

ORIGINAL ARTICLE

Knowledge, Compliance and Attitude of Nursing Students towards Standard Precautions: A Cross-Sectional Study in a Tertiary Hospital

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ABSTRACT

Introduction: Knowledge, compliance, and attitudes toward the standard precaution guidelines are crucial to avoid contamination not only on patients but also on healthcare providers. Little is known regarding Malaysian nursing students' knowledge, compliance, and attitudes toward standard precaution guidelines. The purpose of this study was to look into Malaysian nursing students' knowledge, compliance, and attitudes towards standard precaution guidelines.

Methods: This cross-sectional study was conducted among 337 Diploma nursing students who were chosen by simple random sampling. A self-invented questionnaire based on the CDC recommendations was administered to the participants and their responses were recorded. With a Cronbach's alpha coefficient of 0.96, the instrument is reliable. The STROBE cross-sectional design process guideline was used as the study design. **Results:** Majority of the nursing students have adequate knowledge (n=222, 65.9%), adequate compliance (n=229, 68%) and good attitudes (n=171, 50.7%) with the standard precaution. The findings suggest an association between gender (p=0.005) and year of educational level (p=0.001) with the level of knowledge. There was also an association between the level of knowledge with the level of compliance (p=0.029) and the level of attitude (p=0.002) with standard precautions among the nursing students. **Conclusion:** Even though nearly two-thirds of the participants appeared to have adequate knowledge and compliance, only half of them have good attitudes with the standard precautions. This study indicates that although the students had adequate knowledge and compliance, measures are needed to foster compatible attitudes towards the standard precautions among the nursing students.

Malaysian Journal of Medicine and Health Sciences (2023) 19(2):2-7. doi:10.47836/mjmhs19.2.2

Keywords: Knowledge, Compliance, Attitude, Nursing, Standard precaution

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INTRODUCTION

Ovarian cancer is the second most common gyMicroorganisms are always present in the environment of health care providers. Several types of microorganisms can cause disease outbreaks, the spread of cross infections, and can cause serious lethal infections (1). Nurses make up the largest group of health care workers in hospitals and are continuously exposed to various infections as they often have direct contact with patients (2). Nursing students are also at high risk for various infections as they have more frequent contact with patients and may accidentally cause contamination during their clinical posting.

Owing to these problems, the Center for Disease Control and Prevention (CDC) in 1996 has established standard precautions for all healthcare professionals as preventive measures against nosocomial infections and protective measures for themselves as well as the patients from harmful microorganisms (3). "Hand hygiene, the use of personal protective equipment like gloves, gowns, and masks, safe injection techniques, safe handling of potentially contaminated equipment or surfaces in the patient environment, and respiratory hygiene/cough etiquette are all standard precautions" (4).

Standard precautions will effectively reduce the occupational hazard if there are adequate knowledge, compliance, and attitude among the healthcare providers. However, previous studies have revealed that the level of knowledge on standard precautions among nursing students appeared to be inadequate (5). Other studies have also shown that nursing students' failure

to follow infection control precautions has an impact on not only patients but also other nursing students (6). The previous study by Hambridge et al, (7) in 2021 discovered that accidental wounds from needle stick injuries are common among nursing students and cause a greater psychological impact on an individual. Based on this problem, it is essential to assess the level of knowledge, compliance, and attitude among nursing students towards the standard precautions. This is important for policymakers to implement strategies to overcome these problems in the future.

MATERIALS AND METHODS

Study Design

This cross-sectional study was conducted among nursing students at tertiary hospital, University of Malaya, Malaysia. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist was used in this study.

Setting and Participants

Data were collected over two months from October to November 2014. A total of 337 Diploma nursing students were recruited for this study via simple random sampling method. This sampling method is chosen because all Diploma nursing students had completed Infectious Disease course and they will be invited to participate in the study. The sample size was determined using the single population proportion formula by considering: 95% confidence interval (CI), 50% proportion, 5% margin of error and $\alpha = 0.05$. Given that the source population was less than 10,000 correction formula was used and 10 % non-response was added, making the final sample size 215. Since the total number of nursing students who have completed Infectious Disease course, which includes standard precautions was 337, the study involved all of them to increase the power of the study.

Study instrument

The self-administered questionnaire was adopted from Leodoro et al. (8). All the knowledge, compliance and attitude items are based on the guidelines of CDC (Centers for Disease Control and Prevention) recommendations where the purpose to saves lives and protects people from health threats (CDC, 2019). It consists of three sections. Section A has 3 items on the students' demographics, which are age, gender and the year of educational level in the nursing program Diploma. Whereas, section B has 19 items on the knowledge on the basic concept, content, and requirements towards the standard precautions with possible responses of 'yes' and 'no'. One mark was allocated for the correct answer. A score of 14.86 and above was considered to have "Adequate Knowledge" while a score of 14.85 and below was considered to have "Inadequate Knowledge". Section C consists of 18 compliance items with a scale of 1-5 points: "1 = never, 2 = seldom, 3 = sometimes, 4 = usually, and 5 = always" (8, p86), giving a score range

of 0-90. Respondents with a score of 87.5 and above were considered to have "Adequate Compliance" on the standard precautions while a score below 87.5 was considered to have "Inadequate Compliance". A higher score indicates good compliance with the standard precautions. Section D, the questions on attitude towards the standard precautions focused on abilities of nursing students to treat and handling such patients following certain guidelines or requirements. This section consists of 2 objective questions and 4 attitude items where a range means of 17.14 and above was considered to have "Adequate Attitude" towards the standard precaution. The participants with a score of 17.13 and below were considered to have "Inadequate Attitude".

Validity and reliability

Evaluation of content validity was conducted by three experts in infection control – clinical specialist, infection control nurse and nursing lecturer. to ensure its relevance, clarity, simplicity, and ambiguity. Some minor modifications were done to improve the readability and quality of the questions. A pilot study was applied on 10% of the sample to examine its applicability, clarity, reliability and feasibility and to identify obstacles, problems that may be encountered throughout data collection. The reliability of the test questionnaire for section B (knowledge towards standard precaution) was assessed by the Kuder-Richardson-20 (KR-20) since the questionnaire is in dichotomous items. Section C and D was assessed by Cronbach alpha formula. The reliability was 0.738 for knowledge, 0.711 and 0.823 for compliance and attitude level.

Data Collection

Participants were selected during clinical posting. This sample were selected randomly by using simple random sampling design and applied on them inclusion and exclusion criteria. Eligible participants were approached after finishing their duty. All students were invited to participate in the study voluntarily after explained the purpose of the study and schedule of data collection. The data collection schedule was three days per week in classroom after the clinical day, where each student attended only one time that available to him or her. The students who didn't agree to participate in the study the researcher withdrawal them from data collection procedure. Those who agree to participation were attended in the classroom according to clinical schedule, and gave informed consent. The researcher applied on them inclusion and exclusion criteria. The researcher was available during the data collection in the classroom to answer any question from the students.

Ethical consideration

Permission to conduct the proposed study was obtained from Ethics Committee of University of Malaya (MECID NO: 20145-189). Participants received written and oral information about the flow the study, aim of the study, potential benefit to their consent and participation in

the study. Participants were informed that they may withdraw from the study at anytime without disclosing reason and also was not affected their evaluation in their academic course. The researcher emphasized that participation in the study is anonymity, privacy and confidentiality of the participants will be assured through coding of all data.

Data analysis

The Statistical Package for the Social Sciences (SPSS) version 24.0 was utilized for the analysis. The demographic characteristics of the respondents were descriptively analysed for their frequency and percentages. The Chi-square test was used to test significant associations between the knowledge level and compliance as well as the attitude towards the standard precautions. A P-value <0.05 indicates a significant association. The binary logistic regression procedure was used to test for factors associated with knowledge, compliance, and attitude towards the standard precautions. Significant factors were identified based on 95% CI.

RESULTS

A total of 337 respondents participated in this study. The age of the respondents was between 19-25 years (mean=19.7, SD=±0.8). The majority of the respondents were female (n=312, 92.6%). In addition, 166 (49.3%) respondents were from the 2nd year and 171 (50.7%) respondents were from the 3rd year nursing students.

Knowledge, Practice, and Attitude of nursing students towards standard precautions

Figure 1 shows the percentage of knowledge score on the standard precautions among nursing students. Out of the 337 respondents, 115 (34.1%) respondents have inadequate knowledge of the standard precautions and 222 (65.9%) respondents have adequate knowledge of the standard precautions. The majority of the respondents (n=309, 91.7%) agreed that the risk of nosocomial infection increases due to advanced age or very young age while (n=291,86.4%) believed that invasive procedures do. When it came to the purpose of standard precautions, the majority of the respondents (n=328, 97.3%) understood that the ultimate goal of the standard precautions is to protect both health care personnel and patients from infection transmission, whereas 66.8% (n=225) believed that it is applied for all patients. Concerning the knowledge on hand hygiene, (n=335, 99.4%) of the respondents agreed that hand hygiene is necessary before and after contact with the patients. On the other hand, the majority of the respondents (n=331, 98.2%) agreed that gloves should be worn when there is a risk of contact with blood or bodily fluids and 85.2% (n=287) agreed that gloves should be worn by the healthcare personnel when they have a cutaneous lesion. Finally, (n=334, 99.1%) of the respondents were aware that when there is the possibility of blood or body

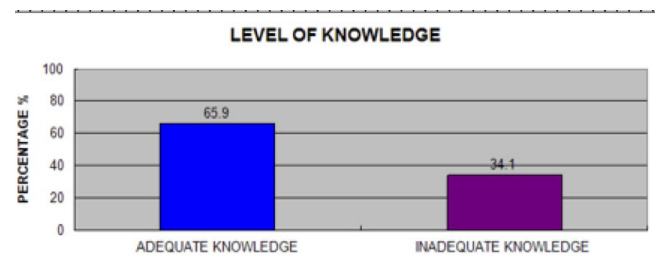


Figure 1: Level of Knowledge among Nursing Students with Standard Precautions

fluid splashes or spray, protective gears such as masks, goggles, and gowns should be worn,

Figure 2 shows the compliance score with the standard precautions among nursing students. Out of the 337 respondents, more than half of the respondents (68.0%) have adequate compliance with the standard precautions. Nearly all of the respondents (n=332, 98.5%) wash their hands immediately after coming into contact with blood, bodily fluid, secretions, excretion, or filthy substances while the majority of the respondents (n=302, 89.6% and n=313, 92.9%) wash their hands after taking off their gloves and when in contact with different patients, respectively. With regards to wearing gloves practices, almost all of the respondents wear gloves when disposing of stool and urine (n=324, 96.1%), during handling patients' mucosa (n=314, 93.2%), when handling saliva or sputum culture (n=315, 93.5%), when dressing wounds and when coming in contact with blood (n=325, 96.4%). Nevertheless, 11.6% (n=39) of the respondents were found to be noncompliant when administering medication through parenteral injection. The majority of the respondents wear masks, protective suits, or gowns when performing operations/procedures that may result in spraying of blood, bodily fluid, secretions, and excretions with compliance rates of 94.7% (n=319) and 88.7% (n=299), respectively. Only eight respondents (2.4%) reported did not wear protective eye patches or goggles.

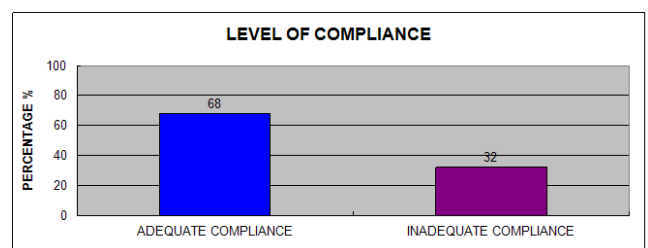


Figure 2: Level of Compliance among Nursing Students with Standard Precaution

Figure 3 shows the attitude score towards the standard precautions among nursing students. There were 166 (49.3%) respondents who have an inadequate attitude towards the standard precautions. The respondents were asked about their first choice on the most effective measures in reducing the spread of infectious agents. The majority of respondents (n=311,92.3%) identified

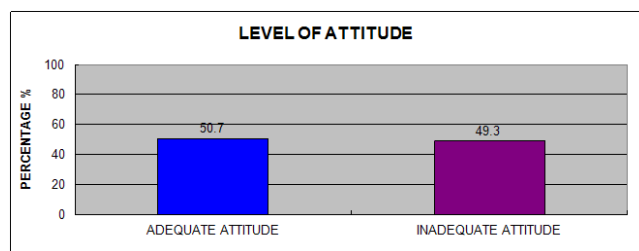


Figure 3: Level of Attitude among Nursing Students with Standard Precautions

hand washing as being the most effective approach to decrease infectious agent transmission.

Association between the level of knowledge with the level of compliance and attitude on standard precaution Table I demonstrates a significant association between the levels of knowledge with the level of compliance ($\chi^2= 4.752, p= 0.029$). The level of knowledge are also significantly associated with the attitude towards the standard precautions ($\chi^2= 9.836, p= 0.002$) (Table II).

Factors associated with knowledge, compliance, and attitude

Table III depicts the factors associated with knowledge, compliance and attitude towards the standard precautions. The gender of the respondents (aOR 3.44; 95% CI [1.44, 8.21]), compliance (aOR 2.04; 95% CI [1.18, 3.50]) and attitude (aOR 2.21; 95% CI [1.35, 3.62]) were significantly associated with inadequate knowledge of the standard precautions. Knowledge (aOR 2.04; 95% CI [1.18, 3.53]) and attitude (aOR 2.17; 95% CI [1.33, 3.56]) were significantly associated with inadequate compliance with the standard precautions. Ward assigned (aOR 1.71; 95% CI [1.03, 2.85]), knowledge (aOR 2.20; 95% CI [1.35, 3.60])

Table I: Association between levels of knowledge with level of compliance among nursing students with standard precaution (N=337)

Level of knowledge	Level of compliance		Value		
	Adequate compliance (n)%	Inadequate compliance (n)%	χ^2	(df)	p
Adequate knowledge	(142)64.0	(80)36.0	4.752	(1)	0.029
Inadequate knowledge	(87)75.7	(28)24.3			

* Statistically significant at p<0.05

Table II: Association between levels of knowledge with level of attitude among nursing students with standard precaution (N=337)

Level of knowledge	Level of attitude		Value		
	Adequate attitude (n)%	Inadequate attitude (n)%	χ^2	(df)	p
Adequate knowledge	(123)55.4	(99)44.6	9.836	1	0.002
Inadequate knowledge	(43)37.4	(72)62.6			

* Statistically significant at p<0.05

and compliance (aOR 2.17; 95% CI [1.33, 3.54]) were significant factors for inadequate attitude towards the standard precautions.

DISCUSSION

This study explored the level of knowledge, compliance, and attitude towards standard precautions among nursing students in one of the universities in Kuala Lumpur, Malaysia. The findings from this study revealed that nursing students had an adequate level of knowledge of the standard precautions. Several previous studies (8, 9) also discovered that nursing students were knowledgeable of the standard precautions. A study conducted by Al-Faouri et al. (5) in 2021 found that the standard precautions are the most basic level of

Table III: Factors associated with inadequate knowledge, compliance and attitude (N=337)

Factor	Adjusted OR (95% CI)		
	Inadequate Knowledge	Inadequate Compliance	Inadequate Attitude
Age (years)			
- 20 and above	1.17(0.51, 2.68)	1.84(0.79, 4.31)	1.25(0.55, 2.84)
- Less than 20	1.00	1.00	1.00
Gender			
- Male	3.44(1.44, 8.21) *	1.87(0.78, 4.47)	1.11(0.46, 2.65)
- Female	1.00	1.00	1.00
Year of education			
- Year 2	1.97(0.85, 4.53)	1.24(0.54, 2.87)	0.59(0.26, 1.34)
- Year 3	1.00	1.00	1.00
Ward assigned			
- Surgical ward	1.38(0.82, 2.35)	0.88(0.51, 1.52)	1.71(1.03, 2.85) *
- Medical ward	1.00	1.00	1.00
Level of knowledge			
- Adequate knowledge	-	2.04(1.18, 3.53) *	2.20(1.35, 3.60) *
- Inadequate knowledge	-	1.00	1.00
Level of compliance			
- Adequate compliance	2.04(1.18, 3.50) *	-	2.17(1.33, 3.54) *
- Inadequate compliance	1.00	-	1.00
Level of attitude			
- Adequate attitude	2.21(1.35, 3.62) *	2.17(1.33, 3.56) *	-
- Inadequate attitude	1.00	1.00	-

* Statistically significant at p<0.05

infection control procedures. The participants may have the acceptable skill and compliance habits. However, more training programs focusing on the standard precautions are required for nurses to strengthen their knowledge, skills, and compliance with the infection-control standard precautions. The sufficient level of knowledge about the standard precautions discovered in the present study could be attributed to the inclusion of standard precautions concepts in the Malaysian nursing curriculum. This result was also supported by a previous study (10). "Having good knowledge of infection prevention measures, a positive attitude towards infection prevention practices, awareness of the availability of standard operating procedures, and the presence of continuous water supply were predictors of good infection prevention practices" (10, p177). However, the findings of this investigation revealed that continuous supervision, as well as maintainable and reliable water, should be implemented to improve adherence to infection prevention practices among workers.

This study showed that the nursing students had adequate compliance. This might be due to the frequent monitoring by the clinical instructors towards the standard precautions practices during clinical attachments, which could also be due to their awareness and practices on the role of the future nurses in reducing the risk of infections during clinical training. This finding is crucial since failure to follow and apply the standard precautions could result in intractable infections (11). However, there was a low level of compliance with the use of protective eye patches or goggles similarly to (8). This could be due to the lack of knowledge on the purpose of this personal protective equipment or the unavailability of this personal protective equipment in the ward.

This study also showed that the participants had an adequate attitude with the standard precautions but need to be improved. From the results, the high level of awareness and knowledge about the concept of standard precautions among the nursing students contributed to their positive attitude as they will use the personal protections properly and timely. Thus, this positive attitude towards the standard precautions may reduce the risk of transmission of microorganisms to the patients. Our study corroborates a study conducted by Shiraly et al. (6) in 2021. This study also evaluated the students nurse's attitude towards standard precaution. The results revealed there was a significant association between the level of knowledge with the level of compliance ($\chi^2=4.752$, $p=0.029$) and attitude ($\chi^2=9.836$, $p=0.002$) as shown in Table 1 and 2. The result implies that knowledge of the standard precautions affects compliance and attitude towards the standard precautions. These results were supported by several previous studies (8, 12, 13), which indicate that knowledge alone is not the only factor influencing

compliance with the standard precaution practices.

The findings indicated that gender was also significantly associated with inadequate knowledge of the standard precautions, in addition to compliance and attitude. This may be due to nursing students in Malaysia being currently dominated by females. The ward that the respondents were assigned to during their clinical attachment is another factor for inadequate attitude towards the standard precaution.

The limitation of this study includes the findings in this study would not be a real reflection of the respondents. The questionnaire was distributed during a clinical attachment. Thus, there is a high possibility of bias that the respondents discussed among themselves before the questionnaires were distributed at different wards at different times. A strategy has been planned to overcome this problem by distributing all the questionnaires at once during the lecture session. Unfortunately, due to problems beyond the control of the researcher, this plan could not be achieved.

Another limitation is the unavailability of benchmarks for the level of attitude with the standard precautions. No existing tools are available from the previous studies. Although the self-administered questions were developed by the author, the benchmarks scale was not provided. Thus, it is recommended that more research studies using a better scale in determining the attitude with the standard precautions should be conducted in the future.

Nurses are the largest group of healthcare personnel in the hospital who have regular contact with patients. During patient management, infectious agents from the patient might transmit to the nurses. Hence, to reduce this occupational hazard to the nurses, we need information on their knowledge, compliance, and attitude on the standard precautions. This information is important for policymakers to implement strategies or to revise the nursing curriculum to improve the healthcare professional's knowledge, compliance, and attitude towards the standard precautions.

CONCLUSION

The findings obtained in this study by analysing data from survey show two-thirds of the participants have adequate knowledge and compliance towards standard precaution; however only half of them have good attitudes with the standard precautions. Therefore, regular courses should be held under the supervision of nursing educators and registered nurses, especially for the nursing students who are posted in critical care units as well as continuous monitoring of compliance. A holistic approach should be taken by the nurse educator, nurse manager, and nurses to overcome this problem.

ACKNOWLEDGEMENTS

We would like to express our gratitude to the Department of Nursing Science, Faculty of Medicine, University of Malaya. We also would like to thank all participants in this study for their time and effort.

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