

Perception Towards Infection Prevention Practices and Occupational Exposure Risk to Corona Virus Disease-19 (COVID-19) Among Nursing Students in a Private Healthcare Setting in Malaysia: A Cross-Sectional Survey

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ABSTRACT

Background: During the COVID-19 pandemic, nursing students are not involved in clinical practice due to safety reasons. However, the COVID-19 pandemic is continuing to affect many across the globe, and nursing students may soon return to clinical to meet the training requirement and for competency development. As non-involvers in the clinical practice during the pandemic, the nursing students lack a clear understanding of the infection control precautions. They may soon commence clinical practice when the pandemic still prevalent make the nursing students vulnerable to acquire COVID-19 infection. Therefore, this research aimed to assess nursing student's perceptions regarding clinical infection prevention practices and risk perception related to occupational exposure to the COVID-19 virus.

Methods: This cross-sectional study included 240 nursing students from one of the private nursing colleges in Malaysia. A questionnaire to assess the perception towards infection control practices for COVID-19 and risk perceptions of acquiring COVID-19 virus infection was developed through a literature review and subjected the tool to pilot testing and validation.

Results: The findings show that respondents positively rated the importance of infection control practices on 27 variables on a Likert scale of 1-5, ranging from strongly disagree to strongly agree ($M= 4.57$; $S.D. =0.63$). Majority of the nursing students agreed to be comfortable to care for COVID-19 patients ($M=3.64$; $SD= .81$; $SE Mean= .052$). The risk perception score was 3.9 of 5 points.

Conclusion: Improvement in infection control practices awareness for COVID-19 can help promote the active practice of infection control measures during their clinical rotation. Given the characteristics of nursing students, it is necessary to develop and apply an effective and viable educational program related to the prevention of COVID-19 infection.

Keywords

COVID-19, Corona Disease; Nursing student; Perception; Occupational risk.

Introduction

The novel Coronavirus disease 2019 (COVID-19) emerged in December 2019 in the City of Wuhan in China [1]. At the time of writing this paper, more than 6.2 million people are infected with COVID-19 across the globe and causing 375 000 deaths [2]. It is one of the worst pandemics of the world, claiming countless lives. COVID-19 Infectious disease also affected 90,000 healthcare workers across the globe [3]. COVID-19 is transmitted from person to person through droplets and objects or surfaces contaminated with nasopharyngeal secretions. COVID-19 is a highly contagious infectious disease [4]. Healthcare workers are at the highest risk for developing the COVID-19 infection by being frontlines in the treatment of COVID-19 patients, and the exposure risk is the highest for nursing students to provide nursing care to all types of patients during their clinical practice. Lacking treatment and vaccination containment of COVID-19 requires training and behavioral changes [1]. Nursing students' clinical rotation could be to any units based on their curricular requirements. In comparison to staff nurses who usually employed in a specific unit, due to clinical rotations, nursing students' risk is very high and unpredictable.

Nursing researches published over the past few months during the pandemic generally focus on knowledge, attitude, and practice related to COVID-19, the mental health of healthcare workers, and resilience factors [5-7]. However, a lack of research on the need for training regarding COVID-19 infection prevention among nursing students presents a new problem.

Therefore, it is necessary to investigate the nursing perception of the importance of infection prevention measures like hand washing, use of hand sanitizer, and Personnel Protective Equipment (PPE) to train and prepare them for a clinical rotation in the future is essential. Moreover, nursing students' especially final year students, are future healthcare professionals who may need to deal with all emerging infectious diseases. Therefore the present study focused on nursing students who could be exposed to COVID-19 infection and investigated their perception towards new COVID-19 related infection prevention measures selectively on hand washing, use of hand sanitizer, and PPE. The study aimed to provide information to develop a training program for the nursing students on infection prevention measures for the effective prevention of the spread of COVID-19 and to contribute to nursing students' compliance with infection prevention guidelines.

Methods

Design and sampling

This descriptive study endeavored to examine perception towards infection prevention practices and perceived occupational risk exposure among undergraduate nursing students who had experienced hospital clinical practice. The researcher recruited the participants through convenient sampling from one of the

private healthcare universities in Negeri Sembilan state. Junior or senior undergraduate nursing students who had engaged in clinical practice for 8 hours a day at the group's network of hospitals in the last six months were selected.

The data collection was done in May 2020 for over two weeks. The sample size was calculated using the Krejcie Morgan table [8]. The maximum number required for this study was 210, but a sample of 250 was targeted in consideration with an online response. Finally, 242 students (response rate=96.8 %) responded to this survey. However, 240 responses were used in this study, excluding responses with incomplete answers. The institutional review board approved the study.

The study questionnaire assessed the general characteristics of the respondents' perception of infection control practices and risk perception of occupational exposure to COVID 19. The appropriateness of the survey questionnaire was verified based on the content validity index by two nurse educators, one chief nursing officer, and one infection control nurse. Besides, the validity of the preliminary questionnaires was evaluated through pilot testing, conducted with 20 nursing students.

Perception of infection prevention practices for COVID 19

The questionnaire was developed by referencing the COVID 19: Management guidelines for workplaces by the Ministry of Health Malaysia [9] and a survey that investigated attitude to infection control practices among Healthcare workers pre and post SARS in a Malaysian hospital [10].

The questionnaire comprises 27 items on the following subtopics: handwashing practices (9 items), perception to effective use of hand sanitizer (6 items), and head protection devices (6 items) and other Personal Protective measures (6 items). Responses were made on a 5-point Likert scale ranging from 1 point for "strongly disagree to 5 points for strongly agree. Higher scores indicated better behavioral intentions to comply with the infection prevention practices related to COVID 19. The reliability of the questionnaire in the pilot study was Cronbach's $\alpha = 0.89$, and in the main survey was Cronbach's $\alpha = 0.92$.

Risk perceptions of occupational exposure to COVID 19

Risk perception is the possibility and fear of infection, and the variables related to it initially assessed nursing students' risk perception toward the Zika virus [11]. In this study, the tool was used after modifying the disease to COVID 19. The following three questions were asked "I feel uncomfortable to care for COVID-19 suspected or positive cases in the near future"; "I am worried I will get the COVID-19 infection from the hospitals and I am worried my family members may get an infection if I work in hospitals during COVID-19 pandemic. The responses for the above three questions were also made on a 5 point Likert scale ranging from 1 point for "strongly disagree to 5 points for strongly agree. Higher scores indicated increased perceived risk of acquiring COVID 19. The reliability of the questionnaire in the pilot study was 0.78, and the main study was 0.72.

Need for training on infection prevention practices related to COVID 19

The questionnaire also had two general questions of training need on Infection control. The questions were "I am aware of the COVID -19 related infection control practices for health care workers" The responses for the above question was made on a 5 point Likert scale ranging from 1 point for "strongly disagree to 5 points for strongly agree. Lower scores indicated increased acknowledgment of the need for training. The second question was, "I need more training on hospital infection control programs for healthcare workers related to care of patients with suspected or positive COVID-19". This final question also was rated on a 5 point Likert scale. Higher agreement also shows a need for training on infection prevention practices related to the care of the patient with COVID 19. The reliability of the questionnaire in the pilot study was 0.72, and the main study was 0.7.

Data analysis

The collected data were analyzed using the SPSS 26.0 version, and the main variables were normally distributed according to the Kolmogorov-Smirnov test. Respondents' demographic profile, perception towards infection control practices, and occupational risk were analyzed using frequency, percentage, mean and standard deviation. The reliability of the questionnaires was calculated using Cronbach's α . The association between gender and perception of infection prevention practice was analyzed using independent samples t-test.

Results

The study was mainly aimed at assessing the perception of student nurses' perceptions regarding infection control practices essential for the care of patients with COVID 19. Based on the population size and using the Krejcie-Morgan table, a total of 210 samples were required for the survey. However, using google forms, 240 nursing students responded to this cross-sectional survey.

The respondents of the study were nursing students from the undergraduate nursing program who have already had clinical rotations in the pre-COVID-19 periods. In this study, first-year students without clinical experience were excluded to

avoid response bias. Table 1 shows the demographic profile characteristics of the respondents. The majority (92.9%) were females aged 20-25 years and were Malays. All the respondents of this study had previous clinical experience.

Characteristics of perception towards infection prevention measures to COVID 19

The perception of infection prevention practices had four subsections. As shown in Table 2 items on handwashing had a positive rating on all nine (9) items. All the respondents agreed to the need for handwashing using the five moments as well as other guidelines related to handwashing (*Mean=4.8; SD 0.5*).

Perception towards the use of hand sanitizer had five items, and the response shows a high agreement level with the hand sanitizer practices. As shown in Table 3, the question about the need for using hand sanitizer a few times during the process of doffing had the lowest score (*M= 3.9; S.D. =1.0*). The mean score for the five items regarding the use of hand sanitizer was *M = 4.3; SD = 0.8*.

As shown in Table 4, perception of the use of head protective devices had a total of 6 items. These items also had a high agreement (*M=4.6; SD=0.6*) among the respondents. Table 5 shows the perception of student nurses related to the use of other protective equipment like gloves, isolation gown, apron, boot, and shoe cover. Perception of the use of other Personal Protective Equipment like isolation gown, apron, gloves, boot, and shoe cover also had a high level of agreement (*M=4.5; SD = 0.73*). The overall perception score was positive (*M=4.6; S.D=0.6*) over the 27 items.

Correlation between perception score and gender

Correlation between gender and perception of infection control practices. An independent t-test demonstrated that there is no significant association ($p<0.05$) between gender and perception to the infection prevention practices with a p-value of 0.93.

As shown in Table 6, there was no significant difference in the perception score of male and female students (*M= 4.5; SD=.36*), $t(236) = -.7, p= .458$. These results suggest that gender does not

Table 1: Demographic characteristics of sample nursing student respondents.

Variables	Characteristics	Frequency N	Valid Percent (%)	Mean	SD	Minimum	Maximum
Age	< 20 years	47	19.6	20.51	1.46	18	30
	20-25 years	188	78.3				
	>25 years	3	1.3				
Gender	Male	17	7.1				
	Female	223	92.9				
Ethnicity	Malay	204	85.7				
	Chinese	2	.8				
	Indian	20	8.4				
	Others	12	5.0				
Type of Program	Diploma	234	97.5				
	Bachelor	4	1.7				
Hospital clinical practice experience	Yes	240	100				
Experience with education related to COVID-19	No	240	100				

Table 2: Perception of Handwashing practices (n=240)

Items	5 Strongly agree		4 Agree		3 Neutral		2 Disagree		1 Strongly disagree		Mean	SD	SE of Mean	
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	(%)	<i>f</i>	(%)	<i>f</i>	(%)				
Practicing five moments of hand hygiene is the key to infection control.	198	83.2	37	15.5	2	.8	1	0.4	-	-	4.9	0.4	.03	
Transmission of COVID-19 can be prevented by washing hands with soap for 20 secs.	112	47.1	95	39.9	21	8.8	9	3.8	1	0.4	4.3	0.8	.05	
It is important to wash hands before any contact with a patient.	191	79.6	47	19.6	-	-	-	-	-	-	4.8	0.4	.03	
It is essential to wash hands before any clean /aseptic procedures	201	84.5	37	15.5	-	-	-	-	-	-	4.8	0.4	.02	
It is vital to wash hands after any contact with a patient.	203	85.3	34	14.3	1	.4	-	-	-	-	4.8	.4	.02	
It is essential to wash hands after contact with the patient's immediate surroundings.	191	80.3	46	19.3	1	.4	-	-	-	-	4.8	0.4	.03	
It is vital to wash hands after any contact with a patient body fluid.	207	87.0	31	13.0	-	-	-	-	-	-	4.9	.3	.02	
It is essential to wash hands before putting on PPE.	168	70.6	64	26.9	5	2.1	1	0.4	-	-	4.7	.5	.03	
It is vital to wash hands after removing PPE.	197	82.8	41	17.2	-	-	-	-	-	-	4.8	.4	.02	
											Overall	4.8	0.5	

Table 3: Perception of the use of hand sanitizer while caring for COVID-19 patients (n=240)

Items	5 Strongly agree		4 Agree		3 Neutral		2 Disagree		1 Strongly disagree		Mean	SD	SE of Mean	
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	(%)	<i>f</i>	(%)	<i>f</i>	(%)				
Follow seven steps of hand hygiene for the use of hand sanitizer.	179	75.2	53	22.3	5	2.1	1	.4	-	-	4.7	0.5	0.03	
Can use hand sanitizer for invisible dirt.	106	44.5	95	39.9	22	9.2	11	4.6	4	1.7	4.2	0.9	0.06	
Use hand sanitizers with 70 % alcohol as hand sanitizer.	121	50.8	82	34.5	29	12.2	5	2.1	1	.4	4.3	0.8	0.05	
After applying sanitizer, wait until hands are dry before hand's touch any surface.	126	52.9	87	36.6	24	10.1	1	.4	-	-	4.4	0.7	0.04	
PPE donning protocol requires the use of hand sanitizer during the PPE donning procedure several times.	93	39.1	103	43.3	36	15.1	5	2.1	1	.4	4.2	0.8	0.05	
Use hand sanitizer after completing every single step of the PPE doffing	81	34.2	78	32.9	48	20.3	28	11.8	2	.8	3.9	1.0	0.07	
											Overall	4.3	0.8	

influence the perception regarding infection control practices of COVID 19. Specifically, the results indicate that respondents have a definite understanding of the infection control practices irrespective of the gender.

Attitude towards care of Patients with COVID 19

There were three items on attitude towards the care of patients with COVID 19. As shown in Figure 1 for the question, "I feel comfortable to care for patients," 57 % (n=137) respondents agreed that they were comfortable to care for patients with COVID 19. However, 37% (n=89) were undecided if they were comfortable to care for COVID-19 patients.

The second question was on worry about acquiring infection from the wards. Figure 2 shows that the majority of the respondents (69

%; n=167) agreed that they are worried they would acquire the disease from the patients admitted in the wards. There were 27% of respondents (n=65) scored a neutral response to this answer. The final question on attitude was their fear of the family members acquiring the infection through them as carriers. The majority (83%; n=199) of the respondents feared that they would be the carriers of COVID-19 to their family members.

Figure 3 shows the awareness of infection control practices for COVID-19 as non-involvers in the clinical area during the COVID-19 pandemic. Most of the respondents (94%) agreed that they have some awareness of COVID-19 infection control protocols. However, 93% agreed on the need for more training on the same.

Table 4: Perception of the use of head protective devices (n=240)

Items	5 Strongly agree		4 Agree		3 Neutral		2 Disagree		1 Strongly disagree		Mean	SD	SE of Mean
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	(%)	<i>f</i>	(%)	<i>f</i>	(%)			
Use head cover while doing any procedures for COVID 19 patients.	162	68.1	64	26.9	10	4.2	2	.8		-	4.6	0.6	0.04
Wear a surgical mask all the time in the ward where COVID-19 cases may be admitted.	164	68.9	60	25.2	9	3.8	1	.4	4	1.7	4.6	0.7	0.04
Wear an N95 mask when meeting Suspected /positive COVID-19 patients.	160	67.2	60	25.2	15	6.3	3	1.3		-	4.6	0.7	0.04
Wear an N95 mask for nursing any positive COVID 19 patient and fittest to be done.	154	64.7	63	26.5	20	8.4	1	.4		-	4.6	0.7	0.04
Wear goggles for suspected COVID 19 patients during specific procedures that can splash to the eye, e.g., suctioning, aerosol therapy.	162	68.1	62	26.1	11	4.6	3	1.3		-	4.6	0.6	.04
Wear face shield for any suspected or definite COVID-19 patients	168	70.6	64	26.9	5	2.1	1	.4		-	4.7	0.5	.03
Overall											4.6	0.6	

Table 5: Perception of the use of other PPE products (n=240)

Items	5 Strongly agree		4 Agree		3 Neutral		2 Disagree		1 Strongly disagree		Mean	SD	SE of Mean
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	(%)	<i>f</i>	(%)	<i>f</i>	(%)			
Wear double surgical gloves for Suspected /positive COVID 19 patients.	152	63.9	60	25.2	21	8.8	5	2.1		-	4.5	0.7	.05
Wear isolation gown while caring for Suspected /positive COVID 19	152	73.5	60	24.4	21	1.7	5	.4		-	4.7	0.5	.03
Wear an apron when dealing with Suspected /positive COVID 19.	155	65.1	58	24.4	14	5.9	8	3.4	3	1.3	4.5	0.9	.059
Wear boot while doing the procedure in the patient premises for suspected / positive droplet borne highly infectious disease patients.	152	63.9	68	28.6	13	5.5	3	1.3	2	.8	4.5	0.7	.05
Wear shoe cover while doing the procedure in the patient premises for suspected / positive COVID-19 patients.	160	67.2	69	29.0	7	2.9	2	.8		-	4.6	0.6	.04
Boot and shoe cover is worn first before wearing other PPE materials	120	50.4	73	30.7	30	12.6	13	5.5	2	.8	4.2	0.93	0.06
Overall											4.5	0.73	

Table 6: Correlation of Gender and mean score of perception (Independent sample t-test).

		Levene's Test		T-test for equality of means			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Mean perception	Equal variances assumed	.009	.926	-.744	236	.458	-.06972
	Equal variances not assumed			-.776	18.821	.447	-.06972

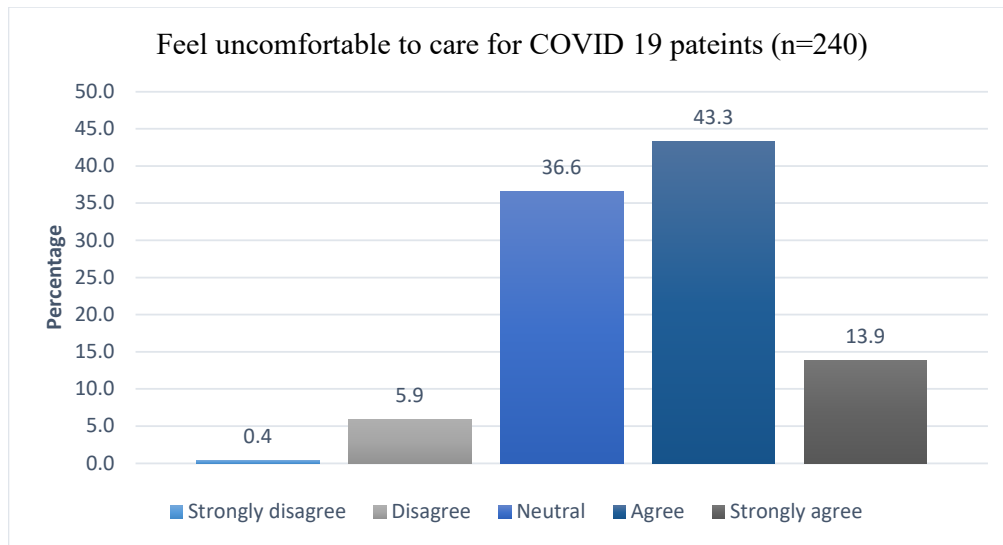


Figure 1: Comfort level in caring for patients with COVID19.

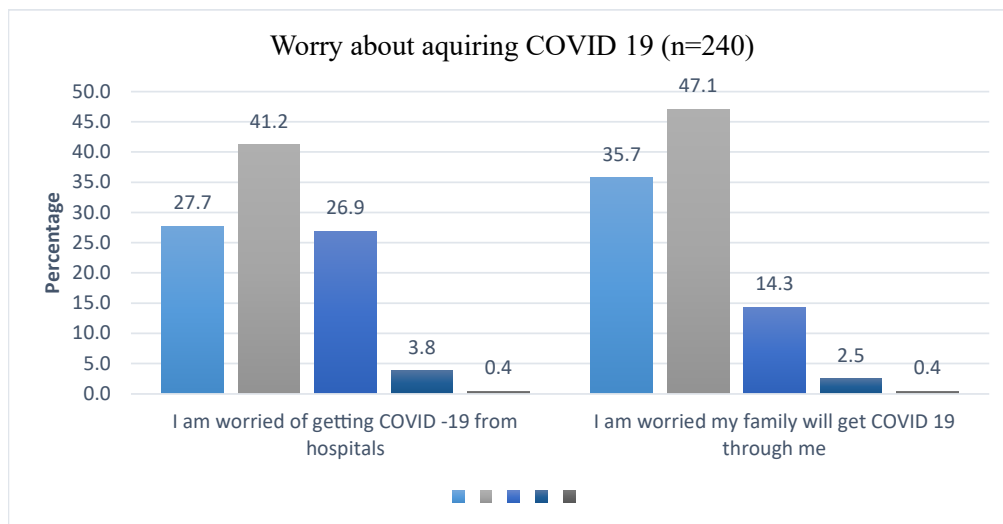


Figure 2: Worry related to acquiring COVID-19

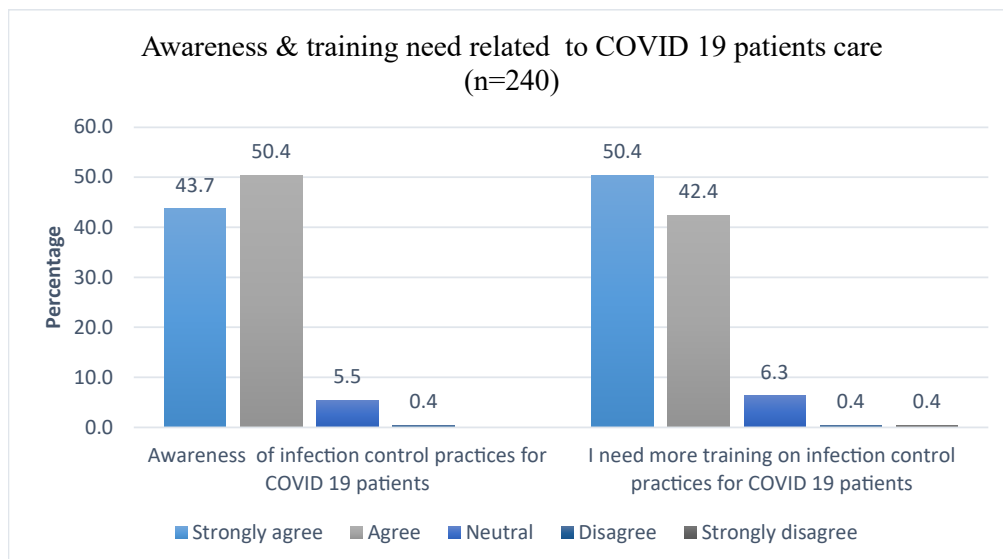


Figure 3: Awareness and training need related to infection control practices

Discussion

Between December 2019 and June 2020, approximately 8500 cases of COVID-19 were reported in Malaysia. The cases were both imported as well as locally spread. Because COVID-19 can spread through droplets as well as contaminated surfaces and objects, nurses and other healthcare workers are at increased risk of exposure to the Coronavirus during their work [4]. As the number of patients infected with COVID-19 increasing worldwide, nursing students engaged in clinical practice also could be exposed to COVID-19 infection. Furthermore, during the pandemic of COVID -19, student nurses were restricted practice in the clinical practice due to occupational risk and safety issues. However, as part of clinical practice requirements and competency development, student nurses soon will be engaged in clinical practice.

Therefore, it is imperative to identify the understanding of nursing students regarding infection control practices acquired through mass media communication. The information will help to plan training for the nursing students on infection control practices recommended explicitly by the Kementerian Kesihatan of Malaysia (KKM) [9] supported by the Centre of Disease Control (CDC). The present study is meaningful in that it examined the actual condition of COVID-19 related perception to infection control practices and risk perceptions among nursing students who are the future experts and need to cope with emerging illnesses.

For the prevention of the spread of COVID-19, student nurses should be informed of the new guidelines in hand hygiene, donning, and doffing of Personal Protective Equipment. CDC and OSHA have developed new guidelines to prevent the spread of COVID-19 infections, including hand hygiene, use of hand sanitizer, and PPE [12]. However, nursing students may be at higher risk of exposure to COVID-19 due to their lack of expertise and proficiency. Therefore, nursing students should acquire proper knowledge of COVID-19 infection control practices and pay more attention to their exposure [12].

In the present study, the knowledge related to infection control practices were relatively good. Overall, nursing students were informed about the infection control practices like hand washing, use of hand sanitizer, head protective devices, and other Personal Protective Equipment. Nursing students had learned the standard precaution in their Fundamentals of Nursing course and had the opportunity to integrate the knowledge during their previous clinical placement. Therefore, there was a high positive agreement on the prevention of infection and attitude towards preventive measures such as handwashing, use of hand sanitizer, and use of PPE. However, in another study, it is noted that student nurses had a negative perception towards Infection prevention and control practices and considered it as additional workload burden and not as an integral part of patient safety or quality of care [13].

These results suggest the need for training programs to promote both knowledge and skills among nursing students. Further, such educational programs should be integrated into the curriculum to protect nursing students in the future. Data analysis of the difference

in gender suggested that perception does not vary with gender. However, the findings may be because of the lack of homogeneity of sample size for both the genders. Further, 67% of the students were worried they would acquire COVID -19 infection from the wards, and 83% were concerned they would become carriers to their immediate family members.

Overall, nursing students agreed that they were aware of COVID-19 infection control practices. However, 93% of students stated that they need an educational experience related to COVID -19 related infection control practices. These findings were consistent with the results of another study in which the health workers had adequate knowledge related to infection control practices. Still, the practice was not positively associated with knowledge [14]. Nursing students continue to practice their skills related to the prevention of droplet borne infectious diseases beyond their training period after they become qualified registered nurses. The perception of the importance of the practice of infection control measures was related to age, length of working experience, in-service training, and availability of PPE materials [14].

In another study, the predictors of adherence to standard precautions and infection control protocols depend on knowledge on infection control practices, perceived barriers, and adequacy of training, management support, and influence of staff nurses [15].

The educators or preceptors should be using the experience to prepare the nursing students to be more resilient in handling any other similar emerging diseases in the future. The result of the present study could be used as primary data for the development and implementation of effective and viable infection prevention training programs for nursing students and all other Healthcare workers in the future. The significance of the training in infection control practices was recommended by other researchers [16].

The limitation of the study was that the respondents were selected from only one University population in Malaysia, which is a healthcare professional training University. The study could be conducted involving students from different universities and involving other healthcare workers.

Conclusion

The present study showed that nursing student's perception of infection control practices related to the care of patients with COVID -19 is good, and their risk perception is relatively high. They were also worried about being carriers for their family members. Most of the respondents agreed that they had acquired the infection control practices may be from mass media communications. However, they also highlighted the need for a structured training program on COVID-19 infection control practices. They may know infection control practices, and the training should focus more on skills for daily practice.

The study findings suggest the need to develop effective and systematic educational programs for nursing students on infection

control practices related to COVID-19 by nursing colleges and hospitals.

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