



ISSN: 1813-1638

The Medical Journal of Tikrit University

Available online at: www.mjotu.com

MJTU

The Medical Journal of
Tikrit University

Assessment of Knowledge, Attitude, and Practice (KAP) Regarding Standard Precautions Among Public and Private Hospital Nurses in Sulaymaniyah Governorate, Iraq

Sasan Mohammed Ahmed ⁽¹⁾; Fattah Hama Rahim Fattah ⁽²⁾

¹College of Medicine, University of Sulaimani, Sulaymaniyah City, Kurdistan Region, Iraq.

Keywords: Standard precautions, infection control, knowledge, attitude, practice, KAP, nurses, public, private, hospital, Iraq

ARTICLE INFO

Article history:

Received 01 Jul 2025
Accepted 01 Sep 2025
Available online 31 Dec 2025

ABSTRACT

Background: Hospital-acquired infections are a significant burden in low and middle-income countries, largely due to poor adherence to standard precautions (SPs) by healthcare workers. Nurses are at particularly high risk due to frequent patient contact, yet their compliance with SPs is often inadequate.

Objectives: This study aimed to assess and compare the knowledge, attitude, and practice regarding SPs among nurses working in public and private hospitals in Sulaymaniyah Governorate, Iraq.

Methods: A cross-sectional comparative study was conducted from February to May 2025 in eight public and private hospitals. A total of 370 registered nurses with at least one year of clinical experience participated. Data were collected using a structured, validated questionnaire and analyzed using Chi-square and independent t-tests to assess group differences and associations.

Results: Significant sociodemographic differences were observed: private hospital nurses were younger and more likely to hold a bachelor's degree, while public nurses had more years of experience ($p < 0.001$). Private nurses scored significantly higher in knowledge (mean = 25.85 ± 5.46) and practice (mean = 37.02 ± 9.04) than public nurses ($p = 0.041$), while attitude scores were similar across both sectors ($p = 0.828$). Notably, unsafe practices such as needle recapping remained prevalent in both settings.

Conclusion: While both groups exhibited positive attitudes toward SPs, a gap between knowledge and practice persists. Targeted infection control training and institutional support are needed to bridge this gap and enhance safety practices.

© 2023 TIKRIT UNIVERSITY,
COLLEGE OF MEDICINE (TUCOM).
THIS IS AN OPEN ACCESS
ARTICLE UNDER THE CC BY
LICENSE
<http://tikrit-medicine.tripod.com/ id10.html>



Citation:

Corresponding author E mail:
sasan0751@gmail.com

INTRODUCTION

Hospital-acquired infections (HAIs) are infections that patients acquire during their stay in the hospital, which were not present or incubating at the time of admission, as defined by the World Health Organization (WHO, 2011). A main source of HAIs is healthcare workers not following standard infection control practices. Although they have good intentions, they can become vectors of disease transmission. The risk of transmission can be greatly reduced with simple preventive steps, such as proper hand hygiene [1, 2].

The prevalence of HAIs is estimated to be 7.6% in developed countries and 10.1% in developing countries, with developing nations facing a 2 to 20 times higher risk, sometimes exceeding 25% [1]. HAIs often appear within 48 hours of hospital admission and pose risks not only to patients but also to healthcare professionals (HCPs), who may acquire occupational infections such as hepatitis B, hepatitis C, human immunodeficiency virus, and tuberculosis. These infections can lead to longer hospital stays, increased healthcare costs, morbidity, economic losses, work hours lost, greater antibiotic use, rising antibiotic resistance, and mortality. Low- and middle-income countries (LMICs), characterized by limited resources and high infection burdens, are especially vulnerable to HAIs due to the lack of standardized diagnostic criteria and surveillance systems for monitoring both patient and occupational infections. As a result, the occupational safety of HCPs and the prevalence of infectious diseases in LMICs remain neglected and underreported [2, 3].

Standard Precautions (SPs) are based on the assumption that all patients' blood and body substances may be potential sources of infection, regardless of their diagnosis or suspected infectious status. SPs are a set of evidence-based guidelines designed to minimize the transmission of infectious agents in healthcare settings. These measures include hand hygiene, the use of personal protective equipment (PPE), safe injection practices, environmental cleaning, respiratory hygiene and cough etiquette, and waste management [1, 3].

Despite their critical role in preventing HAIs, compliance with SPs among HCPs remains insufficient, with studies in Northern Cyprus and Saudi Arabia showing adherence rates often below 50% [4, 5]. Assessments of knowledge, attitude, and practice (KAP) reveal that while many HCPs possess satisfactory knowledge, implementation remains poor; only 30.9% demonstrated adequate practice despite 57.5% having good knowledge [5]. Due to frequent patient contact, nurses are especially vulnerable to occupational exposure and play a pivotal role in infection control, yet many lack proper infection prevention training [6]. Although Infection Prevention and Control (IPC) training improves SPs' compliance, sustaining safe practices also requires adequate PPE, institutional support, and continuous education [5, 4]. The primary aim of this study is to assess and compare the KAP regarding SPs among nurses working in public and private hospitals in Sulaymaniyah Governorate, Iraq.

MATERIALS AND METHODS

Study design:

A cross-sectional comparative study was conducted to compare the KAP regarding SPs among nurses working in public and private hospitals in Sulaymaniyah Governorate.

Study Setting

The study was conducted in eight hospital departments—Wards, Emergency, Operation Theater, Normal Vaginal Delivery (NVD), and Intensive Care Units (ICUs)—which are among the most frequently visited units and involve direct patient contact with nurses. It included four public hospitals (Shar Hospital, Dr. Jamal Ahmad Rashid's Pediatric Teaching Hospital, Hiwa Hospital, and Sulaymaniyah Maternity Hospital) and four private hospitals (Harem Hospital, Smart Health Tower, Anwar Shekha Medical City, and Baxshin Hospital) in Sulaymaniyah Governorate. Data collection took place between 1 February 2025 and 15 May 2025.

Sample size

Based on estimated prevalence rates and using a standard sample size calculation formula, a total sample size of 384 nurses was determined. To allow for comparison between public and private hospitals, the sample was equally divided, with 192 nurses from public hospitals and 192 nurses from private hospitals in Sulaymaniyah Governorate. This sample size was selected to ensure sufficient statistical power for detecting differences in KAP levels between public and private hospitals.

Participants

Inclusion Criteria:

- Registered nurses, as defined by the WHO, provide autonomous and collaborative care to individuals of

all ages, families, groups, and communities, whether sick or healthy, in all settings.

- Nurses working in clinical departments such as the ICU, NVD, Emergency, Wards, and Operating Theaters.
- Nurses with at least one year of clinical work experience in the departments mentioned above.

Exclusion Criteria:

- Nurses not meeting the WHO definition of nursing (i.e., those not engaged in direct patient care).
- Nurses with less than one year of experience in clinical practice.
- Student nurses, interns, or trainees.

Sampling Method

A multi-stage stratified random sampling method was used to select a total of 384 nurses from both public and private hospitals in Sulaymaniyah Governorate. In the first stage, hospitals were stratified based on type (public or private). In the second stage, departments within each hospital, such as the ICU, NVD, Emergency Departments, Wards, and Operating Theaters. Finally, within each department, simple random sampling was applied to select eligible nurses from staff lists.

Data Collection

A structured questionnaire was developed to assess the KAP of nurses regarding SPs. The questionnaire consisted of three main sections: Knowledge: assessing understanding of SPs, Attitude: evaluating beliefs and perceptions about their importance, Practice: examining actual adherence to precautionary measures. Data

were collected through face-to-face interviews with nurses who were available during the day shifts. When nurses were unavailable (e.g., during night shifts or if they were busy at the time of the visit), the head nurse received the questionnaires along with instructions on how to administer them and explain the items clearly. Data collection took place across public and private hospitals in Sulaymaniyah Governorate within the defined study period.

Inferential Data Analysis

Statistical analysis was conducted using both the Chi-Square (χ^2) test and the Independent Samples t-test to determine the association and differences between variables related to KAP regarding SPs among nurses. The chi-square test was applied to examine relationships between categorical variables, while the independent samples t-test was used to compare the means of continuous variables between nurses in private and public hospitals. The level of statistical significance was interpreted using the following criteria: very highly significant ($p < 0.000$), highly significant ($p < 0.001$), significant ($p < 0.05$), and non-significant ($p > 0.05$).

Scoring and Classification of KAP Responses

Knowledge was assessed using 20 questions, and attitude with 12 items. Correct or positive responses were scored as 2, "don't know" as 1, and incorrect or negative responses as 0. Practice was rated on a 5-point scale: Always (5), Often (4), Sometimes (3), Rarely (2), and Never (1). For each domain, the minimum and maximum observed scores were used to calculate the score range. Based on these ranges, knowledge and attitude were

categorized as Good (knowledgeable), Do Not Know (moderate), and Poor (non-knowledgeable); practice was classified from Always to Never. This scoring method enabled meaningful classification and identification of gaps.

Validity and Reliability

The validity of the questionnaire was confirmed through expert reviews conducted by five university lecturers, who included assistant professors, full professors, and specialists in hospital infection control. To evaluate its reliability, a pilot study was performed, and Cronbach's alpha was calculated to measure internal consistency. The results ranged from 0.70 to 0.79, indicating an acceptable level of reliability for the instrument.

Ethical Considerations

Ethical approval will be obtained from the relevant institutional review boards before data collection. Informed consent will be obtained from all participants after explaining the purpose of the study. Participation will be entirely voluntary, and participants will have the right to withdraw at any time without any consequences. All responses will be kept strictly confidential and used solely for research purposes.

RESULTS

Sociodemographic

A total of 400 questionnaires were distributed, of which 370 were returned and completed for analysis. Of these, 190 responses were from nurses working in private hospitals, and 180 were from those in public hospitals. Significant differences were observed between private and public hospital nurses across several key

sociodemographic variables ($p < 0.05$) (Table 1).

Private hospital nurses were younger (median age private 27.0 vs. public 34.0 years, $p < 0.001$) and less experienced (median 4.0 vs. 11.5 years, $p < 0.001$) than public hospital nurses (Table 1). Public nurses also cared for more patients per shift (median 6.0 vs. 5.0, $p < 0.001$). Prior training on SPs was higher among private nurses (34.2% vs. 19.4%, $p = 0.002$). Educational levels differed significantly, with more private nurses holding bachelor's degrees (52.6% vs. 18.9%) and more public nurses holding diplomas (61.1%) ($p < 0.001$) (Table 1). These sociodemographic differences may affect their knowledge, attitudes, and practices regarding SPs (Table 1).

Knowledge

The assessment of nurses' knowledge on SPs revealed significant differences between public and private hospital staff. Private nurses demonstrated better understanding in key areas such as hand hygiene duration, HAI recognition, and knowledge of methicillin-resistant *Staphylococcus aureus* (MRSA). For example, 38.4% of private nurses correctly identified that 10 seconds of hand rubbing is insufficient, compared to 23.9% of public nurses ($p = 0.009$), and more private nurses recognized that HAIs are acquired during care rather than being present at admission (private 43.7% vs. public 38.9%, $p = 0.009$). Additionally, MRSA familiarity was higher among private nurses (51.6% vs. 38.9%, $p = 0.019$). Although a significant difference was found regarding whether SPs apply to all patients ($p < 0.001$), the proportion of correct responses was nearly equal (67.9% private vs. 68.9% public). Overall, both groups demonstrated moderate knowledge,

with private nurses stronger in terminology and procedural understanding, while public nurses performed better in basic hand hygiene (Table 2).

Attitudes

The analysis of nurses' attitudes toward SPs revealed generally positive responses in both private and public hospital settings. A statistically significant difference was found regarding the belief that hand hygiene should always be performed before starting the workday, with private hospital nurses showing stronger agreement (92.1%) compared to their public hospital counterparts (85.0%) ($p = 0.021$). Most nurses in both sectors strongly agreed on the importance of SPs for infection prevention, including practices such as hand hygiene, glove use during direct patient contact, and safe sharps disposal. For instance, 83.7% of private nurses and 80.6% of public nurses agreed that used needles should be placed in sharps containers ($p = 0.682$). Interestingly, public hospital nurses showed a slightly higher level of agreement on the importance of covering the mouth and nose with a tissue in healthcare settings (70.6%) compared to private nurses (63.7%), though this difference was not statistically significant ($p = 0.371$) (Table 3).

Practice

Analysis of nurses' practices regarding SPs showed varied compliance, with significant differences in key areas. Public hospital nurses demonstrated greater adherence to several hygiene practices, including always performing hand hygiene before starting work (51.7% vs. 41.6%, $p = 0.003$), maintaining distance from respiratory patients (47.2% vs. 30.5%, $p = 0.002$), and washing hands after glove

removal (37.2% vs. 23.2%, $p = 0.012$). Although handwashing after patient contact was slightly more common among public nurses (47.2% vs. 42.1%), the difference was not statistically significant ($p = 0.211$) (Table 4).

A significant difference was found in the unsafe practice of recapping used needles, with 59.4% of public and 40.0% of private hospital nurses reporting "always" doing so ($p = 0.006$), highlighting a critical safety concern. However, the self-reported occurrence of needlestick injuries in 2024 showed no significant difference between the two groups ($p = 0.698$) (Table 4).

Comparison of Overall Knowledge, Attitude, and Practice

Most nurses in both public and private hospitals demonstrated fair levels of knowledge (61.7% and 60.5%, respectively). A higher proportion of private nurses had good knowledge (20.0%) compared to public nurses (13.9%), while poor knowledge was more common in the public group (24.4% vs. 19.5%). In terms of attitude, over 73% in both sectors reported good attitudes, but public nurses had a higher rate of poor attitudes (7.8%) than private nurses (2.1%). Regarding practice, few nurses in either group reported "always" following SPs (2.2% public vs. 0.5% private), and most reported practicing them "sometimes" or "rarely," indicating generally insufficient adherence in both settings.

The comparison of mean scores revealed statistically significant differences in knowledge and practice. Private hospital nurses had a higher mean knowledge score (25.85 ± 5.46) than public nurses (24.70 ± 5.29 ; $p = 0.041$), and their mean practice score was also higher (37.02 ± 9.04 vs.

35.04 ± 9.46 ; $p = 0.041$). However, the mean attitude scores were nearly identical between groups (20.12 ± 3.73 for private vs. 20.03 ± 4.52 for public; $p = 0.828$), suggesting similarly positive attitudes overall.

DISCUSSION

This study assessed KAP regarding SPs among nurses in public and private hospitals in Sulaymaniyah Governorate, Iraq. A total of 370 valid questionnaires were analyzed—190 from private and 180 from public hospitals. The findings revealed significant differences between the two sectors, not only in KAP outcomes but also in underlying sociodemographic characteristics that may influence adherence to infection prevention measures.

The current study identified significant sociodemographic differences between public and private hospital nurses that may impact adherence to SPs. Private nurses were younger (median age 27.0) with less experience (median 4.0 years), while public nurses were older (median age 34.0) and more experienced (median 11.5 years) ($p < 0.001$). These results are consistent with a previous study at Shar Teaching Hospital, where most public nurses were aged 30–40, and 65.6% held diploma degrees. Similarly, diploma holders were more common in public hospitals (61.1%), while bachelor's degrees were more frequent among private nurses (52.6%) ($p < 0.001$) [7]. Work experience patterns also aligned, with most nurses in both studies having 5–10 years of service ($p < 0.001$). A shared concern was the lack of infection control training: 69.8% of nurses in the earlier study had no training, and the current study showed significantly fewer public nurses had received SPs training compared to private nurses (19.4% vs.

34.2%, $p = 0.002$), highlighting ongoing gaps in institutional infection prevention education [8, 9].

Private hospital nurses showed significantly better knowledge of methicillin-resistant *Staphylococcus aureus* (MRSA) (51.6% vs. 38.9%, $P = 0.019$), extended-spectrum beta-lactamase (ESBL) (25.8% vs. 13.9%, $P = 0.008$), and hand-rubbing duration. Public nurses performed slightly better in basic hand hygiene and had fewer “do not know” responses to general SPs, suggesting broader familiarity. Overall, most nurses had fair knowledge, with good knowledge more common in private hospitals (20.0%) and poor knowledge in public ones (24.4%). Supporting this, a study at Shar Teaching Hospital found that although 57.5% of nurses had good knowledge of SPs, 69.8% had never received formal infection control training, and none reported having periodic educational programs in their departments [9, 10]. The lack of training for healthcare workers is a consistent issue reported across various studies in Iran and India [11, 12]. Similarly, the Baghdad-based study found significantly better knowledge scores among healthcare workers who had received training, particularly those with over five years of experience [10].

Despite moderate-to-good knowledge, the “know-do gap” was visible in both sectors. While nurses demonstrated awareness of key infection control measures, actual application was inconsistent. For example, the unsafe practice of needle recapping—reported as “always” practiced by 40.0% of private and 59.4% of public nurses—stands out as both dangerous and preventable. This reflects similar findings from Sulaimaniyah, where 79% of HCPs admitted to recapping needles after use

[10]. Comparable trends were observed internationally, including in Northern Cyprus (53.7%) [5] and Faisalabad, Pakistan (53%) [13].

The results revealed that most nurses in both public and private hospitals in Sulaymaniyah demonstrated fair knowledge, with good knowledge more common among private hospital nurses (20.0%) compared to public (13.9%). These findings align with a previous study at Shar Teaching Hospital, where 57.5% of nurses demonstrated good knowledge, 30.2% had fair knowledge, and 12.3% had poor knowledge of SPs [9]. Similarly, a study at a university in Qassim, Saudi Arabia, reported that 67.6% of nurses had good knowledge, 26.3% had fair knowledge, and only 6.1% had poor knowledge [4]. Conversely, an Indian study found the majority of nurses (61.67%) had only fair knowledge regarding infection control precautions, indicating potential regional disparities in training emphasis and infection control education [14, 15]. These comparisons highlight the relevance of structured, ongoing educational programs in enhancing nurses’ knowledge and ultimately improving compliance with SPs.

This gap between knowledge and practice is a consistent global issue [16]. In Nigeria, for example, median knowledge and attitude scores exceeded 90%, but practice scores were only 50.8% [17]. Similarly, Indian HCPs reported 85% theoretical knowledge about hand hygiene but implemented it less than 30% of the time [3]. In Northern Cyprus, 57.5% of healthcare staff had satisfactory knowledge, yet only 30.9% showed satisfactory practice [5]. The present study aligns with these patterns, suggesting that

knowledge alone is insufficient to ensure proper infection control.

Although this study found generally positive attitudes toward SPs —73.3% of public and 73.7% of private nurses demonstrated good attitudes—these did not consistently translate into practice. Only 46.5% of nurses always washed their hands before starting work, with public nurses reporting significantly higher compliance than private (51.7% vs. 41.6%, $p = 0.003$). Similarly, after glove removal, only 37.2% of public and 23.2% of private nurses always performed hand hygiene ($p = 0.012$). This "know-do gap" reflects a global challenge; in Saudi Arabia, although attitudes were high, only 55.4% consistently applied recommended practices [4]. Internationally, similar gaps exist—69.4% of nurses in Northern Cyprus failed to perform pre-patient handwashing, and 64% of Indian nurses incorrectly believed alcohol rub suffices for visibly soiled hands [5, 3]. These findings reveal the need for continuous training and stronger enforcement to bridge the gap between knowledge and infection control practice [18].

PPE usage was high in glove and mask use, but protective goggles were underused—only 26.8% of private and 30.6% of public nurses always wore them ($p = 0.376$), despite over 75% in both groups agreeing on their importance. Cleaning reusable items also showed moderate compliance, with just over 41% in both sectors reporting always doing so. These patterns echo findings in Shar Hospital, where 77.1% misused PPE [7], and studies in Northern Cyprus and Iran reported very low actual use of goggles despite good knowledge [5]. This reinforces the need for accessible PPE, supportive systems, and behavioral

reinforcement to bridge knowledge and practice.

The role of training and education is particularly critical in improving compliance with SPs. In the current study, only 27.0% of all nurses reported receiving prior training on SPs, with a statistically significant difference between hospital types ($p = 0.002$). Specifically, 34.2% of private hospital nurses had received such training compared to just 19.4% in public hospitals. This gap may partly explain the significantly higher knowledge and practice scores observed among private sector nurses. According to this study, there is a significant association between training and knowledge, which aligns with the findings of a study conducted in Baghdad. That study also demonstrated a positive relationship between prior training and increased knowledge, suggesting that this association may remain stable across various Iraqi governorates—an encouraging sign for broader public health education policy [10]. Moreover, within Shar Teaching Hospital—one of the public hospitals included in this research—58% of nurses reported the absence of infection control guidelines and confirmed that no periodic educational programs were offered [7]. Internationally, similar concerns have been raised. In Northern Cyprus, 61.4% of nurses found their infection control training inadequate [5], while in Nigeria, the lack of supervision, structured training, and facility resources were identified as major barriers to compliance [17]. These findings collectively reinforce the urgent need for standardized, accessible, and continuous training programs to ensure that knowledge is effectively translated into safe clinical practice.

Institutional and systemic factors, including heavy workload, lack of PPE, time constraints, and weak administrative enforcement, further limit adherence. These barriers were reported across Nigeria, India, and Ethiopia [3, 17, 19]. In this study, public hospital nurses managed a heavier patient load, which may contribute to lower compliance in practices like distancing from respiratory patients or disinfecting shared equipment.

Finally, sociodemographic factors showed a complex influence. In this study, older and more experienced nurses—primarily in public hospitals—showed better adherence to some critical practices like hand hygiene and needle safety. These trends are supported by studies from Baghdad and Nigeria, where knowledge, attitude, and practice improved with age and experience [1, 10, 20]. However, some research, such as the Northern Cyprus study, found that younger healthcare workers (<25 years) had better knowledge, although age and experience did not consistently predict better practice [5, 21].

CONCLUSION

This study revealed significant differences in KAP regarding SPs among nurses in public and private hospitals in Sulaymaniyah Governorate. Private hospital nurses demonstrated higher knowledge and practice scores, likely influenced by greater access to training and educational resources. However, a clear “know-do gap” was observed in both sectors, where awareness did not always translate into proper practice. Public hospital nurses, despite showing strengths in specific practices, faced more systemic barriers, such as heavier workloads and less institutional support. The findings underscore the urgent need for structured, ongoing infection control training

programs and institutional reinforcement to ensure knowledge is effectively applied in clinical practice.

REFERENCES

- [1] Ogoina D, Pondei K, Adetunji B, Chima G, Isichei C, Gidado S. Knowledge, attitude and practice of standard precautions of infection control by hospital workers in two tertiary hospitals in Nigeria. *Journal of infection prevention*. 2015 Jan;16(1):16-22.
- [2] Devaliya JJ, Brahme K, Shringarpure K. A Study on Knowledge, Attitude and Practice (KAP) of Universal Precautions in The Nursing Staff of Tertiary care Hospital.
- [3] Sharma M, Bachani R. Knowledge, attitude, practice, and perceived barriers for the compliance of standard precautions among medical and nursing students in Central India. *International journal of environmental research and public health*. 2023 Apr 12;20(8):5487.
- [4] Abalkhail A, Al Imam MH, Elmosaad YM, Jaber MF, Al Hosis K, Alhumaydhi FA, et.al. Knowledge, Attitude and Practice of Standard Infection Control Precautions among Health-care Workers in a hospital in Qassim, Saudi Arabia: a Cross-sectional Survey.
- [5] Abuduxike G, Vaizoglu SA, Asut O, Cali S. An assessment of the knowledge, attitude, and practice toward standard precautions among health workers from a hospital in Northern Cyprus. *Safety and health at work*. 2021 Mar 1;12(1):66-73.
- [6] Tufail S, Afzal M, Perveen K, Waqas A, Gilani S. Knowledge, Attitude and Practice towards standard isolation precautions among registered Nurses. *Saudi Journal of Medical and Pharmaceutical Sciences*. 2017;3:534-44.

[7] Mohammed A, Abdulqadir ZS. Nurses' Performances Regarding Infection Control Standard Precautions at Shar Teaching Hospital in Sulaimani City. *Kufa Journal for Nursing Sciences*. 2023 Oct 7;13(2):17-31.

[8] Osoba M, Olulaja O, Oyadiran O, Itunuola O, Afolabi O, Emilomo A. Knowledge, Attitude and Practice of Standard Precautions amongst Allied Oral Healthcare Personnel in Lagos State. *Journal of Oral Healthcare*. 2021 Dec 31;2(1):20-8.

[9] Abdulqadir ZS, Mohammed AK. Nurses' Knowledge Regarding Infection Control Standard Precautions at Shar Teaching Hospital in Sulaimani City. *Mosul J Nurs*. 2023;11(2):450–60.

[10] Fadhl SA, Ali SI, Ali SM. Knowledge, attitude, and practices of infection control amongst medical staff. *University of Thi-Qar Journal Of Medicine*. 2023 Oct 4;26(2):106-19.

[11] Asadpour M, Vazirinejad R, Esmaeli A, Bazyar SH, Fallah A. The knowledge, attitude, and practice of physicians and medical students of Rafsanjan University of Medical Sciences, Iran, regarding standard precautions. *Journal of Occupational Health and Epidemiology*. 2013;2(3):107-13.

[12] Mehta TK, Shah DT, Pethani JD. Interventional knowledge, attitude and practice study of standard precautions among health care workers at a tertiary care hospital in Western India.

[13] Faryad S, Inayat MS, Afzal M, Hussain M. Knowledge, attitude and practice of standard isolation precautions among registered nurses of allied hospital Faisalabad. *Int J Sci Eng Res*. 2018;9(5):461-84.

[14] Sherwani N, Neral A, Verma N, Gade N. Assessment of Level of Knowledge and Practice Of Standard Precautions Of Infection Control Among Various Health Care Workers In A Tertiary Care Hospital Of Chhattisgarh. *Indian Journal of Basic and Applied Medical Research*. 2018 Jun 1;7(3):30-44.

[15] Askarian M, Honarvar B, Tabatabaei HR, Assadian O. Knowledge, practice and attitude towards standard isolation precautions in Iranian medical students. *Journal of Hospital Infection*. 2004 Dec 1;58(4):292-6.

[16] Okhiai O, Nwaopara AO, Omorogbe FI, Izefua E, Nwandike GI, Nmorsi P, et.al. A study on knowledge, attitude and practice of standard precautions among theatre personnel in Irrua specialist teaching hospital, Irrua, Edo State. *International Journal of Basic, Applied and Innovative Research*. 2014;3(4):147-53.

[17] Goje M, Balami AD, Jarma M, Dauda S. Knowledge, attitude, self-efficacy and practice of standard precaution measures by nursing and midwifery students in Damaturu, North-Eastern Nigeria. *Nursing*. 2018;69:55-2.

[18] Lommi M, De Benedictis A, Porcelli B, Raffaele B, Latina R, Montini G, et.al. Evaluation of standard precautions compliance instruments: a systematic review using COSMIN methodology. *InHealthcare* 2023 May 12 (Vol. 11, No. 10, p. 1408). MDPI.

[19] Girma T. Knowledge, Attitude and practice of health care workers towards standard precaution in West Hararghe Hospitals, Oromia Regional State, Ethiopia. *J Infect Dis Ther*. 2015;3(221):2332-0877.

[20] Zhu S, Kahsay KM, Gui L. Knowledge, attitudes and practices related to standard precautions among nurses: A comparative study. Journal of clinical nursing. 2019 Oct;28(19-20):3538-46.

[21] Mohammadzadeh M, Behnaz F, Parsa S. Knowledge, practice and attitude towards standard isolation precautions in nurses, auxiliary nurses and midwives of Shahid Sadoughi hospital Yazd, Iran. International Journal of Infection Control. 2013 Feb 7;9(1).

TABLES

Table 1: Sociodemographic and Occupational Characteristics of Nurses by Hospital Type

Variables	Workplace		Total	P-values
	Private	Public		
Gender N (%)				
Male	90 (47.4)	57 (31.7)	147 (39.7)	0.002
Female	100 (52.6)	123 (68.3)	223 (60.3)	
Age, Median (QR)	27.0 (25.0-30.0)	34.0 (28.0-40.0)	29.0 (25.0-36.0)	<0.001
Level of education, N (%)				
Bachelor's degree	100 (52.6)	34 (18.9)	134 (36.2)	<0.001
Diploma	79 (41.6)	110 (61.1)	189 (51.1)	
Postgraduate Degree	3 (1.6)	7 (3.9)	10 (2.7)	
Others	8 (4.2)	29 (16.1)	37 (10.0)	
Working department, N (%)				
Emergency	46 (24.2)	71 (39.4)	117 (31.6)	<0.001
ICU	13 (6.8)	6 (3.3)	19 (5.1)	
NVD	10 (5.3)	28 (15.6)	38 (10.3)	
Operation theater	45 (23.7)	15 (8.3)	60 (16.2)	
Ward	76 (40.0)	60 (33.3)	136 (36.8)	
Years of experience in the hospital, Median (QR)	4.0 (2.0-7.0)	11.5 (5.0-18.0)	6.0 (3.0-12.0)	<0.001
Previous training regarding Standard Precaution, N (%)				
Yes	65 (34.2)	35 (19.4)	100 (27.0)	0.002
No	125 (65.8)	145 (80.6)	270 (73.0)	
Number of patients typically cared for by a nurse in one shift, Median (QR)	5.0 (4.0-7.0)	6.0 (5.0-12.0)	6.0 (5.0-10.0)	<0.001

Table 2: Knowledge Responses Regarding Standard Precautions Among Nurses by Workplace

Knowledge Item	Workplace	Correct Answer n (%)	False Answer n (%)	Do Not Know n (%)	P-values
Preferred hand hygiene	Private	129 (67.9)	42 (22.1)	19 (10.0)	0.036

method: Alcohol-based hand rub	Public	141 (78.3)	22 (12.2)	17 (9.4)	
	Total	270 (73.0)	64 (17.3)	36 (9.7)	
Hand rubbing for 10 seconds is effective for cleaning	Private	73 (38.4)	102 (53.7)	15 (7.9)	0.009
	Public	43 (23.9)	122 (67.8)	15 (8.3)	
	Total	116 (31.4)	224 (60.5)	30 (8.1)	
Handwashing is mandatory when hands are visibly dirty	Private	145 (76.3)	23 (12.1)	22 (11.6)	0.001
	Public	121 (67.2)	47 (26.1)	12 (6.7)	
	Total	266 (71.9)	70 (18.9)	34 (9.2)	
Use gloves during exposure to blood/body fluids	Private	167 (87.9)	13 (6.8)	10 (5.3)	0.085
	Public	146 (81.1)	13 (7.2)	21 (11.7)	
	Total	313 (84.6)	26 (7.0)	31 (8.4)	
Continue using damaged gloves until the procedure ends	Private	123 (64.7)	50 (26.3)	17 (8.9)	0.686
	Public	118 (65.6)	42 (23.3)	20 (11.1)	
	Total	241 (65.1)	92 (24.9)	37 (10.0)	
Surgical mask mandatory for aerosol procedures	Private	12 (6.3)	141 (74.2)	37 (19.5)	0.458
	Public	17 (9.4)	125 (64.9)	38 (21.1)	
	Total	29 (7.8)	266 (71.9)	75 (20.3)	
Sharps are disposed of in a regular trash bin	Private	107 (56.3)	69 (36.3)	14 (7.4)	0.793
	Public	107 (59.4)	62 (34.4)	11 (6.1)	
	Total	214 (57.8)	131 (35.4)	25 (6.8)	
Hand hygiene after removing gloves	Private	125 (65.8)	45 (23.7)	20 (10.5)	0.317
	Public	105 (58.3)	54 (30.0)	21 (11.7)	
	Total	230 (62.2)	99 (26.8)	41 (11.1)	
Clean/disinfect patient areas only when visibly dirty	Private	135 (71.1)	35 (18.4)	20 (10.5)	0.769
	Public	123 (68.3)	34 (18.9)	23 (12.8)	
	Total	258 (69.7)	69 (18.6)	43 (11.6)	
HAI was acquired during care, not present at admission	Private	83 (43.7)	48 (25.3)	59 (31.1)	0.009
	Public	70 (38.9)	71 (39.4)	39 (21.7)	
	Total	153 (41.4)	119 (32.2)	98 (26.5)	
Invasive procedures cause HAIs	Private	149 (78.4)	22 (11.6)	19 (10.0)	<0.001
	Public	102 (56.7)	33 (18.3)	45 (25.0)	
	Total	251 (67.8)	55 (14.9)	64 (17.3)	
Familiar with MRSA	Private	98 (51.6)	46 (24.2)	46 (24.2)	0.019
	Public	70 (38.9)	44 (24.4)	66 (36.7)	
	Total	168 (45.4)	90 (24.3)	112 (30.3)	
MRSA spreads through airborne droplets	Private	52 (27.4)	86 (45.3)	52 (27.4)	0.094
	Public	45 (25.0)	67 (37.2)	68 (37.8)	
	Total	97 (26.2)	153 (41.4)	120 (32.4)	
ESBL = Extremely Strong Bacterial Load	Private	49 (25.8)	60 (31.6)	81 (42.6)	0.008
	Public	25 (13.9)	77 (42.8)	78 (43.3)	
	Total	74 (20.0)	137 (37.0)	159 (43.0)	

Table 3: Attitudes Toward Standard Precautions Among Nurses by Workplace

Attitude Item	Workplace	Disagree n (%)	Uncertain n (%)	Agree n (%)	P-values
Hand hygiene should always be performed before starting the workday	Private	4 (2.1)	11 (5.8)	175 (92.1)	0.021
	Public	15 (8.3)	12 (6.7)	153 (85.0)	
	Total	19 (5.1)	23 (6.2)	328 (88.6)	
Gloves should always be worn during direct contact with a	Private	16 (8.4)	17 (8.9)	157 (82.6)	0.327
	Public	11 (6.1)	24 (13.3)	145 (80.6)	

patient	Total	27 (7.3)	41 (11.1)	302 (81.6)	
Hand hygiene is required before putting on gloves	Private	17 (8.9)	39 (20.5)	134 (70.5)	0.315
	Public	11 (6.1)	30 (16.7)	139 (77.2)	
	Total	28 (7.6)	69 (18.6)	273 (73.8)	
Used needles and sharp objects must be placed in sharps containers	Private	9 (4.7)	22 (11.6)	159 (83.7)	0.682
	Public	12 (6.7)	23 (12.8)	145 (80.6)	
	Total	21 (5.7)	45 (12.2)	304 (82.2)	
Frequent hand washing is essential in preventing HAIs.	Private	16 (8.4)	49 (25.8)	125 (65.8)	0.406
	Public	9 (5.0)	45 (25.0)	126 (70.0)	
	Total	25 (6.8)	94 (25.4)	251 (67.8)	
Cleaning hands after touching environmental surfaces near the patient is important.	Private	11 (5.8)	37 (19.5)	142 (74.7)	0.326
	Public	18 (10.0)	32 (17.8)	130 (72.2)	
	Total	29 (7.8)	69 (18.6)	272 (73.5)	
Clean and disinfect reusable items before using them on another patient	Private	7 (3.7)	31 (16.3)	152 (80.0)	0.080
	Public	17 (9.4)	29 (16.1)	134 (74.4)	
	Total	24 (6.5)	60 (16.2)	286 (77.3)	
Protective goggles should be worn when there is a risk of spillage into the eye	Private	16 (8.4)	30 (15.8)	144 (75.8)	0.571
	Public	21 (11.7)	26 (14.4)	133 (73.9)	
	Total	37 (10.0)	56 (15.1)	277 (74.9)	
All patients with respiratory symptoms should wear a surgical mask	Private	20 (10.5)	30 (15.8)	140 (73.7)	0.597
	Public	24 (13.3)	32 (17.8)	124 (68.9)	
	Total	44 (11.9)	62 (16.8)	264 (71.4)	
Follow standard precautions even if colleagues do not	Private	20 (10.5)	39 (20.5)	131 (68.9)	0.869
	Public	20 (11.1)	33 (18.3)	127 (70.6)	
	Total	40 (10.8)	72 (19.5)	258 (69.7)	
Essential to educate patients and visitors on respiratory hygiene/cough etiquette	Private	17 (8.9)	24 (12.6)	149 (78.4)	0.981
	Public	17 (9.4)	22 (12.2)	141 (78.3)	
	Total	34 (9.2)	46 (12.4)	290 (78.4)	
Essential to cover the mouth and nose with a tissue in healthcare facilities	Private	33 (17.4)	36 (18.9)	121 (63.7)	0.371
	Public	24 (13.3)	29 (16.1)	127 (70.6)	
	Total	57 (15.4)	65 (17.6)	248 (67.0)	

Table 4: Infection Control Practices with Counts and Percentages

Item	Group	Always	Often	Sometimes	Rarely	Never	P-values
Hand hygiene before starting work	Private	79 (41.6%)	66 (34.7%)	34 (17.9%)	10 (5.3%)	1 (0.5%)	0.003
	Public	93 (51.7%)	69 (38.3%)	11 (6.1%)	5 (2.8%)	2 (1.1%)	
	Total	172 (46.5%)	135 (36.5%)	45 (12.2%)	15 (4.1%)	3 (0.8%)	
Changing gloves before a new patient	Private	108 (56.8%)	53 (27.9%)	20 (10.5%)	9 (4.7%)	0 (0.0%)	0.507
	Public	106 (58.9%)	55 (30.6%)	13 (7.2%)	5 (2.8%)	1 (0.6%)	
	Total	214 (57.8%)	108 (29.2%)	33 (8.9%)	14 (3.8%)	1 (0.3%)	
Wearing protective eyewear	Private	51 (26.8%)	43 (22.6%)	41 (21.6%)	27 (14.2%)	28 (14.7%)	0.376
	Public	55 (30.6%)	51 (28.3%)	27 (15.0%)	25 (13.9%)	22 (12.2%)	
	Total	106 (28.6%)	94 (25.4%)	68 (18.4%)	52 (14.1%)	50 (13.5%)	
Placing used needles in sharps container	Private	124 (65.3%)	32 (16.8%)	12 (6.3%)	15 (7.9%)	7 (3.7%)	0.993
	Public	120 (66.7%)	30 (16.7%)	11 (6.1%)	14 (7.8%)	5 (2.8%)	
	Total	244 (65.9%)	62 (16.8%)	23 (6.2%)	29 (7.8%)	12 (3.2%)	
Cleaning reusable items	Private	79 (41.6%)	65 (34.2%)	28 (14.7%)	13 (6.8%)	5 (2.6%)	0.85
	Public	77 (42.8%)	62 (34.4%)	23 (12.8%)	10 (5.6%)	8 (4.4%)	

	Total	156 (42.2%)	127 (34.3%)	51 (13.8%)	23 (6.2%)	13 (3.5%)	
Asking respiratory patients to wear a mask	Private	53 (27.9%)	68 (35.8%)	35 (18.4%)	19 (10.0%)	15 (7.9%)	0.107
	Public	70 (38.9%)	61 (33.9%)	29 (16.1%)	14 (7.8%)	6 (3.3%)	
	Total	123 (33.2%)	129 (34.9%)	64 (17.3%)	33 (8.9%)	21 (5.7%)	
Standard precautions despite colleagues	Private	83 (43.7%)	64 (33.7%)	29 (15.3%)	13 (6.8%)	1 (0.5%)	0.034
	Public	87 (48.3%)	66 (36.7%)	15 (8.3%)	6 (3.3%)	6 (3.3%)	
	Total	170 (45.9%)	130 (35.1%)	44 (11.9%)	19 (5.1%)	7 (1.9%)	
Washing hands after removing gloves	Private	44 (23.2%)	80 (42.1%)	47 (24.7%)	18 (9.5%)	1 (0.5%)	0.012
	Public	67 (37.2%)	59 (32.8%)	37 (20.6%)	12 (6.7%)	5 (2.8%)	
	Total	111 (30.0%)	139 (37.6%)	84 (22.7%)	30 (8.1%)	6 (1.6%)	
Handwashing after patient contact	Private	80 (42.1%)	54 (28.4%)	33 (17.4%)	21 (11.1%)	2 (1.1%)	0.211
	Public	85 (47.2%)	52 (28.9%)	19 (10.6%)	18 (10.0%)	6 (3.3%)	
	Total	165 (44.6%)	106 (28.6%)	52 (14.1%)	39 (10.5%)	8 (2.2%)	
Reporting/documenting needle stick injuries	Private	78 (41.1%)	66 (34.7%)	30 (15.8%)	13 (6.8%)	3 (1.6%)	0.262
	Public	86 (47.8%)	50 (27.8%)	22 (12.2%)	15 (8.3%)	7 (3.9%)	
	Total	164 (44.3%)	116 (31.4%)	52 (14.1%)	28 (7.6%)	10 (2.7%)	
Proper use/disposal of PPE	Private	67 (35.3%)	66 (34.7%)	27 (14.2%)	23 (12.1%)	7 (3.7%)	0.514
	Public	79 (43.9%)	57 (31.7%)	23 (12.8%)	16 (8.9%)	5 (2.8%)	
	Total	146 (39.5%)	123 (33.2%)	50 (13.5%)	39 (10.5%)	12 (3.2%)	
Needle stick injuries in 2024	Private	14 (7.4%)	11 (5.8%)	71 (37.4%)	43 (22.6%)	51 (26.8%)	0.698
	Public	11 (6.1%)	7 (3.9%)	60 (33.3%)	46 (25.6%)	56 (31.1%)	
	Total	25 (6.8%)	18 (4.9%)	131	89 (24.1%)	107 (28.9%)	
Providing tissue/sanitizer to respiratory patients	Private	51 (26.8%)	72 (37.9%)	31 (16.3%)	25 (13.2%)	11 (5.8%)	0.345
	Public	46 (25.6%)	53 (29.4%)	37 (20.6%)	28 (15.6%)	16 (8.9%)	
	Total	97 (26.2%)	125 (33.8%)	68 (18.4%)	53 (14.3%)	27 (7.3%)	
Encouraging cough/sneeze etiquette	Private	72 (37.9%)	60 (31.6%)	33 (17.4%)	18 (9.5%)	7 (3.7%)	0.349
	Public	80 (44.4%)	52 (28.9%)	27 (15.0%)	10 (5.6%)	11 (6.1%)	
	Total	152 (41.1%)	112 (30.3%)	60 (16.2%)	28 (7.6%)	18 (4.9%)	
Stocked respiratory hygiene stations	Private	62 (32.6%)	79 (41.6%)	34 (17.9%)	14 (7.4%)	1 (0.5%)	<0.001
	Public	89 (49.4%)	50 (27.8%)	23 (12.8%)	11 (6.1%)	7 (3.9%)	
	Total	151 (40.8%)	129 (34.9%)	57 (15.4%)	25 (6.8%)	8 (2.2%)	
Maintaining distance from respiratory patients	Private	58 (30.5%)	66 (34.7%)	33 (17.4%)	27 (14.2%)	6 (3.2%)	0.002
	Public	85 (47.2%)	43 (23.9%)	24 (13.3%)	15 (8.3%)	13 (7.2%)	
	Total	143 (38.6%)	109 (29.5%)	57 (15.4%)	42 (11.4%)	19 (5.1%)	
Recapping needles after use	Private	76 (40.0%)	39 (20.5%)	21 (11.1%)	22 (11.6%)	32 (16.8%)	0.006
	Public	107 (59.4%)	26 (14.4%)	14 (7.8%)	11 (6.1%)	22 (12.2%)	
	Total	183 (49.5%)	65 (17.6%)	35 (9.5%)	33 (8.9%)	54 (14.6%)	

Table 5: Comparison of Overall Knowledge, Attitude, and Practice

Variables	Workplace		P-values
	Public n (%)	Private n (%)	
Knowledge			
Good	25 (13.9)	38 (20.0)	0.216
Fair	111 (61.7)	115 (60.5)	
Bad	44 (24.4)	37 (19.5)	
Mean ± SD ^a	24.70 ± 5.29	25.85 ± 5.46	0.041

Attitude			
Good	132 (73.3)	140 (73.7)	0.026
Fair	34 (18.9)	46 (24.2)	
Bad	14 (7.8)	4 (2.1)	
Mean \pm SD ^b	20.03 \pm 4.52	20.12 \pm 3.73	0.828
Practice			
Always	4 (2.2)	1 (0.5)	
Often	5 (2.8)	15 (7.9)	0.082
Sometime	42 (23.3)	53 (27.9)	
Rarely	85 (47.2)	82 (43.2)	
Never	44 (24.4)	39 (20.5)	
Mean \pm SD ^c	35.04 \pm 9.46	37.02 \pm 9.04	0.0410

a: Maximum Score 38, Minimum Score 11

b: Maximum Score 24, Minimum Score 5

c: Maximum Score 71, Minimum Score 18