Journal of Nursing Science
Journal homepage: www.jns.vn

Standard precautions knowledge among nursing students at Duy Tan University in 2024

Nguyen Thi Le[1], Tran Thi Thu Huong[1], Dang Thi Thanh Thuong[1], Le Thanh Ha[2]
[1]Duy Tan University; [2]108 Central Military Hospital

ABSTRACT

Objectives: *This study aimed to assess the knowledge of nursing students regarding Standard Precautions at Duy Tan University in 2022.* ***Participants and methods:*** *A cross-sectional design was employed, involving 272 second, third, and fourth-year nursing students who participated in clinical internships from February and July 2022. A 56-item questionnaire based on the Ministry of Health's SPs guidelines was used to evaluate students' knowledge.* ***Results:*** *The findings revealed that the overall knowledge level of SPs among nursing students was 60.3%, with significant differences across academic years. Fourth-year students demonstrated superior knowledge compared to second- and third-year students. Factors such as the number of internship facilities, academic performance, participation in SPs-related programs, and the diversity of information sources were found to significantly influence students' knowledge of SPs. The study identified knowledge gaps, particularly in personal protective equipment use, medical instrument handling, and environmental sanitation.* ***Conclusions:*** *It is recommended that nursing curricula include more comprehensive and systematic training on SPs and infection control practices, incorporating both theoretical and hands-on components, to improve students' competency. Moreover, educational institutions should leverage digital media and organize regular SPs seminars to enhance students' knowledge and preparedness for clinical practice. This research highlights the need for continuous education and training to ensure nursing students are well-equipped to prevent infections and promote patient safety in healthcare settings.*

Keywords: *Knowledge, standard precautions, nursing students.*

INTRODUCTION

Standard precautions (SPs) are guidelines developed by the Centers for Disease Control and Prevention (CDC) to reduce the risk of healthcare-associated infection transmission [1]. Health workers (HWs) are at a high occupational risk of acquiring infections as they perform their daily clinical duties. They may be exposed to bloodborne pathogens like hepatitis B, hepatitis C, and HIV through needlestick injuries and come into contact with patients' blood and body fluids. Adherence to SPs is essential in minimizing the risk of infection among health workers. SPs knowledge is crucial for infection control, as following

Cor. author: Nguyen Thi Le
Email: nguyenthile1993@gmail.com
DOI: 10.54436/jns.2025.01.903
Received: Oct 23, 2024
Accepted: Jan 19, 2025
Published: Jan 20, 2025

these measures significantly reduces the occurrence of healthcare-associated infections, limits disease transmission to health workers, patients, and the environment, and improves patient safety and the quality of hospital care [2].

In hospitals, nursing students, who frequently engage in clinical internships, are also exposed to the hospital environment and interact with patients [3, 4]. The knowledge they gain during training can influence their adherence to SPs measures [5]. A study by Kin Cheung et al. in China found that knowledge was a key predictor of SPs compliance among nursing students. Knowledge gaps, combined with environmental changes and insufficient protective supplies, can negatively impact SPs adherence, increasing the risk of healthcare-associated infections. Thus, nursing students' understanding of SPs plays a critical role in reducing such infections [3, 6]. According to Bui Van Tung et al., only 64.2% of students had satisfactory SPs knowledge [3]. Other studies also report low levels of SPs knowledge among students [7, 8, 9]. Students who received training and materials on SPs exhibited higher knowledge than those who did not [3]. Factors such as gender and academic year were found to be associated with nursing students' SPs knowledge [3, 7].

While there is ample research on the status of SPs knowledge among nursing students globally and nationally, no such study has been conducted at Duy Tan University. Identifying factors related to students' SPs knowledge will provide valuable insights for improving the training program. This study aims to describe the knowledge of standard precautions among nursing students at Duy Tan University and identify factors associated with their SPs knowledge.

PARTICIPANTS AND METHODS

Participants: Nursing students studied at the Faculty of Nursing, Duy Tan University

Inclusion criteria: The second, third and fourth year nursing students who studied at the Faculty of Nursing, Duy Tan University, participated in clinical internships.

Exclusion criteria: Students who dropped out or reserved during research period, refused to participate in research

Research location and time: The data collection time was from February 2022 to July 2022 at Duy Tan University

Research design: Cross-sectional research design.

Research sample: Applying the formula for calculating sample size to estimate a proportion in the population:

$$n = Z^2_{(1-\alpha/2)} \frac{P(1-P)}{\Delta^2}$$

In which:

n is the minimum sample size for the study. $Z_{(1-\alpha/2)} = 1.96$ with 95% Reliability ($\alpha = 0.05$). $p = 0.799$ (In the study by Rawajfah et al., the percentage of nursing students who answered correctly the knowledge questions about SPs measures was 79.9%) [10].

Δ: The desired deviation between the two proportions obtained from the sample (p) and the proportion of the population (P). In this case, it was considered the absolute proportion, that is, the difference between the proportions P and p and $\Delta = 5\%$ was chosen.

Thereby, the minimum sample size was calculated to be 247 students. It was estimated that about 15% of the answered-

questionnaires were invalid. Therefore, the desired sample size of the study was 284 students.

After data collection, 12 incomplete questionnaires were eliminated. The sample size collected was 272.

Sample selection: A stratified random sampling method was used in this study. The participants consisted of second, third, and fourth-year nursing students enrolled in the bachelor's training program who participated in clinical internships and met the inclusion criteria. A total of 383 students were eligible for the study: 77 second-year students, 138 third-year students, and 170 fourth-year students. These participants were divided into three groups: second, third, and fourth-year students, and selected through the following steps:

Step 1: Determine the number of students to be selected from each year group based on their proportion within the total sample.

Step 2: Create a list of students by year, numbering them alphabetically (A, B, C, etc.).

Step 3: Use software to randomly select participants from each year group until the desired sample size is achieved.

Students who participated in the pilot study were excluded and replaced to ensure the required sample size. To prevent interaction during the study, students were seated at a sufficient distance apart.

Measurement: The questionnaire used in this study consisted of two sections:

Part 1: Demographic characteristics of the participants.

Part 2: Assessment of participants' knowledge of Standard Precautions (SPs).

The questionnaire was developed based on the 9 SPs guidelines issued by the Ministry of Health, specifically Decision No. 3671/QD-BYT dated September 27, 2012, on "Guidelines for SPs in examination and treatment facilities," and Decision No. 5771/BYT-K2DT dated August 30, 2012, on training materials for infection prevention and control. It included 56 assessment items covering the 9 SPs topics: (1) 10 items on hand hygiene, (2) 12 items on the use of personal protective equipment, (3) 6 items on safe injection practices and prevention of exposure to sharp objects, (4) 5 items on cough and respiratory hygiene, (5) 3 items on patient arrangement, (6) 5 items on handling medical instruments, (7) 5 items on handling cloth items, (8) 5 items on environmental hygiene, and (9) 5 items on medical waste management [11, 12].

The questionnaire included both true/false and multiple-choice questions, with each item having one correct answer. A correct answer received 1 point, while an incorrect answer was scored 0 points. Participants' knowledge of SPs was considered satisfactory if they answered 70% or more of the questions correctly in each section. Total knowledge was considered satisfactory when a student achieved at least 70% across all questions, or at least 39 out of the 56 questions answered correctly.

Reliability test: Reliability test was conducted with 20 students prior to the official data collection. The students were asked about their perceptions of the questionnaire and the topic. The results indicated that none of the items were overly complex or sensitive, and no discomfort was reported. Data were processed using statistical software to assess the reliability of the measurement tool. The Cronbach's alpha

coefficient for the scale assessing students' knowledge of SPs was 0.91, demonstrating high internal consistency [11, 12]. The students who participated in the reliability test were excluded from the main study.

Data collection method: The data for this study were collected through interviews using a pre-designed questionnaire. The study was conducted at Duy Tan University. Participants were approached during their studies and provided with an explanation of the research objectives. Prior to data collection, the participants were informed about the purpose and procedures of the study, and any queries they had were addressed by the researcher. Students who met the participation criteria and were willing to take part in the study were asked to complete the questionnaire, which was then returned to the researcher upon completion. The survey took approximately 20 minutes to complete.

Data processing method: The collected data were managed, processed, and analyzed using SPSS version 20.0. T-tests and ANOVA were employed to examine the relationships between variables and students' knowledge. The results were assessed within a 95% confidence interval, with a p-value of less than 0.05 considered statistically significant.

Research ethics: The study was conducted with the permission of Duy Tan University under the dicision No.3168/QĐ-ĐHDT dated 01/08/2023. Participants were informed about the objectives of the study, agreed to participate voluntarily, and were given the option to discontinue participation at any time. Participants' personal information was kept confidential, with each participant assigned a unique code number. The study posed no harm to participants, and the results were used solely for research purposes.

RESULTS

Table 1. Characteristics of the participants (n = 272)

Characteristic		N	%
Sex	Male	16	5.9
	Female	256	94.1
School year	The second year	57	21.0
	The third year	90	33.0
	The fourth year	125	46.0
Number of internship facilities	1	138	50.7
	2	107	39.3
	3	27	10.0
Academic performance	Excellent	43	15.8
	Very good	106	39.0
	Good	119	43.8
	Ordinary	4	2.5

Characteristic		N	%
Attendance at infection control programs	Yes	145	53.3
	No	127	46.7
Follow the Guidelines for Prevention and Treatment of Sharp Object Injuries through information channels..	Youtube	146	53.7
	Google	182	66.9
	Press	77	28.3
	Television	80	29.4
	Facebook	171	62.9
	Curriculum	251	92.0

Of the 272 participants, the majority were female (94.1%). Fourth-year students accounted for the highest proportion (46%), with 49.3% of students interning at two medical facilities at least. 53.3% of them had attended infection control program and most of them followed and learned about SPs measures through the curriculum (92%).

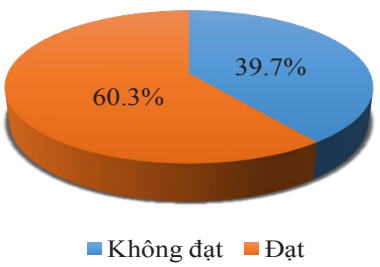

Chart 1. Percentage of knowledge achieved on standard precaution of nursing students at Duy Tan University(n = 272)

60.3% of nursing students had satisfactory knowledge of PNC measures, while 39.7% of students had inadequate knowledge.

Table 2. Percentage of knowledge of standard precautions according to each content of nursing students at Duy Tan University (n = 272)

No	Content	Mean ± SD	Satisfactory knowledge	
			n	%
1	Knowledge of hand hygiene	7.1 ± 2.1	170	62.5
2	Knowledge of using personal protective equipment	6.9 ± 2.9	127	46.7
3	Knowledge of safe injection and prevention of sharp object injuries	3.24 ± 1.48	143	52.6
4	Knowledge of coughing and respiratory hygiene	4.1 ± 1.6	196	72.1

No	Content	Mean ± SD	Satisfactory knowledge	
			n	%
5	Knowledge of appropriate patient placement	1.93 ± 0.97	191	70.2
6	Knowledge of medical instrument handling	2.9 ± 1.4	112	41.2
7	Knowledge of handling cloth things	2.8 ± 1.4	105	38.6
8	Knowledge of environmental sanitation	2.7 ± 1.4	76	27.9
9	Knowledge of medical waste management	3.2 ± 1.6	161	59.2

In the nine domains of standard precautions, nursing students scored the highest in knowledge related to coughing and respiratory hygiene, followed by knowledge of patient arrangement, with respective achievement rates of 72.1% and 70.2%.

Table 3. Factors associated to knowledge of standard precautions of nursing students at Duy Tan University (n = 272)

Characteristic		n (%)	Knowledge	
			Mean (SD)	t/f (p)
Gender	Male	16 (5.9)	27.8 ± 12.04	-2.1 (0.35)
	Female	256 (94.1)	33.5 ± 10.4	
Year of study	The 2nd year ⓐ	57 (21.0)	29.41 ± 11.29	16.23 (0.000) ⓒ>ⓐ,ⓒ>ⓑ
	The 3rd year ⓑ	90 (33.0)	30.34 ± 11.49	
	The 4th year ⓒ	125 (46.0)	36.92 ± 8.20	
Number of internship facilities	1 facility ⓐ	138 (50.7)	30.5 ± 11.19	9.7 (0.000) ⓐ<ⓑⓒ
	2 facilities ⓑ	107 (39.3)	35.5 ± 9.78	
	3 facilities ⓒ	27 (9.9)	37.5 ± 6.67	
Acadamic performance	Excellent ⓐ	43 (15.8)	34.42 ± 10.80	13.98 (0.000) ⓐⓑ>ⓒⓓ
	Good ⓑ	106 (39.0)	34.88 ± 8.88	
	Rather ⓒ	119 (43.8)	31.32 ± 11.6	
	Medium ⓓ	4 (2.5)	29.25 ± 11.84	
Attendance at standard precaution programs at university/conferences	Have	145 (53.3)	35.09 ± 10.08	2.85 (0.005)
	Are not	127 (46.7)	31.48 ± 10.81	
Follow standard precautions guidelines through communication channels	1 channel ⓐ	75 (27.6)	29.4 ± 11.12	4.56 (0.000) ⓐⓑ<ⓒ
	2 channels ⓑ	55 (20.2)	30.87 ± 11.59	
	≥ 3 channels ⓒ	53(19.5)	36.04 ± 9.06	

The results indicated that fourth-year students had significantly higher SPs knowledge scores compared to second- and third-year students (F = 16.23, p = 0.000).

The study also revealed that students who had interned at two or more facilities demonstrated better SPs knowledge compared to those who had interned at only one facility (F = 9.7, p = 0.000).

Students with excellent or very good academic performance scored higher in SPs knowledge than those with good or ordinary performance (F = 13.98, p = 0.000).

Participants who attended school-based or conference infection control programs had higher SPs knowledge scores than non-participants (t = 2.85, p = 0.005). Moreover, students who referred to SPs guidance documents from three or more information sources had higher knowledge scores than those who used only one or two sources (F = 4.56, p = 0.000).

DISCUSSION

Knowledge of standard precautions among nursing students at Duy Tan University: An investigation involving 272 second, third, and fourth-year nursing students revealed that the knowledge level regarding standard precaution measures was 60.3%. This result is lower than the findings of Tran Thi Tuyet (2019) at Hanoi Medical University, which reported a knowledge level of 97.8% [13], but higher than the result from Vu Thi Thu Thuy (2018) at Vinh Medical University, which was 5.9% [7]. The differences in these findings can be attributed to variations in the research subjects and assessment methods. Tran Thi Tuyet's study focused on fourth-year students who had nearly completed the nursing program and gained more clinical practice experience compared to second- and third-year students. Moreover, her study only evaluated knowledge in five domains of Standard Precautions [13]. In contrast, Vu Thi Thu Thuy's study involved second-year students who had just started their major studies and had limited clinical practice experience [7]. Both this study and Vu Thi Thu Thuy's research assessed students' knowledge across nine domains of Standard Precautions, based on Circular 3671/QD-BYT issued by the Ministry of Health in 2012.

When compared with foreign studies, the results of this research are lower than Omar's study (2015) in Jordan, which reported that 79.9% of nursing students had satisfactory knowledge of standard precautions [10]. However, it is higher than Ghalya's study (2014) in Saudi Arabia, where only 45.83% of nursing students had satisfactory knowledge of standard precautions [14]. These variations may be related to differences in participant timing and characteristics. In Omar's study, the proportion of fourth-year students was the highest, similar to the findings of this study. However, Omar used a questionnaire with 18 items to assess students' knowledge, whereas this study utilized a more comprehensive 56-item questionnaire [10]. In Ghalya's study, the proportion of fourth-year students was the lowest [14], suggesting that differences in research subjects may contribute to the variations in results.

Among the nine domains of Standard Precautions, the proportion of nursing students demonstrating satisfactory knowledge of hand hygiene was 62.5%, with an average score of 7.1 ± 2.1. These results align with the findings of Tran Thi Tuyet [13] and Ghalya [14]. Hand hygiene is a fundamental aspect of Standard Precautions

and one of the most effective methods for preventing pathogen transmission in healthcare settings [15]. Due to active promotion and implementation in hospitals, hand hygiene is one of the most commonly practiced techniques in clinical settings. Consequently, nursing students tend to have a stronger understanding of hand hygiene compared to other areas of Standard Precautions. Most students agree that proper handwashing reduces microbial contamination and lowers the incidence of healthcare-associated infections (HAIs). However, very few students are aware of the minimum recommended duration for handwashing, consistent with the findings of Vu Thi Thu Thuy [7].

The proportion of nursing students with satisfactory knowledge of personal protective equipment (PPE) use was 46.7%, with an average score of 6.9 ± 2.9. These results are lower than those reported by Tran Thi Tuyet, which showed 78.4% with an average score of 7.06 ± 1.34 [13], and Amin, with an average score of 10.03 ± 1.35 [15]. A deficiency in knowledge regarding PPE, such as gloves, gowns, glasses, and hats, may lead to improper use or failure to identify suitable scenarios for PPE application, thereby increasing risks for both patients and healthcare workers and contributing to hospital-acquired infections.

The percentage of nursing students with satisfactory knowledge of safe injection practices and prevention of injuries from sharp objects was 52.6%, with an average score of 3.24 ± 1.48. Our results were lower than those of Tran Thi Tuyet [13] and Amin [15]. This difference may be explained by variations in research subjects, as Tran Thi Tuyet and Amin's studies focused on third and fourth-year students. The results also showed that most students recognized the need to report injuries from sharp objects. However, their knowledge of post-exposure prophylaxis for managing injuries that could involve HIV transmission was limited. In the nursing program, theoretical lessons on handling exposure are typically introduced in the fourth year as part of the infection control module. Thus, second- and third-year students may lack sufficient knowledge during clinical practice.

The percentage of nursing students with satisfactory knowledge of cough and respiratory hygiene was 72.1%, with an average score of 4.1 ± 1.6. These findings are higher than those of Vu Thi Thu Thuy [7], Tran Thi Anh Tuyet [13], and Amin [15]. This increase in knowledge may be attributed to the COVID-19 pandemic in 2020, which focused on respiratory health. Media campaigns on preventive measures likely contributed to an enhanced understanding of cough and respiratory hygiene, demonstrating the impact of media on improving knowledge.

The proportion of nursing students with satisfactory knowledge of appropriate patient arrangement was 70.2%, with an average score of 1.93 ± 0.97. This result is consistent with that of Vu Thi Thu Thuy [7]. During clinical internships, students are often tasked with admitting patients, allowing them to gain practical knowledge of patient arrangement through hands-on experience.

Regarding the handling of medical instruments, 41.2% of nursing students demonstrated satisfactory knowledge, with an average score of 2.9 ± 1.4. Most students knew that reusable medical instruments must be processed before being used on other patients. Instruments that come into contact with sterile tissues or blood vessels must be sterilized; however, most students believed

that high-level sterilization was acceptable. This may be due to limited exposure to essential instruments such as catheters and blood vessels, as students mainly focus on cleaning and processing instruments during their internships, rather than learning about sterilization and disinfection processes in detail.

The proportion of nursing students with satisfactory knowledge of handling cloth items was 38.6%, with an average score of 2.8 ± 1.4. While most students correctly classified clean, dirty, and infectious linens in clinical settings, very few answered questions about handling linen for HIV patients correctly. This content is rarely practiced in school laboratories, and in hospitals, nurses typically handle linen classification and disposal. As a result, specialized knowledge regarding HIV/AIDS patients' linen handling is less understood by students.

The proportion of nursing students with satisfactory knowledge of environmental sanitation was 27.9%, with an average score of 2.7 ± 1.4. Most students understood that daily cleaning is required for surfaces such as floors, tables, and hand-washing basins. However, they had limited knowledge regarding the segregation of clean, unclean, or infected areas. This may be because environmental sanitation knowledge is usually taught in the final year as part of the infection control module, which second- and third-year students have not yet completed. Additionally, most cleaning work in hospitals is handled by dedicated cleaning teams, which might explain students' lack of understanding in this area.

Finally, 59.2% of nursing students demonstrated satisfactory knowledge of medical waste management, with an average score of 3.2 ± 1.6. Most students were aware that waste should be classified at the point of generation. Since waste classification is frequently practiced during clinical tasks, students generally possess a solid understanding of this domain. However, few students correctly answered questions regarding the appropriate distance for waste storage relative to dining rooms, patient rooms, and public areas. The study by Vu Thi Thu Thuy also found that only 17% of students correctly answered questions on this topic [7].

To address the gaps identified in this study, it is recommended that nursing programs enhance training on PPE use, handling medical instruments, and environmental sanitation, particularly in earlier years. More in-depth instruction on safe injection practices and waste management should be incorporated, and hands-on experience should be increased to improve students' practical knowledge. Continued emphasis on infection control practices, such as hand hygiene and respiratory hygiene, is also needed to maintain students' awareness of best practices.

Factors associated to knowledge of standard precautions among nursing students: The findings of this study revealed several factors that significantly influence nursing students' knowledge of Standard Precautions (SPs), including their academic year, the number of internship facilities, academic performance, participation in SPs-related programs, and the variety of information sources utilized.

In terms of academic year, fourth-year students exhibited superior knowledge of SPs compared to their second- and third-year counterparts. This aligns with the results of Ghalya [14], Note [16], and Wahab[17], suggesting that more advanced students tend to possess greater knowledge due to

their higher exposure to clinical practice and infection control education. At Duy Tan University, infection control is introduced in the fourth year of the nursing program, providing these students with a more comprehensive understanding of SPs. Furthermore, fourth-year students generally have more opportunities for hands-on clinical experience, including direct interaction with patients and healthcare professionals, which likely enhances their practical knowledge and application of SPs.

Interestingly, students who completed internships at two or more facilities demonstrated better knowledge of SPs. This factor has not been extensively explored in previous studies but may be an important contributor to students' understanding. The variation in SPs practices across different healthcare settings offers students an opportunity to observe and compare practices, thus reinforcing their learning and enabling them to adapt more flexibly to various clinical environments. However, the cross-sectional nature of this study limits the ability to draw definitive conclusions, and further longitudinal research is needed to explore the impact of internship diversity on SPs knowledge more comprehensively.

Academic performance was another significant factor influencing SPs knowledge, with students who achieved excellent or very good grades demonstrating superior understanding compared to their peers with lower academic performance. High-performing students are often characterized by a strong foundational knowledge base and an enhanced ability to retain and apply new information. This finding highlights the importance of tailored educational approaches. For instance, instructors could implement a "paired learning" model, where higher-achieving students support their peers with lower academic performance, facilitating the transfer of SPs knowledge during clinical practice.

Participation in SPs-related programs, such as school-based training or conferences, also positively correlated with higher SPs knowledge. This finding supports previous studies, including Ghalya's [14], which suggested that training programs can enhance students' understanding of SPs. However, the impact of such programs can vary depending on their structure and content. While some studies found no significant effect of training programs on SPs knowledge [13, 15], others have demonstrated that short-term infection control courses can rapidly improve students' knowledge [3, 18]. It is therefore recommended that nursing curricula incorporate robust, evidence-based SPs training, which is continuously reinforced through feedback from clinical instructors and assessment of SPs knowledge throughout clinical training [18, 19].

The study also found that students who accessed multiple sources of information (e.g., online platforms such as Facebook, YouTube, and Google) exhibited better knowledge of SPs. In today's digital age, the internet serves as a powerful tool for knowledge dissemination. Students who actively seek supplementary information from diverse sources are likely to develop a more comprehensive understanding of SPs. This finding underscores the potential of digital media to complement traditional classroom learning, and it is recommended that educational institutions leverage these platforms to enhance students' knowledge of SPs.

Finally, the study found no significant association between gender and SPs knowledge, which is consistent with the results of several previous studies [14, 15,20]. Since the data were self-reported, the

lack of a gender-based difference may reflect other unexamined variables that influence knowledge acquisition. To further understand the factors influencing SPs knowledge, future studies should incorporate experimental and intervention designs to identify more effective strategies for improving nursing students' understanding of SPs.

A limitation of this study is its cross-sectional design, which collects data at a single point in time. This may limit the ability to determine factors that change over time or identify the impact of unobserved factors. Additionally, the study was conducted at only one university, which limits the generalizability of the findings to nursing students at other institutions. Another limitation is the exclusion of external factors, such as students' living environment or psychological factors, which may influence their knowledge of Standard Precautions (SPs). Future studies with a longitudinal design and a broader range of educational settings are needed to better identify the factors affecting students' knowledge and practice of SPs. Furthermore, combining qualitative research methods could provide deeper insights into the psychological and social factors influencing students' perceptions of SPs.

CONCLUSION

In conclusion, the study revealed that nursing students still had limited knowledge of SPs. A statistically significant association was found between SPs knowledge and various factors, including the students' year of study, the number of medical practice facilities, academic performance, attendance at SPs programs, and the number of information sources they followed. To address these gaps, it is essential that students receive comprehensive and systematic training on SPs and infection control prior to their clinical practice. Educational institutions should integrate SPs content into core courses, organize regular seminars on SPs, and develop online training programs to provide students with easy access to vital knowledge.

REFERENCES

1. Centers for Disease Control and Prevention. Workbook for Designing, Implementing & Evaluating a Sharps Injury Prevention Program 2008, 2018 [Available from:https://www.cdc.gov/infection-control/hcp/sharps-safety/program-workbook.html.

2. Australian Government. Australian Guidelines for the prevention and control of infection in healthcare, 2019.

3. Cheung K, Chan CK, Chang MY, Chu PH, Fung WF, Kwan KC, et al. Predictors for compliance of standard precautions among nursing students. American journal of infection control, 2015. 43(7):729-34. doi: 10.1016/j.ajic.2015.03.007.

4. Ojulong J, Mitonga KH, Iipinge SN. Knowledge and attitude of infection prevention and control among health sciences students at University of Namibia. African health sciences, 2013. 13(4):1071-8. doi: 10.4314/ahs.v13i4.30.

5. Kim KM, Oh H. Clinical Experiences as Related to Standard Precautions Compliance among Nursing Students: A Focus Group Interview Based on the Theory of Planned Behavior. Asian nursing research, 2015. 9(2):109-14. doi: 10.1016/j.anr.2015.01.002.

6. Bui Van Tung, Bui Vu Binh, Pham Tung Son, Bui Thi Dieu Huyen, Le Thi Hoan. Knowledge of standard precautions among final year students of Hanoi Medical

University in 2021. Vietnam Medical Journal, 2021. 507(1). DOI: https://doi.org/10.51298/vmj.v507i1.1337.

7. Vu Thi Thu Thuy, Truong Tuan Anh. Current status and some factors associated to knowledge and attitude on standard precautions among nursing students at Vinh Medical University in 2018. Journal of Nursing Science, 2018. 1(2):84-9.

8. Kamulegeya A, Kizito AN, Balidawa H. Ugandan medical and health sciences interns' infection control knowledge and practices. Journal of infection in developing countries, 2013. 7(10):726-33. doi: 10.3855/jidc.2486.

9. Van der Berg LS, & Daniels, FM Do nursing students know and practice the Universal Precautions to prevent transmission of infectious agents? Curationis, 2013. 36(1):E1-7. doi: 10.4102/curationis.v36i1.99.

10. OM AL-R, Tubaishat A. Nursing students' knowledge and practices of standard precautions: A Jordanian web-based survey. Nurse education today, 2015. 35(12):1175-80. doi: 10.1016/j.nedt.2015.05.011.

11. Ministry of Health. Guidelines for standard precautions in medical examination and treatment facilities. 2012.

12. Ministry of Health. Training materials on infection prevention and control. 2012.

13. Tran Thi Tuyet, Nguyen Dang Vung, Nguyen Thi Thanh Huong, Bui Vu Binh,Hoang Phuong Anh. Knowledge of standard precaution among final year nursing bachelor students at Hanoi Medical University in 2019. Journal of Scientific Research, 2019.

14. Ghalya H, Ibrahim Y. Knowledge, attitudes and sources of information among nursing students toward infection control and standard precautions. Life Science Journal, 2014. 11(9):249-60.

15. Amin TT, Al Noaim KI, Bu Saad MA, Al Malhm TA, Al Mulhim AA, Al Awas MA. Standard precautions and infection control, medical students' knowledge and behavior at a Saudi university: the need for change. Global journal of health science, 2013. 5(4):114-25. doi: 10.5539/gjhs.v5n4p114.

16. Anuar TNAT, Samsudin N, Rasudin NS, Zain NM. Knowledge and compliance regarding standard precautions among Nursing Students at Universiti Sains Malaysia. International journal of care scholars, 2021. 4(1):10-7. https://doi.org/10.31436/ijcs.v4i1.158.

17. Wahab PA, Adie FAM. Knowledge and compliance of standard precautions among the undergraduate nursing students. International Journal of Care Scholars, 2021. 4(2):15-21. https://doi.org/10.31436/ijcs.v4i2.184.

18. Bouget Mohammedi S, Landelle C. Review of literature: Knowledge and practice of standard precautions by nursing student and teaching techniques used in training. American journal of infection control, 2023. 51(5):574-81. doi: 10.1016/j.ajic.2022.08.032.

19. Nguyen Kim Hanh. Improving standard precaution knowledge among first-year nursing students at Binh Phuoc Medical College in 2020 [Master's Thesis]. Nam Dinh University of Nursing. 2020.

20. Nguyen Thi Tham, Nguyen Thi Thuy Linh, Hai PT. Knowledge and attitude on standard precaution among students at Hai Phong University of Medicine and Pharmacy in 2019. Journal of Preventive Medicine, 2019. 9(29):245.