



## Knowledge and attitudes toward surgical site infection prevention among surgical and obstetric nurses in the Vinmec Healthcare System

Do Hong Thai<sup>1</sup>, Pham Van Dong<sup>1</sup>, Nguyen Thi Bao Ly<sup>2</sup>,

Nguyen Thi Thu Huong<sup>3</sup>, Hoang Thi Kim Anh<sup>4</sup>, Nguyen Thi Mai<sup>5</sup>, Vu Thi Kieu Anh<sup>6</sup>

<sup>1</sup> Vinmec Times City International General Hospital; <sup>2</sup> Vinmec Nha Trang International General Hospital;

<sup>3</sup> Vinmec Central Park International General Hospital; <sup>4</sup> Vinmec Hai Phong International General Hospital;

<sup>5</sup> Vinmec Da Nang International General Hospital; <sup>6</sup> Vinmec Phu Quoc International General Hospital

### ABSTRACT

**Objective:** To assess nurses' knowledge and attitudes regarding surgical site infection (SSI) prevention and to examine factors associated with these outcomes among surgical and obstetric nurses in the Vinmec Healthcare System in 2025. **Methods:** A cross-sectional study was conducted among 189 nurses working in Surgery and Obstetrics departments across Vinmec hospitals from November 2024 to September 2025. Data were collected using a predesigned questionnaire. Appropriate statistical tests were applied to evaluate associations between nurses' characteristics and SSI-prevention knowledge and attitudes. **Results:** Overall, 84.7% of nurses demonstrated good knowledge of SSI prevention, with a mean knowledge score of  $22.68 \pm 2.0$  out of 27. In addition, 92.6% reported a positive attitude toward SSI prevention, with a mean attitude score of  $21.4 \pm 4.02$  out of 25. Age and participation in SSI-prevention training within the previous 12 months were significantly associated with both knowledge and attitudes. **Conclusion:** Surgical and obstetric nurses within the Vinmec Healthcare System in 2025 generally exhibited good knowledge and positive attitudes toward SSI prevention; however, gaps persisted across age groups and training status. Nurses aged  $<30$  years and those who had not received SSI-prevention training in the past year were more likely to have poorer knowledge and less favorable attitudes. Strengthening routine training and targeted support for younger nurses is recommended to enhance the effectiveness of SSI prevention across the system.

**Keywords:** Surgical site infection; infection prevention; nurses; knowledge; attitudes; Vinmec Healthcare System.

### INTRODUCTION

Surgical site infection (SSI) is an infection that occurs at the operative site from the time of surgery until 30–90 days postoperatively, depending on the type of procedure. SSI is considered one of the most

common healthcare-associated infections (HAIs), accounting for approximately 20%–25% of all HAIs. The incidence of SSI varies substantially across countries. In high-income settings such as the United States, the United Kingdom, and Sweden, reported SSI rates range from 2% to

6.4%. In contrast, higher rates have been reported in several low- and middle-income countries, including India, Pakistan, Nepal, Turkey, and Iran, ranging from 5.5% to 25%<sup>1</sup>. In Vietnam, SSI are estimated to account for 5%–10% of approximately two million surgeries performed annually and represent the most common hospital-acquired infection<sup>2</sup>. These figures indicate that SSI remains a critical issue requiring sustained attention from healthcare organizations and administrators.

The quality of nursing care is closely linked to nurses' knowledge, attitudes, and practices in implementing evidence-based interventions. Recent qualitative evidence suggests that a major barrier to adherence to SSI-prevention measures is insufficient knowledge and limited skills in applying aseptic principles in clinical practice<sup>3</sup>.

In Vietnam, multiple studies have indicated that nurses' knowledge of SSI prevention remains suboptimal. Nguyen Thi Loan (2015) reported that only 60% of nurses had correct knowledge regarding SSI prevention<sup>4</sup>. Pham Van Duong (2017), in a study at Ninh Binh Obstetrics and Pediatrics Hospital, reported a higher proportion (71.8%)<sup>5</sup>. However, to date, no official study has specifically evaluated nurses' SSI-prevention knowledge in Vietnam's private hospital sector, although knowledge is recognized as a direct determinant of practice. Beyond knowledge, the attitudes of healthcare workers-particularly nurses who are directly involved in wound care-within the non-public hospital system are also of concern.

At Vinmec Times City International General Hospital, despite the implementation of a comprehensive SSI-prevention program-such as SSI-prevention

bundles, at least two preoperative showers, Staphylococcus aureus screening, camera-based monitoring of surgical hand hygiene, and routine environmental surface hygiene monitoring with compliance exceeding 80%-the SSI rate after cesarean section during the first three quarters of 2023 increased to 0.39% (4/1,008 cases), compared with 0.16% (1/611 cases) during the same period in 2022. Notably, in the Obstetrics Department, the SSI rate in June 2023 rose to 2.2% (2/93 cases). In the Surgery Department, SSI rates increased markedly in July and August 2023, reaching 4.8% (2/42 cases) and 3.5% (2/57 cases), respectively; both exceeded the control threshold according to the Control Chart.

This upward trend continued in 2024, with the hospital-wide SSI rate reaching 0.5% (29/5,525 cases), higher than 0.4% (19/4,982 cases) in 2023. Moreover, the six other hospitals within the Vinmec Healthcare System also reported new SSI cases, with SSI rates ranging from 0.1% to 0.4% in 2023, compared with 0% in 2021 and 2022. These findings suggest an increasing SSI burden within the Vinmec Healthcare System. Therefore, this study aimed to evaluate nurses' knowledge and attitudes regarding SSI prevention among nurses in the Surgery and Obstetrics departments across the Vinmec Healthcare System in 2025, and to analyze selected associated factors.

## SUBJECTS AND METHODS

**Study participants:** Nurses working at the Vinmec Healthcare System.

*Inclusion criteria:* Contracted nurses working in surgical and obstetrics clinical departments, directly providing patient care for at least one year, and consenting to participate in the study.

*Exclusion criteria:* Nurses who were absent, on leave, on maternity leave, or on sick leave during the data-collection period.

### Study period and setting:

The study was conducted from November 2024 to September 2025 in the Surgery and Obstetrics departments of seven hospitals in the Vinmec Healthcare System (Times City, Central Park, Ha Long, Hai Phong, Da Nang, Nha Trang, and Phu Quoc).

### Study design:

A cross-sectional descriptive study was employed.

### Sample size:

The initial sample size was estimated using the formula for a single population proportion.

$$n = Z_{(1-\alpha/2)}^2 \frac{p(1-p)}{d^2}$$

$n_0$  is the minimum required sample size;

$Z_{1-\alpha/2}$  is obtained from the normal distribution at a 5% significance level ( $Z_{1-\alpha/2} = 1.96$ );

$p = 0.71$ , based on the proportion of nurses with adequate knowledge of wound infection prevention and care reported by Pham Van Duong (2017) at Ninh Binh Obstetrics and Pediatrics Hospital <sup>5</sup>.

$d = 0.05$  is the acceptable absolute margin of error.

**Calculate the sample size using the population sample size formula.**

$$n = \frac{N \times n_0}{N + n_0 - 1}$$

Using this approach, the minimum sample size was calculated as  $n_0 = 316$

nurses. A finite population correction was then applied with  $N = 366$  (the total number of eligible nurses across Surgery and Obstetrics departments in the Vinmec system), yielding  $n = 167$ . After adding 10% to account for potential non-response, the final sample size was 189 nurses.

### Sampling method:

A systematic random sampling technique was used as follows:

- A sampling frame was created from the list of all eligible nurses in the Surgery and Obstetrics departments of the seven participating hospitals.

- The sampling interval was calculated as  $k = 366/189 \approx 2$ .

- A random starting number between 1 and  $k$  was selected by drawing lots; the chosen starting number was 1.

- Nurses with serial numbers  $i + 1k$ ,  $i + 2k$ ,  $i + 3k$ , ... were selected until the required sample size was reached. No replacements were required during the sampling process.

### Study instrument

Data were collected using a structured questionnaire administered to nurses to assess their knowledge and attitudes. The self-administered survey instrument comprised three sections:

- Part A (General information): Thirteen items developed by the research team to collect demographic and occupational characteristics (e.g., age, workplace, seniority).

- Part B (Knowledge of SSI prevention): The knowledge assessment tool has been used in Vietnam by several authors, including Pham Van Duong (2017) <sup>5</sup> and Nguyen Thanh Loan (2014) <sup>4</sup>. It was

adapted from Sickder Humaun Kabir's 2010 instrument ("Knowledge and practice of nurses related to surgical site infection prevention in Bangladesh"; Cronbach's alpha = 0.85) and aligned with the World Health Organization (WHO) 2016 guideline updates on SSI prevention. The Vietnamese version contains 27 items: 9 items on preoperative patient preparation and 18 items on postoperative SSI prevention. Each item has three response options; participants selected the most appropriate answer. A pilot test was conducted among 30 nurses (not included in the main sample), demonstrating acceptable internal consistency (Cronbach's alpha > 0.75).

- Part C (Attitudes toward SSI prevention): The attitude scale was translated and adapted by the research team from the instrument used by Sinéad Horgan et al <sup>6</sup>. The original tool includes five items rated on a 5-point Likert scale (from "strongly disagree" to "strongly agree"). Reported Cronbach's alpha values indicated good internal consistency (Tavakol & Dennick, 2011), with alpha = 0.77 in the pre-test and 0.72 after evaluation. The instrument underwent forward translation (English to Vietnamese), back translation (Vietnamese to English), reconciliation against the original version, and refinement. A pilot survey with 30 nurses confirmed internal reliability (Cronbach's alpha > 0.75), supporting its use in the formal study.

### Evaluation criteria

**Knowledge:** Knowledge of surgical wound/SSI prevention was measured using 27 items, scored 1 point for each correct answer and 0 points for each incorrect answer. Total scores ranged from 0 to 27, with higher scores indicating better knowledge. Knowledge levels were

classified into four categories based on the Ministry of Education and Training's grading regulations: Good ( $\geq 80\%$ ,  $\geq 22/27$ ), Fair (70% – 79%, 19 – 21/27), Moderate (50% – 69%, 14 – 18/27), and Poor ( $< 50\%$ ,  $\leq 13/27$ ). For analytical purposes, categories were dichotomized into Adequate versus Inadequate (including Fair, Moderate, and Poor).

**Attitude:** Attitudes toward SSI prevention were assessed using a 5-point Likert scale: Strongly disagree (1), Disagree (2), Undecided (3), Agree (4), and Strongly agree (5). Total scores ranged from 5 to 25, with higher scores indicating a more positive attitude. Attitudes were classified as positive ( $\geq 80\%$  of total score,  $\geq 20/25$ ) or non-positive ( $< 80\%$ ,  $< 20/25$ ).

### Data analysis:

Data were entered and analyzed using SPSS version 20.0 and EpiData version 4.0. Statistical analyses included the Chi-square test, Fisher's exact test, odds ratios (ORs) with 95% confidence intervals (CIs), and related procedures to examine associations between variables. A p-value  $< 0.05$  was considered statistically significant at the 95% CI level.

### Ethics consideration:

The study was approved by the Proposal Review Board and the Biomedical Research Ethics Board of Nam Dinh University of Nursing (Certificate No. 568/GCN-HĐĐĐ dated March 5, 2025) and was conducted with permission from the Hospital Management Board of the Vinmec Healthcare System. Participants were informed about the study objectives, significance, methods, and duration, as well as their right to participate voluntarily and to withdraw at any time.

**RESULTS****Table 1. Demographic characteristics of participating nurses (n = 189)**

Characteristic		n	%
Gender	Male	15	8.0
	Female	174	92.0
Age group (years)	< 30	36	19.0
	30 - 50	146	77.3
	> 50	7	3.7
Mean $\pm$ SD: 34.9 $\pm$ 6.52 (Min: 23; Max: 71)			

The mean age of participating nurses was 34.9  $\pm$  6.52 years; the youngest was 23 years and the oldest was 71 years. The highest proportion of nurses was in the 30-50 age group (77.3%), followed by nurses under 30 years old at 19.0% and those over 50 years old at 3.7%. The majority of nurses were female (91.0%), with 9.0% being male.

**Table 2. Nurses' scores on knowledge of SSI prevention (n = 189)**

Knowledge domain	Nurses' scores		
	Min	Max	Mean $\pm$ SD
SSI prevention in preoperative patient preparation	4	9	7.21 $\pm$ 1.3
Postoperative SSI prevention	5	18	15.47 $\pm$ 1.73
<b>Overall SSI prevention knowledge (total score, out of 27)</b>	<b>10</b>	<b>27</b>	<b>22.68 <math>\pm</math> 2.0</b>

The mean overall knowledge score was 22.68  $\pm$  2.00/27. Overall, 84.7% of nurses were classified as having good knowledge; 11.6% were fair, while moderate, and poor knowledge accounted for 2.6% and 1.1%, respectively. When dichotomized, 84.7% had good overall knowledge, and 15.3% had poor knowledge.

**Table 3. Nurses' attitudes toward SSI prevention (n = 189)**

TT	Content	Mean $\pm$ SD [Min – Max]
1	Identifying SSI is a healthcare priority at my workplace	4.37 $\pm$ 0.89 [1 – 5]
2	Postoperative monitoring services are available for patients at my workplace	4.34 $\pm$ 0.86 [1 – 5]
3	Overall, I can identify risk factors that increase patients' susceptibility to SSI	4.2 $\pm$ 0.82 [1 – 5]
4	I have sufficient knowledge to advise others (patients, students) on SSI prevention	4.2 $\pm$ 0.83 [1 – 5]
5	I am responsible for supporting SSI prevention at my workplace	4.31 $\pm$ 0.85 [1 – 5]
<b>Total score</b>		<b>21.4 <math>\pm</math> 4.02 [5 – 25]</b>

Attitude scores were high ( $21.40 \pm 4.02/25$ ), with all items scoring above 4. The highest-rated item was prioritizing SSI identification ( $4.37 \pm 0.89$ ). The lowest (but still high) were confidence in identifying risk factors ( $4.20 \pm 0.82$ ) and ability to counsel on SSI prevention ( $4.20 \pm 0.83$ ). Overall, 92.6% of nurses had a good attitude; 7.4% were classified as having a poor attitude.

**Table 4. Factors associated with nurses' knowledge of SSI prevention (n = 189)**

Characteristic	SSI prevention knowledge		OR (95% CI)	P	
	Inadequate n (%)	Adequate n (%)			
Gender	Male	4 (26.7)	11 (73.3)	2.167 (0.46 – 8.04)	0.254*
	Female	25 (14.4)	149 (85.6)		
Age group	< 30	11 (30.6)	25 (69.4)	3.3 (1.39 – 7.82)	0.005
	≥ 30	18 (11.8)	135 (88.2)		
Marital status	Unmarried/Divorced	10 (23.3)	33 (76.7)	2.03 (0.86 – 4.77)	0.101
	Married	19 (13.0)	127 (87.0)		
SSI training	No	17 (22.1)	60 (77.9)	2.36 (1.06-5.28)	0.033
	Yes	12 (10.7)	100 (89.3)		

#### *Fisher-Exact Test*

Nurses who had not received SSI-prevention training within the past 12 months had a significantly higher proportion of inadequate knowledge compared with those who had received training (OR = 2.36; 95% CI: 1.06–5.28;  $p = 0.033$ ). In addition, the proportion of inadequate knowledge was higher among nurses who perceived training as necessary than among those who perceived it as unnecessary; however, this difference was not statistically significant ( $p > 0.05$ ).

**Table 5. Logistic regression analysis of factors associated with knowledge of SSI prevention (n = 189)**

Independent variable	Coefficient (B)	Standard error (SE)	p-value	OR (95% CI)
<b>Gender</b>	0.857	0.649	0.186	2.36 (0.66 - 8.41)
Male (1)				
Female (2)				
<b>Age group</b>	1,000	0.465	0.032	2.72 (1.09 - 6.77)
< 30 (1)				
≥ 30 (2)				

Independent variable	Coefficient (B)	Standard error (SE)	p-value	OR (95% CI)
Seniority group < 10 years (1) ≥ 10 years (2)	0.656	0.671	0.329	1.93 (0.52 - 7.18)
SSI training No (1) Yes (2)	1,054	0.424	0.045	2.29 (1.04 - 5.25)

In multivariable analysis, two factors were significantly associated with knowledge of SSI prevention: age  $\geq 30$  (OR = 2.72; 95% CI: 1.09–6.77;  $p = 0.032$ ) and having received SSI-prevention training (OR = 2.29; 95% CI: 1.04–5.25;  $p = 0.045$ ). Sex and seniority were not statistically significant ( $p > 0.05$ ).

**Table 6. Factors associated with SSI prevention attitudes (n = 189)**

Characteristic		SSI prevention attitudes		OR (95% CI)	P
		Non-positive n (%)	Positive n (%)		
Gender	Male	1 (6.7)	14 (93.3)	0.89 (0.11 – 7.27)	1.000*
	Female	13 (7.5)	161 (92.5)		
Age group	< 30	6 (16.7)	30 (83.3)	3.63 (1.17 – 11.21)	0.018
	$\geq 30$	8 (5.2)	145 (94.8)		
Marital status	Unmarried/Divorced	3 (7.0)	40 (93.0)	0.92 (0.16 – 3.72)	1.000*
	Married	11 (7.5)	135 (92.5)		
SSI training	No	10 (13.0)	67 (87.0)	4.03 (1.22-13.37)	0.015*
	Yes	4 (3.6)	108 (96.4)		

#### *Fisher-Exact Test*

Age and SSI training were significantly associated with attitudes toward SSI prevention. Nurses aged  $\geq 30$  years and those who had received training demonstrated more positive attitudes than nurses aged  $< 30$  years and those without training ( $p < 0.05$ ).

**Table 7. Logistic regression analysis of factors associated with SSI prevention attitudes (n = 189)**

Independent variable	Coefficient (B)	Standard error (SE)	p-value	OR (95% CI)
Gender Male (1) Female (2)	-0.207	1,136	0.856	0.81 (0.08 - 7.54)
Age group < 30 (1) $\geq 30$ (2)	1,242	0.603	0.040	3.46 (1.06 - 11.30)

Independent variable	Coefficient (B)	Standard error (SE)	p-value	OR (95% CI)
Work pressure High (1) Average (2)	0.294	0.613	0.632	1.34 (0.40 - 4.46)
SSI Training No (1) Yes (2)	1,344	0.623	0.031	3.83 (1.13 - 12.99)

Two factors were independently associated with attitudes toward SSI prevention: age  $\geq$  30 years (OR = 3.46; 95% CI: 1.06–11.30;  $p = 0.040$ ) and having received SSI-prevention training (OR = 3.83; 95% CI: 1.13–12.99;  $p = 0.031$ ). Sex and work pressure were not statistically significant ( $p > 0.05$ ).

**Table 8. Association between knowledge and attitudes regarding SSI prevention (n = 189)**

Characteristic	SSI prevention attitudes		OR (95% CI)	p-value	
	Non-positive n (%)	Positive n (%)			
Knowledge of SSI prevention	Inadequate	5 (35.7)	24 (13.7)	3.49 (1.08 – 11.32)	0.028
	Adequate	9 (64.3)	151 (86.3)		

Inadequate knowledge was significantly associated with non-positive attitudes toward SSI prevention (OR = 3.49; 95% CI: 1.08–11.32;  $p = 0.028$ ).

## DISCUSSION

### General characteristics of the study participants

The findings indicate that the nursing workforce in this study was predominantly female and mainly concentrated in the mid-career age group (30–50 years), which is consistent with the distribution of nurses in Vietnamese healthcare settings reported in prior studies.<sup>5, 7, 8</sup> This demographic profile may facilitate professional capacity development and the implementation of future training programs on surgical site infection (SSI) prevention<sup>9,10</sup>. The mean age was  $34.9 \pm 6.52$  years, with the 30–50 age group accounting for the largest proportion (77.3%), followed by nurses aged  $< 30$

years (19.0%) and  $> 50$  years (3.7%). This suggests that most nurses in the Vinmec Healthcare System are in the middle of their careers, having accumulated clinical experience while remaining receptive to acquiring and applying updated knowledge and skills—an advantage for implementing SSI-prevention interventions.

### Nursing education level and SSI-prevention training

With respect to educational attainment, 92.1% of nurses held college or university degrees, whereas only 7.9% had postgraduate qualifications. This reflects the prevailing national pattern in which nurses are largely trained at college and university levels. However, the proportion of postgraduate-

trained nurses at Vinmec remains relatively low given the increasingly stringent requirements for high-quality care and infection control in international-standard hospitals.

Regarding SSI-prevention training, 59.3% of nurses reported receiving training within the previous 12 months, while 40.7% reported not having received any recent training. Although this is a positive sign, the sizeable proportion without updated training may adversely affect infection-control quality. Almost all participants considered such training “necessary” or “very necessary” (95.8%), underscoring an urgent need for regular knowledge updates. Overall, these findings reinforce evidence from previous studies emphasizing the importance of training and seniority in improving knowledge, attitudes, and practices related to SSI prevention <sup>7, 8, 11</sup>.

### **Nurses’ knowledge and attitudes regarding SSI prevention**

This study shows that nurses in the Vinmec Healthcare System had a high level of knowledge regarding SSI prevention, with 84.7% classified as having good knowledge and a mean overall score of  $22.68 \pm 2.0/27$ . This performance exceeds that reported in several domestic studies and suggests that routine training and refresher programs at Vinmec may have contributed to strengthening nurses’ professional knowledge.

Internationally, Vinmec’s results also appear more favorable. For example, Wen Feng (2019) reported that only 39% of nurses achieved a knowledge level  $\geq 70\%$ . 6-13 In Ireland, Horgan et al. (2024) observed significant knowledge improvement after an educational intervention, yet baseline

knowledge remained lower than that observed in this study <sup>12</sup>. These findings suggest that Vinmec’s internal training and recruitment systems-particularly structured programs such as the Graduate Nurse Program (GNP)-may contribute to sustaining a strong professional foundation in SSI prevention.

Nevertheless, item-level analyses indicate that certain advanced content areas remain limited. Only 49.2% of nurses correctly identified SSI classifications, 59.3% answered diagnosis-related items correctly, and 69.3% understood the SSI surveillance/monitoring process. Such topics require deeper epidemiological and clinical reasoning and may be less emphasized in basic training. This pattern is consistent with studies in Can Tho (Huynh Huyen Tran, 2017) <sup>13</sup> and in Ireland (Horgan et al., 2024) <sup>12</sup>, where the domains of SSI diagnosis and classification scored lowest. Therefore, tiered and specialized training programs particularly targeted to Surgery and Obstetrics units where SSI risk is higher should be prioritized.

In terms of attitudes, nurses demonstrated a very high level of positivity toward SSI prevention (mean  $21.4 \pm 4.02/25$ ; 92.6% classified as positive). This suggests that SSI prevention has been embedded within the professional culture of the Vinmec Healthcare System. However, some gaps in self-confidence persist, particularly for identifying SSI risk factors and providing patient counseling (mean  $\sim 4.2/5$ ). This may reflect uncertainty among less experienced nurses. A similar pattern was reported by Horgan et al. (2024), where confidence improved markedly following intervention training <sup>12</sup>. Accordingly, Vinmec training should further incorporate components that

strengthen soft skills, clinical reasoning, and patient counseling competencies.

Overall, the findings indicate that Vinmec nurses have strong knowledge and positive attitudes toward SSI prevention compared with many domestic and international reports. However, limitations remain in specialized domains (diagnosis, classification, surveillance), highlighting the need for continued strengthening of advanced training that integrates theory, simulation-based practice, and clinical supervision. Maintaining a robust safety culture and supportive work environment is also essential to reinforce nurses' proactive, confident, and accountable roles in infection control.

#### **Factors associated with knowledge and attitudes toward SSI prevention**

Both univariate and multivariable analyses indicate that age and participation in SSI-prevention training within the previous 12 months are significantly associated with knowledge levels. Nurses aged < 30 years were more likely to have poorer knowledge (OR = 3.3;  $p = 0.005$ ), consistent with findings from Hai Duong and China, where experience and years of service were key determinants of knowledge<sup>8,9</sup>. In addition, nurses who had not attended training within the past year were more likely to have poorer knowledge (OR = 2.36;  $p = 0.033$ ), aligning with evidence from Nam Dinh and Thu Duc showing that recent and repeated training improves knowledge and related competencies<sup>10,14</sup>. These results support the need for strengthened clinical training, mentorship, and career-oriented support for younger nurses in Surgery and Obstetrics departments.

Similarly, age < 30 years and lack of SSI-prevention training within the past 12

months were significantly associated with poorer attitudes. Nurses aged < 30 years were more likely to report negative attitudes (OR = 3.63;  $p = 0.018$ ), consistent with trends observed in China (Wen Feng, 2019)<sup>11</sup> and in Vietnam (Pham Van Duong, 2017)<sup>5</sup>. Training within the previous year also had a clear influence on attitudes: nurses without recent training were more likely to report negative attitudes (OR = 4.03;  $p = 0.015$ ), consistent with studies in Nam Dinh and Thu Duc<sup>10,14</sup>. These findings confirm that training programs shape not only knowledge but also professional attitudes, especially for proactive infection-control behaviors.

Finally, the association between knowledge and attitudes observed in this study, where nurses with poorer attitudes had a higher likelihood of poorer knowledge (OR = 3.49;  $p = 0.028$ ) is consistent with previous studies<sup>7,9,12</sup>. This aligns with the KAP (Knowledge, Attitude, Practice) framework, emphasizing that correct knowledge underpins positive attitudes and standard practice, while negative attitudes may hinder learning. Therefore, training initiatives should integrate both knowledge and attitude components through clinical coaching, mentoring, case-based discussions, and structured feedback from infection-control teams to maximize SSI-prevention effectiveness in practice.

#### **CONCLUSION**

Nurses in the Surgery and Obstetrics departments of the Vinmec Healthcare System demonstrated good knowledge and positive attitudes toward surgical site infection prevention, with achievement rates of 84.7% and 92.6%, respectively. However, nurses aged < 30 years and those who had not received SSI-prevention training within

the past 12 months were significantly more likely to have poorer knowledge and less favorable attitudes. These findings highlight the importance of maintaining regular SSI-prevention training, particularly targeted support and capacity-building for younger nurses to enhance the effectiveness of SSI prevention across the system.

## REFERENCES

1. Haleema S, et al. Assessment of nurses' knowledge and practices regarding prevention of surgical site infection. *Saudi J Med Pharm Sci.* 2017;3(6B):585-595. DOI: 10.36348/sjms.2017.v03i06.017.
2. Ministry of Health. Guidelines for surface hygiene in surgical areas. Hanoi: Medical Publishing House; 2015.
3. Lin F, Gillespie BM, Chaboyer W, et al. Preventing surgical site infections: Facilitators and barriers to nurses' adherence to clinical practice guidelines: A qualitative study. *J Clin Nurs.* 2019 May;28(9-10):1643-1652. doi:10.1111/jocn.14766
4. Nguyen TL. Nursing knowledge and practice on wound infection prevention. *Ho Chi Minh City Medical Journal.* 2014;18(5):129-135.
5. Pham VD. The current state of knowledge and practice of nurses in wound infection prevention and care at Ninh Binh Provincial Obstetrics and Pediatrics Hospital, 2017 [Master's thesis]. Nam Dinh University of Nursing; 2017.
6. Horgan S, et al. Healthcare professionals' knowledge and attitude towards surgical site infection and surveillance: A quasi-experimental study. *Nurs Open.* 2023;11(1):e2048. doi: 10.1002/nop2.2048.
7. Tran TMH, Do TH. Knowledge and related factors on surgical wound infection prevention of nurses in surgical departments of Binh Dan Hospital. *Vietnam Medical Journal.* 2024;543(10). <https://doi.org/10.51298/vmj.v543i1.11364>.
8. Do TTH, Nguyen TH. Practices and related factors on surgical site infection prevention among nurses at a Hai Duong Provincial Hospital in 2021. *Clinical Medical Journal* 108. 2021;16(7):153–159. DOI:10.52389/ydls.v16i7.912.
10. Cao THN, Ngo DK. Knowledge and practice of surgical wound infection prevention of healthcare workers at Thu Duc City Hospital in 2021. *Vietnam Medical Journal.* 2023;526(5):special issue.
11. Wen F. Relationship between knowledge, attitude, and practice of surgical site infection prevention among operating room nurses in Guizhou Province, China [Thesis]. Songkla University; 2019.
12. Horgan S, et al. Healthcare professionals' knowledge and attitude towards surgical site infection and surveillance: A quasi-experimental study. *Nurs Open.* 2024;11:e2048. doi:10.1002/nop2.2048
13. Huynh HT, Nguyen THN. Nursing knowledge and practice on surgical wound infection prevention at Can Tho City General Hospital. *Journal of Scientific Research and Economic Development - Tay Do University.* 2017;(2):141–151.
14. Vu NA, Pham TTH, Nguyen TTD, et al. The current state of knowledge about surgical wound infection prevention among nurses in surgical departments of Nam Dinh Provincial General Hospital in 2020. *Nursing Science.* 2020;3(3).