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Knowledge, Attitude, and Compliance to Standard Precautions Among Universiti Malaysia Sarawak Nursing Students

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ABSTRACT

Standard precautions pertain to the minimum standards of infection prevention practices that apply to patient care, regardless of confirmed or suspected infection status among patients in any setting where medical care is given. These practice guidelines not only help to minimize the spread of infection among patients but also help to avoid healthcare workers from contracting infections when caring for patients. Nursing students are equally at risk to exposure to infections during their clinical attachments in the healthcare setting. Hence, this study aims to assess the level of knowledge, attitude, and compliance toward standard precautions among undergraduate nursing students in Universiti Malaysia Sarawak. It also aims to identify the associations between knowledge, attitude, and compliance toward standard precautions among Universiti Malaysia Sarawak nursing students. Data was collected from a total of 167 participants using a self-administered questionnaire which was disseminated online via Google Forms. The data collection tool consisted of a 46-item structured questionnaire in 4-parts investigating participant's sociodemographic profile, knowledge, attitude and compliance towards standard precautions. Study participants consisted of students from the Bachelor of Science in Nursing (with honours) Programme in Universiti Malaysia Sarawak. Data collected were entered into a Microsoft Excel spreadsheet and was further analyzed using IBM SPSS version 26. The majority of the study participants demonstrated very good (46.7%, n=78) and good level of knowledge (50.9%, n=85) levels while only a minority demonstrated a fair level of knowledge (2.4%, n=4) with none exhibiting low knowledge levels toward standard precautions. Most nursing students (97.6%, n=163) investigated in this study showed positive attitudes toward standard precaution practices. Most study participants self-reported their compliance toward standard precaution practices to be high (89.8%, n=150) with a minority reporting average (7.8%, n=13), low (0.6%, n=1) and very low (1.8%, n=3) compliance respectively. Further analyses revealed significant correlations between knowledge and attitude (r= .165, p=.033, p< .05); and attitude and compliance (r= -.505, p=.000, p< .05) with no significant correlations between knowledge and compliance (r= -.036, p=.645, p> .05). Undergraduate nursing students of Universiti Malaysia Sarawak in this study demonstrated desirably good knowledge levels and positive attitudes with a high level of compliance toward standard precaution practices. Despite the overall desirable findings, there is still room for targeted improvements in the undergraduate programme delivery specifically aimed at misconceptions regarding the use of personal protection equipment (PPE) to maintain and further enhance student's knowledge, attitudes and compliance toward standard precautions.

Keywords**:** Knowledge, attitude, compliance, standard precautions

INTRODUCTION

Standard precautions or also known as universal precautions was coined by the Centre for Disease Control and Prevention (CDC) in 1996. Standard precautions pertain to the minimum standards of infection prevention practices that apply to patient care, regardless of confirmed or suspected infection status among patients in any setting where medical care is given (Centre for Disease Control and Prevention, 2018). According to Zeb et al. (2019), these practice guidelines not only help to minimize the spread of infection among patients but also help to prevent healthcare workers from contracting infections when caring for patients. The five main domains in standard precautions include hand hygiene, use of Personal Protective Equipment (PPE), safe injection practices, safe handling and cleaning of

contaminated equipment, and respiratory hygiene or cough etiquette (Labrague et al., 2012). According to Almoghrabi et al. (2018), hand hygiene is the simplest, and perhaps the most effective action to avoid infections linked to healthcare. Even though hand rubs are useful and convenient in healthcare settings for hand hygiene, it does not substitute hand washing completely. When hands are soiled with blood, or body fluids, hand washing with soap and water should be practised (Centre for Diseases Control and Prevention, 2018). Studies have also suggested relationships between improving hand hygiene practices and reducing infection rates (Almoghrabi et al., 2018). Personal protective equipment (PPE) refers to wearable equipment including gloves, face mask, protective eyewear, face shields, and protective clothing designed to protect healthcare workers from exposure to or contact with infectious agents (Centre for Diseases Control and Prevention, 2018). Safe injection practice is another aspect of standard precaution defined as not harming the recipient, not exposing the provider to risk, and avoiding waste disposal which endangers the community. Safe injection practices are established to minimize risks to both healthcare personnel and patients when preparing and administering parenteral medications (Centre for Diseases Control and Prevention, 2018). Infection control measures for respiratory hygiene or cough etiquette are intended to restrict the spread of respiratory pathogens via means of droplet and airborne transmission (Centre for Diseases Control and Prevention, 2018).

Beyamo et al. (2019) explained that occupational exposure to blood and body fluids is a serious concern for healthcare staff and poses a substantial possibility for spreading blood-borne infections such as human immune-deficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV). Healthcare providers are regularly exposed to microorganisms that can cause extreme or even fatal infections. In particular, nurses are frequently exposed to a myriad of infections during the period of nursing practices. Likewise, during their clinical practice sessions, nursing students are often at risk of such illnesses and accidents because of inadvertent contamination. According to Angaw et al. (2019), in developing countries, over 90 percent of these infections are estimated to occur among healthcare workers and healthcare students. Therefore, appropriate standard precautions should be practised among the healthcare workers so that healthcare facilities do not become the source of infection and epidemic (Beyamo et al., 2019). This study aims to ascertain the current knowledge levels, attitudes, and compliance of nursing students towards standard precautions.

MATERIAL & METHODS

This study was conducted at the Faculty of Medicine and Health Sciences of Universiti Malaysia Sarawak, Malaysia. The study employed a quantitative cross-sectional design. In this study, total population sampling was used to achieve the objectives of the study. The study involved a total of 167 undergraduate nursing students ranging from year 2 to 4 of their studies. Permission to conduct the study was sought from the Faculty of Medicine and Health Sciences, Universiti Malaysia Sarawak. Full disclosure of the purpose and objectives of the study were detailed in the information sheet accompanying the questionnaire distributed to participants. Informed consent was obtained from individual respondents. Respondents' privacy and anonymity were assured with no use of personal details tracing back to individual respondents in the data collection. Respondents were afforded the right to withdraw from the study at any time without penalty or repercussion. Permissions to utilize the study instruments were obtained from the respective original authors.

The instrument used in this study consisted of an online self-administered questionnaire which was piloted prior to use in the actual study. The questionnaire was presented in English. The questionnaire consisted of four sections namely Part (A) socio-demographic data, Part (B) knowledge on standard precautions, Part (C) attitude toward standard precautions, and Part (D) Compliance with standard precautions. Part A collected data on the participant's socio-demographics which consisted of respondent's age, gender and year of study. Part B consisted of 18-items about knowledge toward standard precautions which were adopted from Labrague et al. (2012). Knowledge was measured using an 18-item dichotomous scale which assessed 3 domains mainly hand hygiene, nosocomial infections, and standard precautions. The possible responses were Yes or No. "Yes" responses were scored as 1, and "No" responses were scored as 0. A total score from 16 to 19 was considered Very Good Knowledge, a score between 12 to 15 Good Knowledge, a score of 8 to 11 was considered Fair Knowledge, and a score range between 0 to 7 was considered Poor Knowledge. Reliability testing of the instrument returned a Cronbach's Alpha value of 0.742. Part C consists of questions based on attitude toward standard precautions. This part of the questionnaire was adopted from Mohd-Nor and Bit-Lian (2019) and consisted of 13 items that included both positive and negative attitude statements. The answers were measured using a 5-point Likert scale with responses ranging from 1=strongly disagree, 2=disagree, 3=undecided, 4=agree, and 5=strongly agree. Respondents who achieved a mean score between 2.5 to 5 were considered to possess positive attitudes and mean scores between 0 to 2.4 were considered negative attitudes (Mohd-Nor & Bit-Lian, 2019). The total mean and standard deviations of the total possible score of between 15 to 75 were

used to determine attitude levels (Mohd-Nor & Bit-Lian, 2019). Part D consisted of 15 questions assessing the compliance with standard precautions adopted from Labrague et al. (2012). Items were measured using a 5-point Likert scale ranging between: 0 never, 1 seldom, 2 sometimes, 3 usually, and 4 always. The total possible scores ranged between 0 to 68. Respondents who achieved a mean score of between 3.51 to 4.00 were considered to have High compliance, 2.51 to 3.50 as Average Compliance, 1.51 to 2.50 as Low Compliance, and 0 to 1.50 as Very Low Compliance (Labrague et al., 2012). Reliability testing on this part returned a Cronbach's Alpha value of 0.726.

Data Analysis Method

Data analyses were carried out using SPSS version 26. Descriptive statistics were used to present categorical data (gender, year of study, each response according to items). Continuous data (age, level of knowledge, attitude, and compliance score) were calculated to obtain their mean and standard deviations. Statistical significance for association between knowledge, attitude, and compliance of (NAME OF INSTITUTE) nursing students to standard precautions were tested using Spearman's Rank Order Correlation. (Laerd Statistics, 2018).

RESULTS

Table 1 shows the socio-demographic characteristics of the study participants. A total of 167 responses were included for data analyses in this study. Out of 167 participants, 27 (16.2%) participants were males, and 140 (83.8%) participants were females. There were 25.7% (n= 43) of nursing students aged 21 years old and below, 40.7% (n= 68) of nursing students aged 22 years old, and 33.5% (n= 56) of nursing students aged 23 years old above participated in this study. There were a total of 32.9% (n=55) participants from Year 2, 37.7% (n=63) participants from Year 3 and 29.3% (n=55) participants from Year 4.

Table 1. Socio-Demographic Characteristics of Participants (N=167)

Characteristic	n (%)	Range (mean ± SD)
Age (years)		1.08 (±0.768)
21 years old and below	43 (25.7%)	
22 years old	68 (40.7%)	
23 years old and above	56 (33.5%)	
Gender		
Male	27 (16.2%)	
Female	140 (83.8%)	
Years of Study		
Year 2	55 (32.9%)	
Year 3	63 (37.7%)	
Year 4	49 (29.3%)	

Knowledge on Standard Precautions

Table 2 shows the distribution of participants' knowledge on standard precautions. The majority of respondents (n=162, 97.0%) agreed that invasive procedures increase the risk of nosocomial infection, while 92.8% (n=155) believed that advanced age or very young age also contributes to the risk of nosocomial infection. With regards to the goals of standard precautions, the majority of respondents (n=166, 99.4%) knew that the ultimate goal of standard precautions was to protect both healthcare workers and patients from transmission of infection, while 3.6% (n=6) disagreed that standard precautions only applied to patients. 135 (n=80.8%) respondents believed that standard precautions are intended to protect only the patients from infections. Regarding knowledge on hand hygiene, 98.2% responded that hand hygiene is recommended before and after contact with patients, while half of the respondents (n=108, 64.7%) reported that hand hygiene is recommended before or after contact with patients. All the respondents (n=167, 100%) agree with the use of gloves when there is a risk of contact with the blood or body fluid, while 46.1% (n=77) think that gloves should be used for all procedures. Finally, the vast majority of respondents (n=167,100%) were aware that healthcare staff must wear masks, goggles, and gowns when there is a chance of blood and body fluids splashing or spraying.

Table 3 presents the cumulative scores of the respondents on the questionnaires on standard precautions. Nearly half (n=85, 50.9%) of the respondents scored within the scored range of 12 to 15 which is interpreted as "Good Knowledge", while 46.7% (n=78) scored within the score range of 16-19 which is interpreted as "Very Good Knowledge". In

general, Universiti Malaysia Sarawak nursing students possess "Good Knowledge" on standard precautions with a weighted mean score of 41.75.

Table 2. The Distributions of Participant on Knowledge of Standard Precautions (N=167)

No.	Knowledge Items	Yes	No
		n (%)	n (%)
	1. Nosocomial Infection		
a.	Advanced age or very young age increases the risk of nosocomial infection.	155 (92.8%)	12 (7.2%)
b.	Invasive procedures increases the risk of nosocomial infection	162 (97.0%)	5 (3.0%)
	2. Precautions standards		
a.	Include the recommendations to protect only the patients.	135 (80.8%)	32 (19.2%)
b.	Include the recommendations to protect the patients and the healthcare workers.	166 (99.4%)	1 (0.6%)
c.	Apply for all patients.	161 (96.4%)	6 (3.6%)
d.	Apply for only healthcare workers who have contact with body fluid.	111 (66.5%)	56 (33.5%)
	3. *When is hand hygiene recommended?*		
a.	Before or after a contact with (or care of) a patient.	108 (64.7%)	59 (35.3%)
b.	Before and after a contact with (or care of) a patient.	164 (98.2%)	3 (1.8%)
c.	Between patient contact.	138 (82.6%)	29 (17.4%)
d.	After removal of gloves.	164 (98.2%)	3 (1.8%)
	4. *The standard precautions recommended use of gloves?*		
a.	For each procedure.	77 (46.1%)	90 (53.9%)
b.	When there is a risk of contact with the blood or body fluid.	167 (100%)	0 (0%)
c.	When there is risk of a cut.	19 (11.4%)	148 (88.6%)
d.	When healthcare workers have cutaneous lesions.	160 (95.8%)	7 (4.2%)
	5. *When there is a risk of splashes or spray of blood and body fluids, the healthcare workers must wear?*		
a.	Only mask	159 (95.2%)	8 (4.8%)
b.	Only eye protection.	161 (96.4%)	6 (3.6%)
c.	Only a gown.	161 (96.4%)	6 (3.6%)
d.	Mask, goggles, and gown.	167 (100%)	0 (0%)

Table 3. Level of Knowledge of Standard Precautions among Universiti Malaysia Sarawak Nursing Students.

No.	Level of Knowledge	Score Range	n	%
1.	Very Good Knowledge	16-19	78	46.7%
2.	Good Knowledge	12-15	85	50.9%
3.	Fair Knowledge	8-11	4	2.4%
4.	Poor Knowledge	0-7	0	0%
	Average score =		41.75	

Attitude towards Standard Precautions

Table 4 shows the participants' responses on attitude towards standard precautions. The aim of standard precautions, hand hygiene, the use of personal protective equipment (PPE) in various situations, environmental cleaning, and water disposal were among the questions posed. Nearly half of participants (n=77, 46.1%) agree with the statement that standard precautions are not easy to follow. This shows that the respondents show a negative attitude toward standard precautions as only 3.6 % (n=6) strongly disagree that standard precautions are not easy to follow. The majority of respondents agree that standard precautions can prevent the spread of infections and prefer to wash their hands before and after any intervention with patients with 70.7% (n=118) and 52.1% (n=66.5%) respectively. For the use of personal protective equipment (PPE), 52.1% (n=87) respondents who responded "strongly agree" to the statement stated that infectious diseases can be treated hence protective devices are not required. Nearly half of respondents (n=67, 40.1%) also agree that personal protective equipment can be used during emergencies and 18% (n=30) of respondent strongly disagree with the statement that it is difficult to work wearing personal protective equipment. A significant percentage of respondents responded "strongly agree" to the statement that changes of gloves is not

necessary during procedures even if heavily contaminated (58.1%, n=97) and should not use goggles, mask and other devices because it may harm patients psychologically (48.5%, n=81). It was also observed that 49.7% (n=83) of respondents strongly agreed that stationeries, telephones, and doorknobs are not sources of infection. The majority of respondents strongly agree that all healthcare providers should ensure the availability of adequate protective barriers and adequate disinfection of medical equipment with attitude rates of 58.1% (n=97) and 62.3% (n=104) respectively. Finally, almost all of the respondents (n=108, 64.7%) knew that transmission of the infectious organism can be reduced by adhering to standard and contact precautions and 52.7% (n=88) of respondents strongly agree that segregation of clinical and non-clinical waste is useful to prevent transmission of infections from one to another.

Table 5 shows the cumulative scores of the respondents on the questionnaire of attitude toward standard precautions. The majority of Universiti Malaysia Sarawak nursing students (n=163, 97.6%) scored within the mean score range of 5.0-2.5 which is interpreted as having a "Positive Attitude" while 2.4% (n=4) respondents scored within the mean range of 2.4-0 which is interpreted as having a "Negative Attitude". In general, Universiti Malaysia Sarawak nursing students possess a "Positive Attitude" toward standard precautions with a weighted mean score of 41.75. The mean scores for each year of study were 40.62 (±6.211), 41.33 (±5.781), and 43.57 (±4.937) for Year 2, Year 3, and Year 4 respectively (Table 6).

Table 4. The Distributions of Participant on Attitude towards Standard Precautions (N=167).

No.	Attitude Items	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
		n (%)	n (%)	n (%)	n (%)	n (%)
1.	Standard precautions is not easy to follow.	6 (3.6%)	28 (16.8%)	19 (11.4%)	77 (46.1%)	37 (22.2%)
2.	Standard precautions can prevent spread of infections from patients to healthcare workers and vice versa.	1 (0.6%)	0 (0%)	5 (3%)	43 (25.7%)	118 (70.7%)
3.	Infectious diseases can be treated hence protective devices are not required.	5 (3%)	6 (3.6%)	15 (9%)	54 (32.3%)	87 (52.1%)
4.	Prefers to wash hands before and after any intervention with patients.	1 (0.6%)	3 (1.8%)	4 (2.4%)	48 (28.7%)	111 (66.5%)
5.	Personal protective equipment can be used during emergencies.	3 (1.8%)	7 (4.2%)	33 (19.8%)	67 (40.1%)	57 (34.1%)
6.	Changes of gloves is not necessary during procedures even if heavily contaminated.	4 (2.4%)	5 (3%)	15 (9%)	46 (27.5%)	97 (58.1%)
7.	It is difficult to work wearing personal protective equipment.	30 (18%)	35 (21%)	52 (31.1%)	41 (24.6%)	9 (5.4%)
8.	All healthcare providers should ensure availability of adequate protective barriers.	1 (0.6%)	1 (0.6%)	9 (5.4%)	59 (35.3%)	97 (58.1%)
9.	Should not use goggles, masks, and other devices because it may harm patients psychologically.	2 (1.2%)	7 (4.2%)	19 (11.4%)	58 (34.7%)	81 (48.5%)
10.	Stationeries, telephone and door knobs are not sources of infections.	3 (1.8%)	7 (4.2%)	21 (12.6%)	53 (31.7%)	83 (49.7%)

Table 4. The Distributions of Participant on Attitude towards Standard Precautions (N=167) (Contd.)

11.	Segregation of clinical and non-clinical waste is useful to prevent transmission of infections from one to another.	1 (0.6%)	6 (3.6%)	21 (12.6%)	51 (30.5%)	88 (52.7%)
12.	Adequate disinfection of medical equipment should be ensured by all healthcare providers.	0 (0%)	0 (0%)	11 (6.6%)	52 (31.1%)	104 (62.3%)
13.	Transmission of infectious organism can be reduced by adhering to standard and contact precautions.	1 (0.6%)	1 (0.6%)	7 (4.2%)	50 (29.9%)	108 (64.7%)

Table 5. Level of Attitude of Standard Precautions among Universiti Malaysia Sarawak nursing students.

No.	Level of Attitude	n	%
1.	Positive Attitude	163	97.6%
2.	Negative Attitude	4	2.4%
	Total=	167	100%

Table 6. The Distribution of Mean on Attitude of Universiti Malaysia Sarawak Nursing Students towards Standard Precautions.

No.	Year of Study	Minimum score	Maximum score	Mean Score (SD)
1.	Year 2	26	52	40.62 (±6.211)
2.	Year 3	26	51	41.33 (± 5.781)
3.	Year 4	33	51	43.57 (± 4.937)
		Total Mean :		41.75 (±5.792)

Compliance towards Standard Precautions

Table 7 depicts the information obtained from the respondents regarding their compliance activities toward standard precautions.

The majority of the respondents (n=153, 91.6%) reported washing their hands immediately after contacting any blood, body fluids, secretion, excretion, and dirty substances, and more than half washed their hands when coming in contact with different patients (n=126, 75.4%) and after taking off the gloves (n=139, 83.2%). When it comes to wearing gloves, the vast majority of respondents do so when disposing of stool and urine (n=158, 94.6 %), handling the mucosa of patients (n=155, 92.8 %), saliva and sputum (n= 154, 92.2 %), and come in contact with blood (n= 157, 94 %). However, 1.8 % (n=3) of respondents reported not wearing gloves when cleaning blood traces, which indicated a lower compliance level. The majority of the nursing students or respondents adhere to wearing masks and protective suits or gowns when performing procedures that might induce spraying of blood, body fluids, secretions, and excretions with a compliance rate of 92.8% (n=155) and 81.4% (n=136). However, a significant percentage of non-compliance (n=10, 6%) was noted, with respondents saying that they seldom use protective eyewear. With regards to proper care of used needles, 92.8% (n=155) of the nursing students reported disposing of needles and blades in the sharp disposal box or receptacle after use.

Table 8 shows the cumulative scores of the respondents on the questionnaire of compliance toward standard precautions. 89.8% (n=150) of the respondents scored within the mean score range of 3.51-4.00 which is interpreted as “High Compliance”, 7.8% (n=13) scored within the mean score range of 2.51-3.50 which is interpreted as “Average Compliance”, 0.6% (n=1) scored within the mean score range of 1.51-2.50 which is interpreted as “Low Compliance”, while 1.8% (n=3) scored within the mean score range of 0-1.50 which is interpreted as “Very Low Compliance”. It can be concluded that Universiti Malaysia Sarawak nursing students have a “High Compliance” of standard

precautions with a grand mean of 3.7892 (± 0.5436). The mean score for each year of study was 3.8764 (± 0.3211), 3.7048 (± 0.6472), and 3.8000 (± 0.5889) for Year 2, Year 3, and Year 4 respectively (Table 9).

Table 7. The Distributions of Participant on Compliance toward Standard Precautions (N= 167).

No.	Compliance Items	Always	Usually	Sometimes	Seldom	Never
		n (%)	n (%)	n (%)	n (%)	n (%)
1.	Washes hands when comes in contact with different patients.	126 (75.4%)	33 (19.8%)	5 (3%)	0 (0%)	3 (1.8%)
2.	Washes hands after taking off the gloves.	139 (83.2%)	21 (12.6%)	2 (1.2%)	0 (0%)	5 (3%)
3.	Washes hand immediately after contacting any blood, body fluids, secretion, excretion and dirty substances.	153 (91.6%)	7 (4.2%)	4 (2.4%)	1 (6%)	2 (1.2%)
4.	Wears gloves when drawing blood samples.	151 (90.4%)	10 (6%)	2 (1.2%)	1 (0.6%)	3 (1.8%)
5.	Wears gloves when disposing stool and urine.	158 (94.6%)	5 (3%)	1 (0.6%)	1 (0.6%)	2 (1.2%)
6.	Wears gloves when handling impaired patient skin.	138 (82.6%)	14 (8.4%)	5 (3%)	5 (3%)	5 (3%)
7.	Wears gloves when handling patients' mucosa.	155 (92.8%)	8 (4.8%)	1 (0.6%)	1 (0.6%)	2 (1.2%)
8.	Wears gloves when handling saliva or sputum culture.	154 (92.2%)	6 (3.6%)	3 (1.8%)	0 (0%)	4 (2.4%)
9.	Wears gloves when dressing wounds.	158 (94.6%)	3 (1.8%)	2 (1.2%)	2 (1.2%)	2 (1.2%)
10.	Wears gloves when cleaning blood traces.	155 (92.8%)	7 (4.2%)	2 (1.2%)	0 (0%)	3 (1.8%)
11.	Wears gloves when comes in contact with blood.	157 (94%)	6 (3.6%)	1 (0.6%)	1 (0.6%)	2 (1.2%)
12.	Wears mask when performing operations/procedures that might induce spraying of blood, body fluids, secretions and excretions.	155 (92.8%)	6 (3.6%)	2 (1.2%)	2 (1.2%)	2 (1.2%)
13.	Wears protective eye patch or goggles when performing operations/procedures that might induce spraying of blood, body fluid, secretions and excretions.	124 (74.3%)	18 (10.8%)	9 (5.4%)	10 (6%)	6 (3.6%)
14.	Wears protective suit or gown when performing operations/procedures that might induce spraying of blood, body fluid, secretions and excretions.	136 (81.4%)	20 (12%)	5 (3%)	4 (2.4%)	2 (1.2%)
15.	Disposes needles and blades in a sharp disposal box or receptacle after using.	155 (92.8%)	8 (4.8%)	2 (1.2%)	0 (0%)	2 (1.2%)

Table 8. Level of Compliance of Standard Precautions among Universiti Malaysia Sarawak Nursing Students

No.	Level of Compliance	n	%
1.	High Compliance	150	89.8%
2.	Average Compliance	13	7.8%
3.	Low Compliance	1	0.6%
4.	Very Low Compliance	3	1.8%
Total =		167	100%

Table 9. The Distribution of Mean Score on Compliance of Universiti Malaysia Sarawak Nursing Students towards Standard Precautions.

No.	Year of Study	Minimum score	Maximum score	Mean Score (SD)
1.	Year 2	2	4	3.8764 (± 0.3211)
2.	Year 3	0	4	3.7048 (± 0.6472)
3.	Year 4	0	51	3.8000 (± 0.5889)
	Total mean score :			3.7892 (± 0.5436)

Association between Knowledge, Attitude and Compliance towards Standard Precautions

The association between level of knowledge, attitude and compliance to standard precautions among Universiti Malaysia Sarawak nursing students was investigated using Spearman's Rank Order Correlation. Table 10 shows that there is a weak positive correlation between the knowledge of standard precautions and attitude toward standard precautions with r= .165, n=167, p =.033, p< 0.05. Thus, the level of knowledge of standard precautions is correlated with the attitude of Universiti Malaysia Sarawak nursing students towards standard precautions. There is also a weak negative correlation between the knowledge and compliance variable, but no significant correlation between the knowledge of standard precautions and compliance of Universiti Malaysia Sarawak nursing students toward standard precautions [r= -.036, n= 167, p= .645, p > .05]. Thus, the level of knowledge of standard precautions is not correlated with the attitude of Universiti Malaysia Sarawak nursing students toward standard precautions. There is a weak negative correlation between the level of attitude and level of compliance with a significant correlation found between the level of attitude and level of compliance of Universiti Malaysia Sarawak nursing students toward standard precautions, r= -.505, n=167, p= .000, p< .05. Thus, these results show that the level of compliance is correlated with Universiti Malaysia Sarawak nursing students' attitude toward standard precautions.

Table 10. Association between Knowledge, Attitude and Compliance toward Standard Precautions.

Variable		Knowledge	Attitude	Compliance
Knowledge	Correlation Coefficient	1.000	.165*	- .036
	Sig. (2-tailed)	-	.033	.645
	N	167	167	167
Attitude	Correlation Coefficient	.165*	1.000	- .505**
	Sig. (2-tailed)	.033	-	.000
	N	167	167	167
Compliance	Correlation Coefficient	- .036	- .505**	1.000
	Sig. (2-tailed)	.645	.000	-
	N	167	167	167

**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)

DISCUSSION

Knowledge on Standard Precautions

Findings from this study indicated that the Universiti Malaysia Sarawak nursing students were knowledgeable on standard precautions with 46.7% demonstrating very good knowledge, 50.9% good knowledge, 2.4% fair knowledge with none demonstrating poor knowledge levels. The findings from this study are also similar to the findings from Labrague et al. (2012) where the majority of respondents (89.7%) had good knowledge about standard precautions. Similarly, the study by Kim et al. (2001) also found that knowledge of standard precautions was better among the nursing students when compared to other students. A separate study by Vaz et al. (2010) also showed that 90.0% of nursing students knew about standard precautions. On the level of hand washing when dealing with patients, 98.2% of respondents knew that they should perform hand washing before and after contact with patients. However, this result is in contrast with the findings from a study by Abou El-Mein and El-Mahdy (2018) where only 47.1% of their respondents knew that hand washing should be done before and after patient care. According to Mohd-Nor and Bit-Lian (2019), a study in Iran showed that 97.9% of respondents were aware that hand washing is an important method to control the spreading of infection from patients to nursing students and vice versa. The findings suggest that the nursing school's curriculum and syllabus play an integral role in equipping nursing students with fundamental

knowledge which forms the basis of effective and current standard precaution practices (Mohd-Nor & Bit-Lian, 2019).

Attitude towards Standard Precautions

Universiti Malaysia Sarawak nursing students demonstrated overall positive attitudes towards standard precautions with a mean score of 41.75 (±5.792). The majority of 97.6% of nursing students reported having a positive attitude towards standard precautions, with a mere 2.4% of nursing students reporting negative attitudes toward standard precautions. These findings were similar to the results from a study by Mohd-Nor and Bit-Lian (2019), where 70% of respondents reported good attitudes. These findings are also consistent with the result of Singh et al. (2010), where most students demonstrated good attitudes toward standard precautions and believe infection control measures to be necessary. However, a study by Permana & Hidayah (2017) did report a contrasting finding where students reported negative attitudes towards the implementation of standard precautions. Permana and Hidayah (2017) further reiterated that the attributable reasons could be the lack of guidelines in the application of standard precautions and the lack of equipment provided by the hospital. Further according to Permana and Hidayah (2017), improvement in attitude among nursing students is compulsory in order to prevent the spread of hospital-acquired infection. Therefore, nursing students can improve their attitudes by getting used to applying standard precautions when giving care to patients.

Compliance towards Standard Precautions

The study findings revealed that nursing students from Universiti Malaysia Sarawak had high compliance (n=150, 89.8%) towards standard precautions with only 1.8% (n=3) of them reporting "very low compliance" towards standard precautions. The findings from this study are similar to the studies by Labrague et al. (2012), where the respondents also showed high compliance to standard precautions with a mean score of 3.59. This might be due to stringent monitoring done by the faculty relative to standard precautions practices during clinical rotations (Labrague et al., 2012). Therefore, they were able to monitor and follow up closely with their students during the performance of standard precautions compliances. However, this result is in contrast with findings from a study by Lam et al. (2010), where results indicated low compliance levels toward standard precautions, except in certain areas such as disposal of sharp instruments, use of gloves while handling the blood, and other body fluids. Lam et al. (2010) further explained that although standard precautions was a mandatory and serious topic in the nursing curriculum, it was still implemented insufficiently, inappropriately, and even selectively. Therefore, low to very low compliance which are represented by 2.4% of respondents in the study could be attributed to several factors such as deficiencies in the overall curricular and syllabus and insufficient clinical monitoring and mentoring by clinical supervisors and staff.

Association between Knowledge, Attitude and Compliance toward Standard Precautions

In this study, a lack of significant association was found between the knowledge and compliance with standard precautions. The findings suggests that knowledge of standard precautions does not necessarily affect the compliance and application in practice by the nursing students. These findings are similar to a study by Labrague et al. (2012) where no significant association was found between those two variables. This result, however, contradicts findings by Kim et al. (2001), who found that experience is associated with the use of standard precautions in their study. This could have been attributed to the lectures and clinical practice in the fundamental nursing course which highlights the importance of aseptic techniques, infection control, and standard precautions (Kim et al., 2001). The result from this study also contradicts the findings from other authors that firmly suggest that knowledge of standard precautions was positively correlated with compliance, suggesting that the greater the knowledge of students on standard precautions, the better their compliance toward standard precautions (Labrague et al., 2012). Furthermore, studies by Luo et al. (2010) also stated that knowledge of standard precautions was found to exert a great impact on the individual's compliance with standard precautions. Hence, it shows that nursing students' compliance toward standard precautions is more likely affected by their level of knowledge on standard precautions since lack of knowledge is the main reason for non-adherence to standard and isolation precautions (Sax et al., 2005). This study also revealed that there is a significant correlation between knowledge of standard precautions and attitude toward standard precautions among Universiti Malaysia Sarawak nursing students. This suggests that the nursing student's attitude toward standard precautions will be affected by their knowledge of standard precautions. This is consistent with the findings from the study done by Mohd-Nor and Bit-Lian (2019) which states that knowledge affects attitude and it is required to initiate the process that culminates in attitude. Thus, the provision of education and training courses on standard precautions could be considered important to ensure the continuity of a good attitude toward standard precautions among nursing students (Mohd-Nor & Bit-Lian, 2019). The study findings further suggests that there is a weak negative significant correlation between the level of attitude toward standard precautions and compliance toward standard precautions. This suggests that a positive attitude toward standard precautions is associated with high compliance toward standard

precautions among nursing students. Similarly, Askarian et al. (2004), found attitude to be one of the more significant factors influencing compliance with standard precautions. These findings are similar to those of Permana and Hidayah (2017), who found that good attitude is a precursor to good practice of standard precautions. In summary, students' attitudes toward standard precautions play a significant role in affecting their compliance with standard precautions.

CONCLUSION

In conclusion, this study found that majority of the undergraduate nursing students from the Bachelor of Science in Nursing (with honours) Programme in Universiti Malaysia Sarawak demonstrated very good (46.7%, n=78) and good knowledge (50.9%, n=85) towards standard precautions with desirably positive attitudes (97.6%, n=163) and high levels of compliance (89.8%, n=150) overall towards standard precaution practices.

This study revealed no significant correlation between the level of knowledge of standard precautions and level of compliance toward standard precautions with r= -.036, n=167, p= .645. However, there was a significant correlation between the knowledge of standard precautions and attitude toward standard precautions with r= .165, n=167, p= .033. A significant correlation was also observed between the attitude toward standard precautions and compliance toward standard precautions among Universiti Malaysia Sarawak nursing students with r= -.505, n=167, p= .000. Hence, higher knowledge levels on standard precautions may be a precursor to positive attitudes while better attitudes would also contribute to better compliance in standard precaution practices. Despite the overall desirable findings, there is still room for targeted improvements in the undergraduate programme delivery specifically aimed at misconceptions regarding the use of personal protection equipment (PPE) to maintain and further enhance student's knowledge, attitudes and compliance toward standard precautions. While the current study provides baseline data for undergraduate nursing students in Universiti Malaysia Sarawak, the study can be advanced further with the inclusion of nursing students from other institutions for generalizability of the findings to a wider population.

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