two procedures as interchangeable.

The attitude findings demonstrated strong recognition of the clinical consequences of nosocomial infections. Approximately 90% of respondents agreed that these infections could produce serious patient outcomes, a result comparable with the high level reported by Kamunge (5). Most participants also considered themselves role models and supported rewarding compliance. Comparable favourable attitudes have been reported among healthcare workers in Ethiopia, India, Nigeria, and multinational samples (8,9,12,14). However, nearly three-quarters of the present participants agreed that hand cleaning after every contact was unrealistic. This response suggests that awareness of infection-control principles may coexist with doubts concerning their operational feasibility, especially in high-volume clinical settings.

The practice findings showed high self-reported adherence to hand hygiene surrounding body-fluid handling, catheter insertion, direct patient contact, and movement from contaminated to clean body sites. These findings were consistent with the generally favourable practices reported among registered nurses by Kamunge and in a recent global KAP study (5,14). However, other investigations have found that good knowledge does not necessarily translate into consistent clinical practice. Studies from Ethiopia, Georgia, Iran, and the Philippines identified deficiencies in observed or self-reported practice despite generally acceptable knowledge levels (8,10,15,16). The present finding that 78.2% of nurses

reported reduced compliance during high workload or emergencies provides a plausible explanation for this knowledge–practice gap.

The reported use of nail polish or artificial fingernails and the handling of charts or computer keyboards during busy care episodes also merit attention. Hands, jewellery, equipment, and frequently touched environmental surfaces may serve as vehicles for organism transmission when hand hygiene is interrupted or improperly timed. Consistent compliance therefore depends not only on individual knowledge but also on adequate staffing, conveniently located hand-hygiene facilities, continuous availability of supplies, visible institutional policies, supportive supervision, and timely performance feedback. Hand hygiene remains one of the most important measures for preventing healthcare-associated infection, but sustained adherence requires organizational as well as individual-level interventions (13). Educational programs are most effective when reinforced through continuing instruction, observation, role modelling, audit, and feedback rather than delivered as isolated lectures (4,16).

The study included nurses from multiple clinical departments and duty shifts and achieved a high proportion of analysable questionnaires. It also examined knowledge, attitudes, and practices using a common instrument, allowing potential gaps among these domains to be identified. Several limitations should nevertheless be considered. Participants were recruited through convenience sampling at a single teaching hospital, which limits generalizability. Practices were self-reported rather than directly observed and may therefore have been affected by recall and social-desirability bias. The internal-consistency coefficients reported for the three domains were modest. The analysis was descriptive and could not identify independent predictors of knowledge or compliance. In addition, the questionnaire contained positively and negatively worded items, while the available scoring information did not clearly establish whether all negatively worded responses were reverse-coded. Item-level distributions should consequently be prioritized when interpreting the findings.

CONCLUSION

Nurses working at Saidu Group of Teaching Hospital demonstrated high raw knowledge, attitude, and self-reported practice scores regarding nosocomial infection prevention. Strong awareness was observed for handwashing guidelines, safe disposal of contaminated equipment, fomite transmission, serious patient outcomes, and hand hygiene during invasive and body-fluid-related procedures. However, important gaps remained in the perceived feasibility of hand hygiene after every contact, compliance during periods of increased workload, and practices involving fingernails and frequently touched equipment. These findings support infection-prevention strategies that combine continuing education with adequate resources, workload-sensitive workflow design, supervision, and regular monitoring of clinical practice.

REFERENCES

1. Masavkar SP, Naikwadi AM. Knowledge, attitude and practice regarding nosocomial infections among general health practitioners and medical college students. *Sch J Appl Med Sci.* 2016;4(5):1852–1856. doi: 10.36347/sjams.2016.v04i05.084.
2. Sharif I, Rashid Z, Tariq NA, Mashhadi SE, Din MU, Wazir L, et al. Gaps in knowledge and practices regarding nosocomial infections among nursing staff of a tertiary care hospital of Rawalpindi. *Pak Armed Forces Med J.* 2019;69(6):1210–1215.
3. Mustafa U, Sana, Nasir M. Knowledge, attitude and practices of health professionals towards nosocomial infection. *J Muhammad Med Coll.* 2019;9(1):27–31. doi: 10.62118/jmmc.v9i1.49.

4. Suchitra JB, Devi NL. Impact of education on knowledge, attitudes and practices among various categories of health care workers on nosocomial infections. *Indian J Med Microbiol.* 2007;25(3):181–187. doi: 10.4103/0255-0857.34757.
5. Kamunge EW. Exploring knowledge, attitudes and practices of registered nurses regarding the spread of nosocomial infections [dissertation]. South Orange: Seton Hall University; 2013.
6. Jahangir M, Ali M, Riaz MS. Knowledge and practices of nurses regarding spread of nosocomial infection in government hospitals, Lahore. *J Liaquat Univ Med Health Sci.* 2017;16(3):149–153. doi: 10.22442/jlumhs.171630524.
7. Khan A, Abdullah M, Wajid HA, Ameen F, Ali NF, Kanwar MM, et al. Knowledge and practices regarding nosocomial infection among nurses in hospitals of Islamabad. *Ann Med Health Sci Res.* 2021;11(9):393–403.
8. Gezie H, Leta E, Admasu F, Gedamu S, Dires A, Goshiye D. Health care workers' knowledge, attitude and practice towards hospital-acquired infection prevention at Dessie Referral Hospital, Northeast Ethiopia. *Clin J Nurs Care Pract.* 2019;3:59–63. doi: 10.29328/journal.cjnecp.1001019.
9. Thankam T, Goswami YP. Knowledge, attitude and practice of health care workers towards hospital-acquired infection prevention in Joseph Hospital, Tamil Nadu, India. *Int J Life Sci.* 2021;10(2):31–37.
10. Soleimani Z, Mosadeghrad AM, Alighardashi M, Azadnajafabad S, Safari M, Mokhtari Z, et al. Knowledge, attitude, and practice of nurse aides and service staff about nosocomial infection control: a case study in Iran. *Environ Health Eng Manag J.* 2023;10(3):343–351. doi: 10.34172/EHEM.2023.38.
11. Dhupdale NY, Singh P, Cacodcar J. Knowledge and practices of health care professionals with regard to nosocomial infections at a medical college at Goa, India: a cross-sectional study. *J Evol Med Dent Sci.* 2019;8(12):902–906. doi: 10.14260/jemds/2019/201.
12. Ojo FT, Gbadebo OG, Festus KA, Baki KK, Asogba PC. Knowledge, attitude and practice towards nosocomial infections among healthcare workers in Ijebu-Ode Local Government Area of Ogun State. *TASFUED J Pure Appl Sci.* 2023;2(1):50–58.
13. Saloojee H, Steenhoff A. The health professional's role in preventing nosocomial infections. *Postgrad Med J.* 2001;77(903):16–19. doi: 10.1136/pmj.77.903.16.
14. Khatrawi EM, Prajjwal P, Farhan M, Inban P, Gurha S, Al-Ezzi SMS, et al. Evaluating the knowledge, attitudes, and practices of healthcare workers regarding high-risk nosocomial infections: a global cross-sectional study. *Health Sci Rep.* 2023;6(9):e1559. doi: 10.1002/hsr2.1559.
15. Verulava T. Knowledge and practices of nurses on prevention of nosocomial infection in emergency care hospitals. *Malta Med J.* 2024;36(4):51–58.
16. Campo LKC, Remon AR. Knowledge and practices of nurses on the prevention and control of healthcare-acquired infections in a private tertiary hospital in Baguio City. *Acta Med Philipp.* 2025;59(3):92–103. doi: 10.47895/amp.vi0.9136.
17. Balarabe SA, Joshua IA, Danjuma A, Dauda MU, Sunday OO, Yusuf HD. Knowledge of healthcare workers on nosocomial infection in selected secondary health institutions in Zaria, Nigeria. *J Prev Med.* 2015;3(1):1–6. doi: 10.12691/jpm-3-1-1.