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# Nursing Students' Attitudes and Behaviors toward Personal Protective Equipment: A Cross-Sectional Study

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**Abstract**

**Background:** Patient safety is one of the shared goals for every healthcare professional to be provided to all clients and Personal Protective Equipment (PPE) is vital in ensuring the infection prevention especially in nurses who provide care to the patient for a longer time. Since Personal Protective Equipment is essential, the nurse's compliance should be consistent and influenced by the awareness, perception and barriers towards the Personal Protective Equipment usage.

**Aim:** This study aimed to assess the compliance, attitude and behavior of the nursing students towards Personal Protective Equipment usage.

**Methods:** This study utilized a cross sectional research design where research instrument was implemented via online link at Riyadh Elm University. There are 263 nursing students which served as the total sample of this study. They were selected using convenience sampling technique with nursing level 3 to 8. The data were analyzed using descriptive statistics, and inferential statistics such as ANOVA, t test and F test.

**Results:** Findings revealed that majority were female (54.37%) and nursing level 8 (46.01%). Predominantly, the nursing students were moderate level of compliance (77.9%) and moderate level of attitude and behavior (M = 3.24). It was found that there is a significant positive attitude towards PPE use ($p < .001$). The variables gender, marital status, and academic level were predictors of attitude and behavior in PPE use. The female nursing students have higher compliance than male nursing students. The identified barriers were cognitive bias (46.39%), complexity of precautions (43.73%), and physical constraints (42.21%).

**Conclusion:** The nursing students demonstrated positive attitude towards Personal Protective Equipment use. To address the gaps and inconsistency in behavioral application, PPE education should be integrated into the nursing curriculum to ensure a quality and patient safety culture.

**Keywords:** Attitude and Behavior, Barriers, Compliance, Personal Protective Equipment, Universal Precautions

## Introduction

Personal Protective Equipment (PPE) plays a crucial role in infection prevention and ensuring occupational safety within healthcare environments for all medical staff especially nursing, who offering care for long time and deal with large number of patients. According to the Occupational Safety and Health Administration (OSHA, 2023) [11], PPE meaning specific equipment used to guard healthcare professionals from potential exposure to infectious agents and hazardous materials. Common types of PPE include masks, gloves, gowns, and respirators, all of which act as essential protective barriers. When used correctly, PPE helps minimize the risk of cross-contamination and reduces the incidence of healthcare-associated infections, safeguarding both medical staff, patients and external community members. (George, *et al*, 2023) [8].

Although PPE is vital in healthcare settings, adherence to its proper use among healthcare workers including nursing students it is tends to be inconsistent. Compliance is influenced by various personal factors, such as the individual's level of knowledge, perception of risk, and confidence in correctly using PPE. Additionally, institutional and environmental aspects like the availability of protective equipment, level of supervision, time limitations, and workload pressures play a significant role in determining adherence (Alsharari and Kerari, 2024; Yeon and Shin, 2020) [1, 18]. Common barriers to consistent use also include physical discomfort during extended wear and difficulties in communication while wearing PPE (George, *et al*, 2023)

[8]. Nursing students are the future pillar through whom everyone in health care system, especially patients, will be protected; therefore, work must begin from their start in academic education and clinical training period to demonstrate it at this fundamental period of professional development, wherever attitudes and behaviors regarding PPE are being mapped (Shwe, *et al*, 2021) [12].

Nursing students who disregard PPE guidelines run a serious risk of spreading infections and compromising patient safety (Bouchoucha, *et al*, 2021) [3]. Understanding nursing students' present attitudes and actions about PPE use is essential because they will make up the front line employees in healthcare settings in the future. These understandings are crucial for creating focused educational initiatives that support safe behaviors and bolster the infection prevention culture in Saudi Arabian clinical settings (Brown, *et al*, 2020) [4].

**Aims**

This study aims to evaluate the attitudes and behaviors of nursing students toward PPE usage among nursing students.

**Research Questions**

This study sought to answer the following research questions:

1. What is the level of compliance with PPE among nursing students?
2. What are the nursing students' attitudes toward PPE use?
3. What are the barriers that prevent proper PPE compliance as identified by the nursing students?

## Materials and Methods

**Study Design**

A cross-sectional survey research design was utilized by using online survey.

**Setting**

Study was implemented in REU University, Nursing department.

**Tools: tool 1-** Sociodemographic information comprises the student's name, ID, semester and academic level, and GPA.

**Tool 2:** Attitude tool was adapted from Mohd-Nor and BitLian, is composed of 3 parts, With 15 substances and five Likert-scale questions (1 = strongly disagree, 5 = strongly agree) to assess students' attitudes regarding standard precautions. The accepted score is 75 points, ranging from 15 to 75 points. Poor.

**Sample Characteristics**

Nursing students who start nursing practical courses from level 3 to level 8 students in Riyadh Elm University.

**Inclusion Criteria**

- Enrolled nursing students at REU university.
- Present during the data collection period and available to complete the survey.
- Students who are in clinical training or have completed at least one clinical rotation.

**Exclusion Criteria**

- Nursing students who are on academic leave, suspension, or not actively enrolled during the study period.
- Students who have not yet started clinical practice or exposure.

**Sample Size**

Convenient sample of 263 student was utilized by using following formula:

Yamane's Formula for Sample Size Calculation:

$$n = N1+N(e)2n = \frac{N}{1 + N(e)^2}n=1+N(e)2N$$

Where:

- nnn = Sample size
- NNN = Population size (in your case, 780)
- eee = Margin of error (commonly 0.05 for 95% confidence level)

**Survey Administration**

The survey was distributed online using Google Forms for one month. Participation was voluntary, and each participant completed the survey once. The expected completion time is approximately 10 minutes.

**Study preparation**

The following steps were utilized in the study's framework:

1. The study received ethical approval from Riyadh ELM University's Research Ethics Committee.
2. To assess the precision and suitability of the developed instrument, a pilot research involving 10% of the study population was conducted. Any necessary tool adjustment was made, and the pilot study's findings were not included in the main research sample.
3. To collect information from students who would like to participate in the study, the data collecting period began.
4. The researchers started gathering data, analyzing sociodemographic information with a tool, and evaluating students' attitudes with a tool. 2.

**Statistical Analysis**

Data was managed by using the Social Sciences (SPSS), version 22.0 (IBM Corp., Armonk, NY, 2013). Descriptive statistics (frequencies, percentages, and means for Likert-scale items) were calculated. Results were presented in tables and graphs.

**Ethical Considerations**

The study was submitted to the Institutional Review Board (IRB) of Riyadh Elm University for approval, following the university's IRB policies and procedures. Electronic informed consent will be obtained at the start of the questionnaire. Participation will be voluntary, responses will remain anonymous, and data will be kept confidential.

## Results

**Table 1:** Demographic Characteristics of the nursing students (n=263)

| Variable | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **Gender** | Female | 143 | 54.37 |
| | Male | 120 | 45.63 |
| **Semester of Study** | First | 110 | 41.83 |
| | Second | 153 | 58.17 |
| **Marital Status** | Single | 159 | 60.46 |
| | Married | 96 | 36.50 |
| | Divorced | 8 | 3.04 |
| **Academic Level** | Level 8 | 121 | 46.01 |
| | Level 7 | 89 | 33.84 |
| | Level 6 | 16 | 6.08 |
| | Level 4 | 14 | 5.32 |
| | Level 5 | 10 | 3.80 |
| | Levels 1-3 | 13 | 4.94 |

The table 1 shows the demographic characteristics of the nursing students. Based on the results, there were 263 nursing students who were involved in the study. It shows that majority of the nursing students were female which accounted for 54.37%, more than half of the male respondents which garnered only 45.63% of the total nursing students. As for their status, most of the nursing students were single which accounted for nearly two third of the study population 60.46%. With regards to the academic level of the nursing students, almost half of the nursing students were level 8 (46. 01%) while the lowest were garnered by the level 1 to 3 which got only 4.94% of the study sample.

The data revealed a shifting demographic were the gender male and female becoming more balanced in the nursing workforce. This reflects that more male enter into the female dominated nursing workforce. Another implication of this study is the greater number of level 8 nursing students which indicates more students were at the last part of their clinical training as they were about to graduate which should possess a high level of safety awareness on personal protective equipment.

**Table 2:** Level of Compliance of the nursing students to Personal Protective Equipment Usage

| Compliance Level | Mean Score Range | Frequency (n) | Percentage (%) |
|---|---|---|---|
| High Compliance | 3.41−5.00 | 55 | 20.90% |
| Moderate Compliance | 2.61−3.40 | 205 | 77.90% |
| Low Compliance | 1.00−2.60 | 3 | 1.10% |
| Total | | 263 | 100% |

Based on the data results above, it can be infer that it is predominantly moderate level of compliance among nursing students on the personal protective equipment. This garnered a 205 or more than three fourth of the nursing students with the score of 2.61 and above. Interestingly, bridging the gap is essential since moderate to high compliance need to be addressed. The result of the study suggests that the nursing students were aware on the necessity of the PPE but they were inconsistent on its usage.

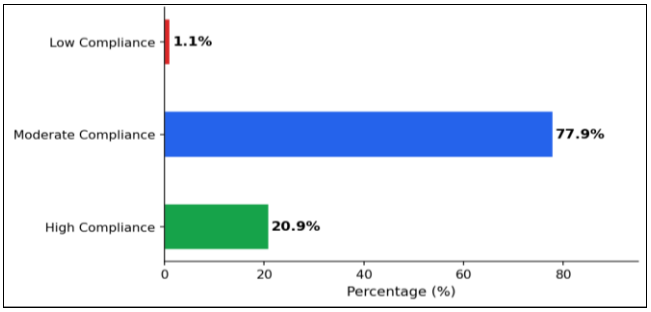


**Fig 1:** Level of Compliance to PPE Usage Among Nursing Students (n=263)

The figure 1 shows the level of compliance of the nursing students in the personal protective usage. Based on the results of the study, There were also disparities with regards to compliance. First is the gender bias, which showed that male nursing students shows a lower compliance of (M = 3.10) while female students (M=3.42). This indicates that a targeted training should be implemented and addresses specific behavioral obstacles. Another implication is the academic progression which infers that safety culture is learned overtime.

**Table 3:** Level of attitude and Behavior of the nursing students towards PPE

| S. No | Item Statement | Mean | SD | Level |
|---|---|---|---|---|
| 1 | Standard precaution is not easy to follow | 3.02 | 1.55 | Moderate |
| 2 | Standard precautions prevent the spread of infections | 3.43 | 1.44 | High |
| 3 | PPE are not required since diseases can be treated | 3.08 | 1.49 | Moderate |
| 4 | Prefers hand hygiene before/after interventions | 3.56 | 1.43 | High |
| 5 | PPE can be used during emergencies | 3.49 | 1.3 | High |
| 6 | Changing gloves is not necessary even if contaminated | 2.75 | 1.57 | Moderate |
| 7 | It is difficult to work wearing PPE | 2.89 | 1.55 | Moderate |
| 8 | Healthcare providers should ensure PPE availability | 3.53 | 1.52 | High |
| 9 | PPE should not be used (psychological harm) | 2.95 | 1.55 | Moderate |
| 10 | Stationeries/telephones are not sources of infection | 2.96 | 1.58 | Moderate |
| 11 | Waste segregation is useful to prevent transmission | 3.49 | 1.5 | High |
| 12 | Disinfection of equipment should be ensured | 3.41 | 1.49 | High |
| 13 | Precautions reduce transmission of organisms | 3.69 | 1.36 | High |
| 14 | It's not logical to assume all patients are contagious | 3.16 | 1.52 | Moderate |
| | Average | 3.24 | | Moderate |

The above table outlines the frequency distribution on the level of attitude and behavior towards Personal Protective Equipment (PPE). The table illustrates the breakdown of the entire 14 items with their means scores. It was found that nursing students has overall attitude and behavior level of the nursing students as moderate with mean score of 3.24.

According to the results, there are areas which are of high performance. These areas were disease prevention which recognize the respondents from the precaution of reducing the organism transfer (M = 3.69) and prevent the spread of infections (M = 3.43). The next area with high level is the hand hygiene, performing the procedure before and after the nursing intervention (M = 3.56). Another is the responsibility and the utility wherein nursing students where the providers ensure the availability of PPE (M = 3.53) and the PPE is vital in emergencies cases (M = 3.49). The waste management was also considered to be at high level using waste segregation in preventing transmission (M = 3.49).

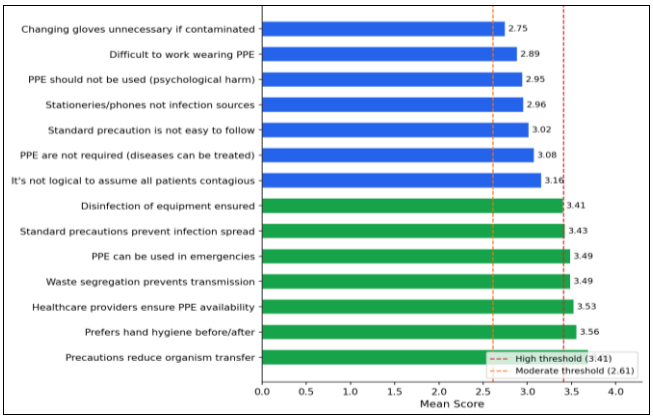


**Fig 2:** Mean Scores of the Attitude and Behavior Towards PPE (n=263)

The figure above shows the mean scores of the attitude and behavior towards PPE. It can be seen that on most items, the standard deviation ranges from 1.3 to 1.58 indicating a notable variance in the nursing student's responses. It means that the nursing students value the utilization of PPE for infection control, their level of attitude and knowledge were at a moderate level.

**Table 4:** Barriers Perceived by the Nursing Students towards Personal Protective Equipment Usage

| Barrier Category | Specific Barrier Statement | Agreement Rate (%) | Level of Concern |
|---|---|---|---|
| Cognitive Bias | Assumption that patients are not contagious unless infection is confirmed. | 46.39% | High |
| Complexity | Perceived difficulty in following standard precautions. | 43.73% | High |
| Physical Constraints | Perception that it is difficult to work while wearing PPE. | 42.21% | Moderate |
| Misconception | Belief that stationeries, phones, and doorknobs are not infection sources. | 42.21% | Moderate |
| Psychological Concern | Concern that PPE usage might psychologically harm patients. | 40.68% | Moderate |
| Practice Deficit | Belief that changing contaminated gloves during a procedure is unnecessary. | 35.36% | Significant |

The table above presents the barriers perceived by the nursing students towards personal protective equipment usage. It can be seen in the table that there are six barriers affecting nursing students in the use of personal protective equipment. The first one is the cognitive bias with agreement rate of 46.39%. This suggests the tendency to wait for a diagnosis before taking patients as potentially infectious. This is in contrast to the universal precaution that every patient is considered to be a potential source of infection which makes everyone should ensure safety. The next barrier is the complexity with agreement rate of 43.73% which finds it not easy to follow the standard precautions. It can be viewed the nursing students as burden for them but it is actually a step in the integration for safety. The third is the physical constraints which represents the environmental knowledge barrier. This implies that proportion of the nursing students (42.21%) not recognize the environment such as knobs and telephone as infectious vectors. This means that the nursing students must both focus on direct and indirect contact. Meanwhile, the misconception (42.21%) and psychological concern (40.68%) is another barrier that using certain personal protective equipment can be less intimidating to patients. These two represents the emphatic barrier which creates worry that personal protective equipment creates barriers to build patient rapport. The most significant level of concern is the practice deficit having the belief that changing the contaminated gloves during procedure is unnecessary having agreement rate of 35.36%.

Lastly, the barriers identified in this study are a combination of knowledge gaps, misperceptions and psychological barriers. All these barriers need to be addressed by implementing clinical educations such as universal precautions so that they will be protected.

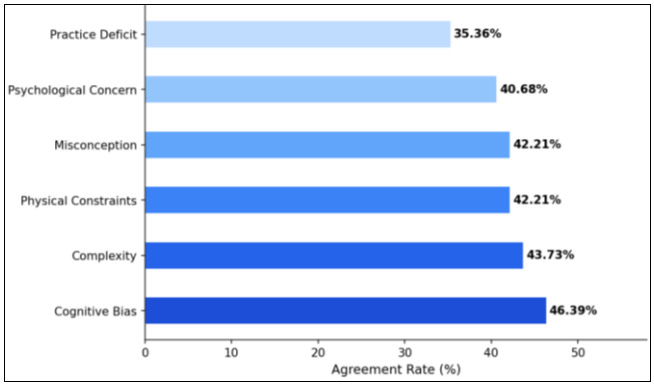


**Fig 3:** Barriers to PPE Usage among Nursing Students (n=263)

The figure 3 presents the barriers identified by the nursing students in the personal protective equipment usage. The cognitive bias is the main barriers identified by the nursing students.

**Table 5:** Nursing students attitudes toward Personal Protective Equipment n=263

| Variable | Mean score | SD | Test value | T test | p-value | Decision | interpretation |
|---|---|---|---|---|---|---|---|
| Attitude and behavior towards e | 3.27 | 0.56 | 3 | 7.88 | <.001 | Reject the null | Statistically significant |

*Significance level at 0.05

The table 6 shows the nursing students attitude towards personal protective equipment. The data was results of one sample t test that compares mean score attitude scores against neutral test value. The results shows that p-value is

<.001 is less than the significance threshold of p<.05 which indicates that the null hypothesis was rejected and the nursing students have significantly positive attitude and behavior toward the use of Personal Protective Equipment. The result means that the nursing students reported to have positive attitude.

The findings suggest that the nursing students possess the necessary knowledge to enter in the clinical setting where infection control is important. The nursing students recognize that the use of PPE is a crucial part of nursing practice. On the mean score is 3.27, the students have effective current curriculum towards safety of the patient. The teaching method of the faculty regarding attitude and behavior towards PPE is moving beyond new heights. In the context of nursing, the nursing students have a decreased occupational risk which less likely to experience exposure to such blood borne pathogens.

**Table 6:** Differences on the Nursing students attitudes toward Personal Protective Equipment according to demographic characteristics

| Variable | Test Statistic | T/F test | p-value | Decision | interpretation |
|---|---|---|---|---|---|
| Gender | Independent t-test | -4.81 | <.001 | Reject the null | Statistically significant |
| Semester of study | Independent t-test | 1.28 | 0.2 | Accept the null | Not statistically significant |
| Marital Status | One-way ANOVA | 15.19 | <.001 | Reject the null | Statistically significant |
| Academic level | One-way ANOVA | 2.25 | 0.031 | Reject the null | Statistically significant |

The table 6 illustrates the differences on the nursing student's attitudes toward personal protective equipment according to demographic characteristics. The results show that gender (p<.001): perceive the use of PPE significantly different between male and female. This suggests that female demonstrate a higher compliance towards safety standards in comparison with male. Another factor is the marital status (p<.001), this suggest that the status life stages influence their safety perceptions. Also, the academic level (p=0.031), which indicates student's progress as their attitude change significantly throughout their degree as nursing.

These results infer that as gender and marital status shows significant differences, it is essential to examine the subgroups that have lower scores to address the need for tailored interventions. Since the academic level is a predictor in the attitude and behavior about personal protective equipment. There should be PPE training on each level as to increase reinforcement on the use of personal protective equipment. Thus, focusing on the three predictors e.g., gender, marital status and academic level can ensure that attitude in PPE can be fostered effectively.

## Discussion

This study examined the level of attitude and behaviors of the nursing students regarding the use of personal protective equipment. This also identified the level of compliance and perceived barriers which are instrumental in the attitude of the nursing students in performing the PPE usage as they practice in the clinical setting. This study will provide a multidimensional understanding and significant implications to the nursing education.

The demographic characteristics play an essential role in the progressive shift towards broader transformation of nursing program. The gender reflects a near-balanced distribution as female 54.37% while male 45.63% which indicates a changes in the traditional dominance of female in healthcare. Mcmullan *et al* (2024) believes that gender diversification can impact the nursing environment. They concluded that there are lots of benefits whi9ch can be gained from greater gender diversity in the nursing environment. This impact the patient care within the nursing environment and actions should be taken in the nursing education to a more inclusive profession. Historically, the nursing field is widely dominated by female. The male around the word comprise only of about 11% (WHO, 2020) [14]. The male enjoyed opportunities in the nursing practice but failed to sustained the nursing role and become advanced nurses (Woo *et al*., 2022) [13]. These carried an implication to the PPE on nurses since there is a presence of gender differences with regards to compliance to PPE usage. Yet, the world forecast of global shortfall of nurses of an estimated 9 million to meet the population health needs by 2030 (WHO, 2021). Notably, the dominance of the nursing level 8 comprising 46.01% embodies the performance of them regarding infection control. However, the nursing students demonstrated moderate level of compliance which signifies a gap between the knowledge and behavioral application of the PPE. The study result is consistent with previous study that integration of mentorship courses can significantly enhance student learning. Approaches such as constructive feedback, observing role models and self-assessment can be contributory (Archer, 2010).

The current study found that 78% of the respondents reported to have moderate level of PPE compliance. This implies that while they have moderate levels of compliance it is not enough due to the health-care associated infection affecting the clinical environment. Asghar *et al*. (2025) [2] cited that health care associated infection is the main cause of preventable disease and deaths worldwide. They explained that adherence to infection control and prevention guides in the prevention of healthcare associated infection. Similarly, previous study demonstrated a consistent PPE usage which reduces significantly the transmission by breaking the chain as respiratory and blood borne pathogens can be prevented through the use of mask gloves and eye mask. This study has implication to nursing curriculum as the instruction of the IPC should be embedded in order to achieve the goal of quality patient safety (Chu *et al*. 2021).

The study revealed a moderate level of attitude (M-3.24) which indicates the general awareness of PPE usage. This infers in the study of Khasawneh *et al*. (2020) [9] which noted the presence of theoretical attitude among nursing students towards effective infection control. It can be observed the SD of 1.30 to 1.58 which implies a considerable heterogeneity in the nursing student's responses. This means that the attitude of the students is not the same and it may be persuaded by the individual of contextual factors on PPE. On the other hand, the nursing students recognize the fundamental purpose of PPE utilization in the prevention of infection. Other areas were also encouraging as responded by the nursing students such as the hand hygiene (m=3.56), waste segregation (m=3.49) and disinfection of equipment (m=3.41), these are part of the competencies which needs to be possessed by the healthcare

professionals. These competencies are within the competency framework in relation to Infection Prevention and Control (CDC, 2021) [5]. Interestingly, the difficulty working with PPE garnered mean=2.89. This level can undermine the quality of patient safety which the nurse can provide. Doos *et al*., (2022) [7] concluded that the reuse of personal protective equipment is not an acceptable practices posing risk of cross-contamination to health workers.

For the perceived barrier to the use of PPE by the nursing students, it has been identified that the most prevalent barrier garnered 46.39% which is the cognitive bias. This reflects the nursing student's misinformed about the universal precautions. The participants should understand that they considered every patient as potentially infectious before considering the performance of the PPE. According to World Health Organization (2020) [14], the health professional should not wait for the confirmed diagnosis before PPE measures. This selective application contradicts its formulated guidelines which directly result to cross contamination. Finally, the significant findings (t-7.88,p<0.001) delineates that the nursing students has a positive attitude towards the PPE usage which indicate a progressive shift for improvement. The nursing students demonstrate a strong foundation on both affective and cognitive domain towards PPE adherence. This is a good starting point for targeted interventions as the attitude can be changed as it is not difficult for attitude in moderate level and the nursing students already have the foundation towards PPE usage (Khasawneh *et al*., 2020) [9].

## Conclusion

The current study revealed that nursing students demonstrated a moderate level of PPE attitude and behavior. They also exhibit moderate level of compliance towards PPE use. It was found a statistically significant positive attitude towards PPE while gender, marital status, and academic level emerged as significant predictors of PPE-related attitudes. There are several barriers identified by the nursing students. These are cognitive bias, complexity, physical constraints, misconceptions, psychological concerns, and practice deficits. These are the key obstacles to the personal protective equipment adherence. These findings underscore the immediate need of tailored progressive Personal Protective Equipment education integrated to the nursing curriculum. The gender responsive education will address the balance-based disparity in order to close the gap between moderate and high level compliance.

## Recommendations

Based on the study findings, the following recommendations are provided to improve the Personal Protective Equipment (PPE) usage among students:

1. Conduct curriculum enhancement with the integration of Infection Prevention and Control (IPC) in order to reinforce safety standards as the nursing student's progress to more levels.
2. Develop targeted intervention training to areas where students demonstrated lower compliance in order to address the behavioral obstacles.
3. To address the barriers such as cognitive bias, the nursing educators should emphasize the universal precautions in order for the patients are treated as potentially infection source and psychological concern as to maintain rapport to reduce psychological concern.
4. Conduct a further investigation for generalizability of the study and determine how factors influence safety perceptions and behaviors in nursing.

## Data Availability

The data used in the present study are not available to others in order to protect the privacy of the participants. However, they are available from the corresponding author upon reasonable request.

## Declaration of Interests

Conflicts of interest the authors have no financial or even relevant non-financial interests in the material presented here.

## Conflict of Interest Statement

The authors have no conflicts of interest for this study.

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