KNOWLEDGE, ATTITUDE, AND PRACTICE REGARDING STANDARD PRECAUTIONS AMONG NURSES AT A PROVINCIAL GENERAL HOSPITAL IN VIETNAM: A CROSS-SECTIONAL STUDY

Nguyen Xuan Bai[1]*, Tran Van Vinh[2], Nguyen Viet Khanh[1]

Abstract

Objective: This study aimed to assess knowledge, attitude, and practice (KAP) regarding standard precautions (SPs) among nurses at Vinh City General Hospital and to identify factors associated with adequate knowledge, positive attitude, and good practice.

Method: A single-site cross-sectional study was conducted at Vinh City General Hospital from July 2024 to March 2025 among 254 nurses directly involved in patient care. A census sampling method was used. Data were collected by direct interview using a structured questionnaire developed from infection-control guidance and previous studies. Adequate knowledge was defined as a score of at least 25/35 points (>=70%); positive attitude as at least 36/45 points (>=80%); and good practice as at least 20/22 points (>=80%) with correct responses to two reverse-coded questions. Descriptive statistics, chi-square tests, and multivariable logistic regression were used.

Results: Among 254 nurses, 68.9% had adequate knowledge, 76.4% had a positive attitude, and 66.5% had good practice regarding SPs. University-level education or higher (AOR=3.06; 95% CI: 1.5-6.1; p=0.001) and prior SP training (AOR=4.85; 95% CI: 1.9-12.7; p=0.001) were associated with adequate knowledge. Age 40-49 years (AOR=2.43; 95% CI: 1.0-5.9; p=0.048) and longer work experience were associated with positive attitude (5-10 years: AOR=2.34; 95% CI: 1.1-5.1; p=0.030; 11-15 years: AOR=3.16; 95% CI: 1.3-7.5; p=0.009; >15 years: AOR=3.63; 95% CI: 1.5-8.7; p=0.004). Good practice was associated with university-level education or higher (AOR=2.34; 95% CI: 1.3-4.3; p=0.006), prior training (AOR=3.49; 95% CI: 1.3-9.5; p=0.014), adequate knowledge (AOR=5.26; 95% CI: 2.8-10.0; p<0.001), and positive attitude (AOR=4.40; 95% CI: 2.3-8.6; p<0.001).

Conclusion: Although nurses generally showed a positive attitude toward SPs, gaps remained in knowledge and practice. Competency-based training, practical reinforcement, supportive supervision, and a non-punitive peer-feedback culture should be strengthened to improve SP compliance.

Keywords: Knowledge, Attitude, Practice, Associated Factors, Standard Precautions, Nurse.

I. INTRODUCTION

Healthcare-associated infections (HAIs) remain an important patient-safety problem worldwide. They increase morbidity, antibiotic use, length of hospital stay, treatment costs, and mortality, especially in low- and middle-income countries [1-3]. Standard precautions (SPs) are the core infection-prevention measures applied to all patients, regardless of diagnosis, and include hand hygiene, appropriate use of personal protective equipment, safe injection and sharps management, respiratory hygiene, environmental cleaning, and safe handling of linen and waste [2, 4, 5].

Nurses are the largest professional group in hospitals and have frequent direct contact with patients. Therefore, their knowledge, attitude, and practice regarding SPs are central to preventing HAIs and occupational exposure. Previous studies in Vietnam and other countries have reported variable levels of knowledge and compliance, suggesting that training, safety culture, workload, and institutional context may influence SP implementation [6-9].

Vinh City General Hospital has implemented infection-control activities since the establishment of its Infection Control Department in 2011. However, like many provincial hospitals, it faces practical challenges such as periodic overcrowding and infrastructure limitations in some clinical departments. Local evidence is therefore needed to identify specific gaps and guide feasible interventions for nurses in this setting.

The objectives of this study were: (1) to assess the knowledge, attitude, and practice regarding standard precautions among nurses at Vinh

1. Thai Binh University of Medicine and Pharmacy
2. Vinh City General Hospital
*Corresponding author: Nguyen Xuan Bai
Email: bainxytb@yahoo.com.vn
Received date: 06/5/2026
Revised date: 18/5/2026
Accepted date: 24/5/2026

City General Hospital; and (2) to identify factors associated with adequate knowledge, positive attitude, and good practice regarding standard precautions among these nurses.

II. MATERIAL AND METHODS

2.1. Study design and setting

A cross-sectional descriptive study was conducted at Vinh City General Hospital, Nghe An province, Vietnam, from July 2024 to March 2025. This was a single-site study; no additional health facility was included. This design was appropriate for estimating the current proportion of nurses with adequate KAP and examining associated factors at the time of survey.

2.2. Study subjects

Eligible participants were registered nurses working in clinical departments, directly involved in patient care, employed at the hospital for at least 12 months, and willing to provide informed consent. Nurses who were not directly involved in clinical care or who were absent during data collection because of sick leave, study leave, maternity leave, or official travel were excluded.

2.3. Sample size and sampling method

Sample size

The sample size was estimated using the formula for a single proportion:

$n = Z^2_{1-\alpha/2} \times p(1-p) / d^2$

In this calculation:

n: the minimum sample size

$Z_{1-\alpha/2}$: the confidence coefficient (Z=1.96 for α=0.05)

d: the desired margin of error (d=0.05)

p: the proportion of nurses with good practice of SPs. Referencing a study at the National Hospital of Traditional Medicine in 2023, where p=0.818 [6]. The minimum required sample size was 236. In practice, all eligible nurses from 21 clinical departments were invited using a census sampling method, and 254 nurses were included.

Sampling method

To maximize coverage of the finite eligible population and minimize sampling-related selection bias, a census sampling method was used. This approach involved attempting to recruit every eligible nurse working in the 21 clinical departments of Vinh City General Hospital. By including the eligible population at this single site, the findings are representative of the study population in this hospital.

2.4. Measurements

The questionnaire included sociodemographic information and three KAP domains. Knowledge was assessed using 26 multiple-choice and true/false questions with a total score of 35 points. A score of >=25/35 (>=70%) was classified as adequate knowledge. Attitude was assessed using nine 5-point Likert-scale items; a score of >=36/45 (>=80%) was classified as a positive attitude. Practice was assessed using 22 items on SP implementation; a score of >=20/22 (>=80%) together with correct responses to two reverse-coded items was classified as good practice. The 70% and 80% cut-offs were selected to reflect minimum acceptable knowledge and higher expected standards for attitude and safety practice in infection prevention.

2.5. Data collection tool, validity, and reliability

The questionnaire was developed based on Vietnamese Ministry of Health infection-control guidance and relevant KAP studies [2,7,8]. Content validity was reviewed by three experts, including an infection-control specialist and a senior nurse manager. The instrument was pilot-tested among 10 nurses not included in the final sample to assess clarity, face validity, and completion time. Minor wording revisions were made before official data collection. Cronbach's alpha values were 0.78 for the attitude scale and 0.85 for the practice scale, indicating acceptable internal consistency. Cronbach's alpha was not used for the knowledge section because it contained heterogeneous multiple-response and true/false items assessing distinct factual domains; therefore, content validity and pilot testing were used to support its appropriateness

2.6. Statistical Analysis

Data were checked for completeness, entered into Epidata, cleaned, and analyzed using SPSS version 27.0. Categorical variables were summarized as frequencies and percentages. Chi-square tests were used for bivariate comparisons. Multivariable logistic regression was used to identify factors associated with adequate knowledge, positive attitude, and good practice. Variables were selected for multivariable models based on theoretical relevance and bivariate results. Multicollinearity was assessed before final model

interpretation. Results are presented as odds ratios (ORs), adjusted odds ratios (AORs), 95% confidence intervals (CIs), and p-values. A p-value <0.05 was considered statistically significant.

2.7. Ethical considerations

The study was conducted in accordance with ethical principles for biomedical research. Participants were informed about the study objectives, voluntary participation, confidentiality, and the right to withdraw at any time. Written informed consent was obtained before interview. The study protocol was reviewed and approved by Thai Binh University of Medicine and Pharmacy, Decision No. 991/QD-YDTB, dated May 20, 2025. All collected data were used only for research purposes and were anonymized before analysis.

III. RESULTS

3.1. Demographic characteristics

Table 1. General characteristics of the nurses

Characteristics	Overall (n=254)	
	n	%
Sex		
Male	22	8.7
Female	232	91.3
Age group		
<30	38	15.0
30-39	142	55.9
40-49	62	24.4
≥ 50	12	4.7
Educational Level		
Intermediate level	1	0.4
College	136	53.5
University	114	44.9
Postgraduate	3	1.2
Job Position		
Clinical Staff	212	83.4
Administrative	21	8.3
Head Nurse	21	8.3
Work Experience		
<5 year	37	14.5
5-10 year	102	40.2
11-15 year	49	19.3
>15 year	66	26.0

Because all eligible participants were recruited from Vinh City General Hospital, baseline characteristics are summarized for the overall sample only. A total of 254 nurses participated. Most were female (91.3%), aged 30-39 years (55.9%), and worked as clinical staff (83.4%). More than half had a college degree (53.5%), while 46.1% had a university or postgraduate degree. The most common duration of work experience was 5-10 years (40.2%), followed by more than 15 years (26.0%).

3.2. Knowledge, attitude, and practice regarding standard precautions

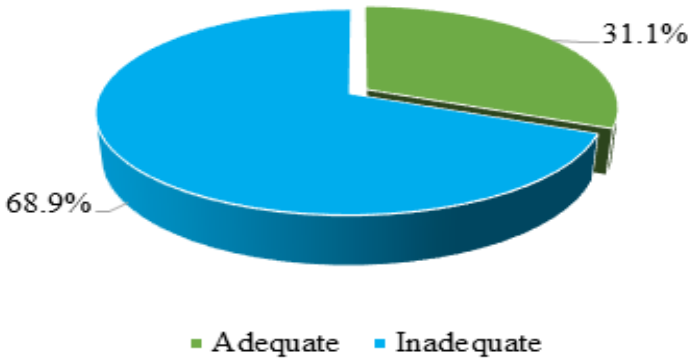

Figure 1. Percentage of nurses with adequate knowledge of standard precautions

Figure 1 shows the results of the knowledge assessment for the 254 nurses. The results indicate that 175 nurses had adequate knowledge, accounting for 68.9%.

Table 2. Nurses' attitudes towards certain standard precaution regulations

Statement	Disagree		Neutral		Agree	
	n	%	n	%	n	%
Standard Precautions (SPs) help reduce healthcare-associated infections (HAIs) and occupational exposure for healthcare workers (HCWs).			7	2.8	247	97.2
I have enough time to comply with hand hygiene regulations/guidelines.	3	1.2	37	14.6	214	84.3
I feel uncomfortable reminding or giving feedback to colleagues and others in the department when they do not follow hand hygiene regulations correctly.	73	28.7	83	32.7	98	38.6
Giving feedback and helping colleagues to correctly follow hand hygiene guidelines will contribute to improving the quality of Infection Prevention and Control (IPC) in the workplace.	3	1.2	6	2.4	245	96.5
The hospital currently has adequate and appropriate regulations/guidelines on Standard Precautions (SPs).			26	10.2	228	89.8
The current Standard Precautions (SP) regulations/ guidelines are sufficient and appropriate.	1	0.4	25	9.8	227	89.4
The hospital needs to organize training and knowledge updates on Standard Precautions (SPs) for healthcare workers (HCWs).			9	3.5	245	96.5
I believe that complying with Standard Precaution (SP) regulations/guidelines helps reduce HAIs in patients and healthcare workers (HCWs).			4	1.6	250	98.4
The purpose of wearing Personal Protective Equipment (PPE) is to protect healthcare workers (HCWs), patients, and the community.			7	2.8	247	97.2

Table 2 presents all 9 statements used to assess attitude. The full questionnaire, including all knowledge and practice items, is available as supplementary material.

The results in Table 2 show that the highest agreement rate was 98.4% for the belief that SPs help reduce HAIs. Conversely, the statement with the lowest agreement rate was "Feeling inconvenient when having to remind or give feedback to colleagues," with only 38.6% agreeing. This item also recorded the highest disagreement rate (28.7%) and the highest "neutral" rate (32.7%).

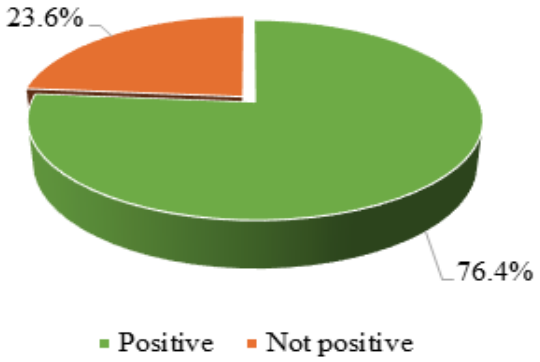

Figure 2. Percentage of nurses with a positive attitude towards standard precautions

Figure 2 shows that 76.4% of nurses had a positive attitude towards SPs.

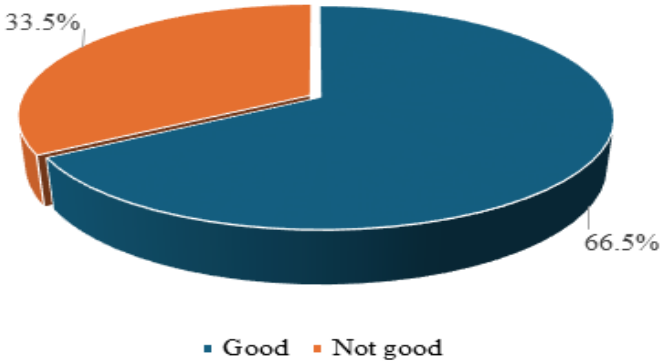

Figure 3. Percentage of nurses with good practice of standard precautions

Regarding SP practice, Figure 3 shows that the percentage of nurses with good practice was 66.5%.

3.3. Factors associated with KAP outcomes

Table 3. Key factors associated with adequate knowledge, positive attitude, and good practice

Outcome	Associated factor	AOR	95% CI	p-value
Adequate knowledge	University level or higher	3.06	1.5-6.1	0.001
Adequate knowledge	Prior training on SPs	4.85	1.9-12.7	0.001
Positive attitude	Age 40-49 years	2.43	1.0-5.9	0.048
Positive attitude	Work experience 5-10 years	2.34	1.1-5.1	0.030
Positive attitude	Work experience 11-15 years	3.16	1.3-7.5	0.009
Positive attitude	Work experience >15 years	3.63	1.5-8.7	0.004
Good practice	University level or higher	2.34	1.3-4.3	0.006
Good practice	Prior training on SPs	3.49	1.3-9.5	0.014
Good practice	Adequate knowledge	5.26	2.8-10.0	<0.001
Good practice	Positive attitude	4.40	2.3-8.6	<0.001

AOR: adjusted odds ratio; CI: confidence interval. Only statistically significant adjusted associations are shown. Models were adjusted for sex, age group, education, work experience, and SP training; the practice model additionally included knowledge and attitude.

After adjustment, university-level education or higher and prior SP training were associated with adequate knowledge. Age 40-49 years and longer work experience were associated with a positive attitude. Good practice was associated with university-level education or higher, prior training, adequate knowledge, and positive attitude.

IV. DISCUSSION

This study provides local evidence on nurses' KAP regarding SPs at a provincial general hospital in Vietnam. The main findings were that 68.9% of nurses had adequate knowledge, 76.4% had a positive attitude, and 66.5% had good practice. These results suggest a relatively favorable attitudinal foundation but also demonstrate remaining gaps in knowledge and, more importantly, in daily practice.

The proportion of nurses with adequate knowledge in this study was lower than some reports from national-level Vietnamese hospitals, but higher than several international studies using different tools and thresholds [6,10,11]. Such variation may be explained by differences in questionnaires, scoring criteria, hospital level, workload, and the quality and frequency of training. In provincial hospitals, nurses often provide care across diverse clinical conditions, which may increase the need for repeated and practice-oriented reinforcement rather than one-time theoretical training.

Although 76.4% of participants had a positive attitude, only 66.5% achieved good practice. This knowledge-attitude-practice gap is important. Positive beliefs may not automatically translate into safe practice when nurses face high workload, time constraints, patient overcrowding, limited convenience of supplies, weak supervision, or inconsistent peer norms. Similar studies have also reported that knowledge and positive attitude are associated with better compliance but are not sufficient without enabling conditions and continuous monitoring [12-15].

The finding related to peer feedback deserves attention. A considerable proportion of nurses were neutral or uncomfortable about reminding colleagues when hand hygiene was not performed correctly. This may reflect fear of conflict, hierarchical workplace culture, or lack of a formal non-punitive feedback mechanism. Therefore, improving SP compliance should not rely only on individual responsibility. Hospital leaders and head nurses should promote a safety culture in which constructive feedback is considered a professional duty, supported by clear procedures and respectful communication.

In the multivariable models, university-level education or higher and prior training were associated with adequate knowledge, supporting the role of professional education and continuous training. Age 40-49 years and longer work experience were associated with positive attitude, suggesting that accumulated clinical exposure may help nurses better appreciate the importance of SPs. For good practice, adequate knowledge and positive attitude showed the strongest associations, while education and prior training also remained significant. These findings support competency-based training combined with practical supervision, mentoring by experienced nurses, and periodic assessment of SP performance.

This study has several limitations. First, the cross-sectional design allows identification of associations but does not establish causality. Second, the study was conducted in a single provincial hospital, which may limit generalizability to other settings. Third, practice was assessed through interview/self-report rather than direct observation, so social desirability bias may have occurred. Fourth, although the questionnaire underwent expert review and pilot testing, construct validity was not assessed in depth and reliability evidence for the knowledge section was limited by the heterogeneous nature of the items. Finally, institutional factors such as workload, staffing levels, availability of supplies, and supervision intensity were not fully analyzed.

V. CONCLUSION

Nurses at Vinh City General Hospital showed moderate-to-good KAP regarding standard precautions, with 68.9% having adequate knowledge, 76.4% having a positive attitude, and 66.5% having good practice. Higher education and prior training were associated with adequate knowledge and good practice; work experience was associated with positive attitude; and adequate knowledge and positive attitude were strongly associated with good practice. The hospital should strengthen competency-based training, practical skills reinforcement, supportive supervision,

adequate enabling conditions, and a non-punitive peer-feedback culture to improve sustained compliance with standard precautions.

REFERENCES

1 **World Health Organization.** Report on the burden of endemic health care-associated infection worldwide. Geneva: World Health Organization; 2011. Available from: https://iris.who.int/handle/10665/80135

2. **Ministry of Health.** Training materials for infection prevention and control. Hanoi: Ministry of Health; 2012.

3. **Drohan SE, Levin SA, Grenfell BT,** Laxminarayan R. Incentivizing hospital infection control. Proc Natl Acad Sci U S A. 2019;116(13):6221-6225. doi:10.1073/pnas.1812231116.

4. **National Health and Medical Research Council**. Australian guidelines for the prevention and control of infection in healthcare. Canberra: Commonwealth of Australia; 2019.

5. **Ministry of Health.** Guidelines for infection control in medical examination and treatment facilities. Hanoi: Ministry of Health; 2017.

6. **Doan TM, Le TB.** Knowledge and practice of standard precautions among nurses at the National Hospital of Traditional Medicine in 2023. Vietnam Journal of Medicine. 2023;533(1):333-338.

7. **Sarani H, Balouchi A, Masinaeinezhad N, Ebrahimitabas E**. Knowledge, attitude and practice of nurses about standard precautions for hospital-acquired infection in teaching hospitals affiliated to Zabol University of Medical Sciences (2014). Glob J Health Sci. 2016;8(3):193-198.

8. **Amoran OE, Onwube OO.** Infection control and practice of standard precautions among healthcare workers in northern Nigeria. J Glob Infect Dis. 2013;5(4):156-163. doi:10.4103/0974-777X.122010.

9. **Da'seh A, Al-Zaru I, Hayajneh A, Obaid O.** The nurses' knowledge and compliance with standard precautions to prevent healthcare-associated infections. Open Nurs J. 2023;17:e187443462306231. doi:10.2174/18744346-v17-e20230711-2023-3.

10. **Abuduxike G, Acar Vaizoglu S, Asut O, Cali S.** An assessment of the knowledge, attitude, and practice toward standard precautions among health workers from a hospital in Northern Cyprus. Saf Health Work. 2021;12(1):66-73. doi:10.1016/j.shaw.2020.09.003.

11. **Abalkhail A, Al Imam MH, Elmosaad YM, Jaber M, Al Hosis K, Al Humaydani M.** Knowledge, attitude and practice of standard infection control precautions among health-care workers in a university hospital in Qassim, Saudi Arabia: a cross-sectional survey. Int J Environ Res Public Health. 2021;18(22).

12. **Nguyen QT. Current status and knowledge, at**titudes, and practices of nurses on standard prevention at Hoa Binh Provincial General Hospital in 2021 [Level II specialized thesis]. Thai Binh University of Medicine and Pharmacy; 2022.

13. **Nguyen TMH, Tran NN, Dinh TKD.** Knowledge and attitudes about standard precautions among nurses at the National Hospital of Endocrinology in 2022. Journal of Nursing Science. 2022;6(3):6-14.

14. **Nguyen TP, Tran TKN, Pham NN.** Survey of knowledge and attitudes about standard precautions among health workers in the prevention of COVID-19 at Da Nang Hospital. Journal of Medicine and Pharmacy - Hue University of Medicine and Pharmacy. 2022;6(12):142-148. doi:10.34071/jmp.2022.6.19.

15. **Pham TKT, Hoang TTH, Duong TH.** Knowledge and practice of standard precautions among nurses at the National Eye Hospital in 2024. Journal of Community Medicine. 2024;66(1):63-68.