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Knowledge on Coronavirus Disease (COVID-19) and Practice of COVID-19 Prevention Among Students in the Health Campus

Nurul Atikah Nuraini Canti, Norhasmah Mohd Zain*, Hasni Embong
School of Health Sciences, Universiti Sains Malaysia, Kelantan, Malaysia.

ABSTRACT

Introduction: Knowledge of COVID-19 and the practices towards the prevention of COVID-19 are crucial especially among health sciences students who are required to do a clinical placement at a hospital. This study aimed to assess the knowledge on COVID-19 and practice of COVID-19 prevention among university students.
Methods: A cross-sectional study was conducted via a web-based survey. A total of 273 students of the medical, dental and health sciences programs were invited to participate in this study using stratified random sampling methods. A set of questionnaires developed by WHO training material for identification, prevention, response, and control of COVID-19 was used.
Results: Most of the respondents were fourth year students (37.4%) age of 22 years old. The mean of total knowledge score was 23.14 ± 1.50. The overall mean score for the practice towards prevention of COVID-19 was 30.06 ± 3.03. The findings revealed that 71.1% students had good knowledge while 28.9% of them had poor knowledge regarding COVID-19. Half (58.6%) of the students have good practice and 41.4% had poor practice of COVID-19 prevention. There is no significant correlation of knowledge on COVID-19 and the practice of COVID-19 prevention.
Conclusion: This study emphasizes the need for continuous education and a regular reminder to the student population involved in the clinical area regarding infectious disease prevention.

Keywords: COVID-19, Prevention, Pandemic, Malaysia, Youth

***Corresponding author**
Dr. Norhasmah Mohd Zain
Nursing Program,
School of Health Science, Universiti Sains Malaysia,
Health Campus, 16150 Kota Bharu Kelantan
E-mail: hasmahmz@usm.my

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INTRODUCTION

Coronavirus Disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus and causes many effects, such as the increased risk of mortality especially for the older adults and financial constraints for the health care system. The first human case of COVID-19 was reported in Wuhan City, China in December 2019(1). In January 2020, World Health Organization (WHO) declared it as health emergency and global pandemic in March 2020(2). In the latest report on 4th June 2021, there were a total of 171,782,908 cases of COVID-19 and 3,698,621 cases of deaths recorded throughout the world (3). In Malaysia, as of 4 June 2021, there were 603,122 COVID-19 cases including 3,182 deaths and 515,571 cases of recovery (4).

The virus is transmitted via droplets and airborne by asymptomatic infected individuals and symptomatic individuals, while coughing and sneezing (5,6). In addition, the infection also can be acquired by either inhaling or touching surfaces contaminated by these droplets and touching the nose, mouth, and eyes (5). The symptoms of COVID-19 typically manifest as fever or chills, cough, shortness of breath or difficulty breathing, fatigue, muscle aches, headache, loss of taste, sore throat, congestion or runny nose, nausea or vomiting, and diarrhea (5). A study in Wuhan stated that fever, dry cough, myalgia, and exhaustion are common symptoms in a patient of COVID-19. But sputum production, headache, hemoptysis, abdominal pain, and diarrhea are less common symptoms (7). Treatment for COVID-19 is similar to Middle East respiratory syndrome–related coronavirus (MERS-CoV) and severe acute respiratory syndrome coronavirus (SARS-CoV) where no specific antiviral treatment has been confirmed yet to be effective. Treatment for patients that are positive for COVID-19 is applying appropriate symptomatic treatment and supportive care including oxygen therapy, fluid management, and antibiotics treatment for secondary bacterial infections (8,9). A few measures taken by Ministry of Health Malaysia in keeping the spread and mortality under control including health screening at all points of entry, increase number of hospitals to treat COVID-19 case and implementation of Movement Control Order (10) to restrict the movement of people into or out of an area (11). The MOH also increased awareness program on basic protective and hygiene measures to minimize transmission of COVID-19 in simple diagram form to reach the public easily. This includes hand-washing techniques and the use of hand sanitizers, social distancing and face masks (11).

As on 26th March 2020, it was reported that a total of 80 health workers were tested positive for COVID-19 and two positive cases of COVID-19 related to university students (4). Not only frontline health care workers, but medical students are also susceptible to being infected by the virus. In other hands, medical, dental, and nursing students are often considered as healthcare workers who are still in the training period. Dental, medical, and nursing students are involved in the theoretical and practical educational processes (12). Their educational process set them up to assist care for people in different health care environments, especially in hospitals or clinics and act in the pandemic situation (13). These groups are at risk, and even a single case can spread to other students, family members or patients, causing a pandemic. Therefore, it is crucial to take the necessary precautions to reduce such risks in this group.

Knowledge, attitude, and practices (KAP) towards COVID-19 play an integral role in determining a society's readiness to accept behavioral change measures from health authorities (14). In order to determine the type of intervention required to change misconceptions about the virus, KAP studies provide primary data. It would be helpful to evaluate the COVID-19 related to KAP to give better insight to address poor knowledge of the disease and develop preventive strategies and health promotion programs (14). Apart from knowing the basic knowledge, habits and perspectives of university students dealing with pandemic can also be evaluated through KAP study. Good KAP among university student will give impact to the families and communities as they may influence their surrounding by being trusted source of information and agent of changes (15).

A study from Shaanxi Province, China, showed that proactive practice toward COVID-19 was found in 82.34% of university students (16). The result of that study is different from the study

on two Pakistani university populations that reported they had adequate knowledge and attitude on COVID-19 but had poor practice on preventive measures of COVID-19(17). Study in Indonesia found that only 48% of university student from medical background has good knowledge and 43.5% has good practice toward COVID-19(15). Evidence from previous studies shows that greater knowledge about infectious diseases during an outbreak is positively associated with increased involvement in appropriate protective behavior (18,19) A study by Azlan et al. on knowledge, attitudes, and practices among 4,850 Malaysian residents concluded that Malaysians have knowledge about the COVID-19 pandemic; however, nearly half of the respondents did not practice strict measure (wear a face mask) when being outside of their premise (14). There is a lack of data assessing knowledge of COVID-19 and practice towards the prevention of COVID-19 among university students in Malaysia. Thus, the objectives of this study are 1) to determine the knowledge of COVID-19 and the practice of COVID-19 prevention among university students involved in clinical training at Hospital USM and 2) to examine the association between the practice of COVID-19 prevention and selected variables (gender, school, academic year and knowledge of COVID-19). Study hypothesis was there is no significant relationship between the level of knowledge about COVID-19 and practices towards prevention of COVID-19 among students in Health Campus, USM.

METHODS

Study Design and Setting

This is a cross-sectional, questionnaire-based study via a web-based survey. This study was conducted among university students in the Health Campus of USM from March 2021 until May 2021. The sample size of this study was calculated using single proportion calculation formula based on a previous study by Taghrir et al (20). A total of 273 students were required for this study with 10% dropout rate. Students were recruited through stratified random sampling. There are three major programs included in this study which are the nursing, dental, and medical programs with total population are 553 students. The proportionate stratified random sample was obtained using the formula: (sample size/population size) x stratum size. The required sample was selected by simple random sampling method from the group name list to represent each program. A name lists of students was obtained from the academic office of each school and were numbered accordingly. A set of random numbers was obtained from an online random number generator. The samples were selected based on the numbers from the name lists that matched with obtained random numbers. The selected samples, who meet the inclusion criteria were invited to participate in this study. The inclusion criteria were students from medical, dental and nursing programs, and students that were currently involved in clinical training in Hospital USM during the study period. The researchers excluded students who had been diagnosed as positive COVID-19.

Instruments

A questionnaire developed by WHO training material for identification, prevention, response, and control of COVID-19 was used (21). Permission was already obtained from the author. The instrument was sent to three experts in this field for validation and accuracy of the content of the instrument. This structured questionnaire had three essential components related to socio-demographic characteristics, knowledge of COVID-19, and practice towards prevention of COVID-19.

There are 5 subdomains in 26 knowledge items which are the characteristics of disease, symptoms of the disease, prevention of the disease, transmission routes and groups at possible high risk of the disease. These items are in the form of a true, false, or 'no opinion' answers. The correct answer was assigned 1 point and an incorrect answer or 'no opinion' was assigned 0 points. The maximum knowledge score was 26. The 12-item questions regarding the practice of COVID-19 prevention used the 3-point Likert scale. Each of the item score range from always (3), occasional (2), and never (1) with a maximum score of 36. The total score for knowledge and practice was categorized as good and poor based on the mean of the total score. The pilot study was done among 27 students from second year, third year, and fourth year. The Cronbach's alpha coefficient for the knowledge and

practice questionnaire was 0.653, which was seen as acceptable internal consistency (22)

Data collection and analysis

Ethical approval for this study was obtained from the Human Research Ethics Committee (HREC), Universiti Sains Malaysia (USM/JEPeM/20120653), and permission was given by the Deans of those three faculties. The questionnaire was formatted into the google form. After obtaining the phone number or email of selected students, the link of the google form was given to be completed. In the google form, the participants were briefed on the purpose of the study and the consent was taken before participants responded to the online questionnaire.

Data were analyzed using Statistical Package for Social Science (SPSS) version 26.0. Descriptive analysis was used to analyze the socio-demographic data, knowledge on COVID-19, and practice towards prevention of COVID-19. All numerical variables were tested for normality using the Kolmogorov-Smirnov goodness-of-fit test. Numerical variables for knowledge and practice score were not normally distributed and were analyzed using non-parametric tests. The Spearman-rank correlation test was used to examine the association between the knowledge on COVID-19 and practice towards the prevention of COVID-19. The Kruskal-Wallis test was used to examine the association of selected variables with two dependent variables (knowledge on COVID-19 and practices of COVID-19 prevention). A p-value of < 0.05 was considered statistically significant.

RESULTS

Socio-Demographic Data of the Participants

A total of 273 selected students participated in the study, giving a response rate of 100%. Most of the participants were females (78.4%), from the Medicine program (46.9%), and were fourth-year students (37.4%) as shown in **Table 1.**

Table 1: Socio-demographic characteristics among students in Health Campus USM (N = 273)

Variables	n (%)
Gender	
Female	214 (78.4)
Male	59 (21.6)
School	
Medical	128 (46.9)
Nursing	97 (35.5)
Dental	48 (17.6)
Academic Year	
Year 2	49 (17.9)
Year 3	36 (13.2)
Year 4	102 (37.4)
Year 5	86 (31.5)

Knowledge on COVID-19

The majority of students (99.3%) knew that COVID-19 is a contagious disease but only 88.6% knew that the prevalence of COVID-19 is increasing in Malaysia. Only 78.4% identified the correct treatment for COVID-19. In terms of recognizing the symptoms of COVID-19, the most recognizable symptoms noted by the students are fever, cough and sore throat (> 90.0%). In regard to recognizing people at high risk of COVID-19, participants knew that the elderly, people with weakened immune systems and people with comorbid diseases such as cancer and diabetes were at high risk. In terms of prevention and control of the disease, avoiding contact with suspected individuals is the answer given by most of the students (99.3%) (**Table 2**).

Overall, the mean of total score of knowledge regarding COVID-19 was 23.14±1.50 as shown in Table 3. In addition, 194 (71.1%) students in the Health Campus had good knowledge on COVID-19 while 79 (28.9%) of them had poor knowledge regarding COVID-19. In terms of the knowledge domain, students were well informed regarding people at high risk of the disease (M=3.98, SD=0.23), followed by knowledge on characteristics of the disease (M=5.61, SD=0.60). They had poor knowledge on prevention and control of the disease (M=4.78, SD=0.71).

Practice of COVID-19 Prevention

The common behaviors for the prevention of COVID-19 practiced by students were wearing a mask when going outside (97.8%), paying more attention to personal hygiene than usual (93.0%), using disinfectants (92.8%), avoiding

Table 2: Knowledge regarding COVID-19 among students (N = 273)

No	Items	n (%)
Characteristics of the COVID-19		
1.	COVID-19 is new disease discovered in 2019	262 (96.0)
2.	COVID-19 is a contagious disease	271 (99.3)
3.	Cause of COVID-19 is virus	269 (98.5)
4.	Incubation period of the COVID-19 is 3 to 14 days	258 (94.5)
5.	Treatment for COVID-19 is a symptomatic therapy	214 (78.4)
6.	Age group at most risk for COVID-19 is above 50 years	257 (94.1)
Symptoms of the COVID-19;		
7.	Fever	271 (99.3)
8.	Cough	270 (98.9)
9.	Sore throat	271 (99.3)
10.	Body pain	211 (77.3)
11.	Diarrhoea	201 (73.6)
12.	Headache	213 (78.0)
Prevention & control of the COVID-19		
13.	In suspecting infection with COVID-19, individuals have to measure body temperature	253 (92.7)
14.	In suspecting infection with COVID-19, individuals have to visit a physician	34 (12.5)
15.	In suspecting infection with COVID-19, individuals have to avoid unnecessary daily activities.	255 (93.4)
16.	To avoid contracting COVID-19, individuals have to avoid contact with individuals suspected to be infected with COVID-19	271 (99.3)
17.	The prevalence of COVID-19 disease is increasing in Malaysia	242 (88.6)
18.	Washing hands with water and soap can eliminate the virus	249 (91.2)
Transmission route of the COVID-19		
19.	Directly through cough.	269 (98.5)
20.	Directly through contact with infected surface	257 (94.1)
21.	Directly through the consumption of contaminated dairy and meat products	167 (61.2)
22.	Directly through contact with the infected individuals through handshakes, hugs, and kisses.	267 (97.8)
Group at high risk		
23.	Pregnant women	270 (98.9)
24.	Older people	272 (99.6)
25.	People with the weakened immune system	272 (99.6)
26.	People with cancer, diabetes and chronic respiratory disease.	271 (99.3)

Table 3: Mean score of knowledge subdomain regarding COVID-19 among students (n = 273)

Domain	Mean score ± SD
Characteristic of disease	5.61 ± 0.60
Symptoms of the disease	5.26 ± 1.00
Prevention of the disease	4.78 ± 0.71
Transmission route	3.52 ± 0.54
Group at high risk of the disease	3.98 ± 0.23
Total score	23.14±1.50

unnecessary vacations (91.2%) and frequently washing hands (90.8%) (**Table 4**). The less practiced measures of COVID-19 prevention among students were using herbal products (74.4%) and taking vitamin supplements (42.1%). Of the less practiced areas of students were avoiding going to work and avoiding consuming outdoor food among students in this study (Table 4).

Table 4: Practices regarding prevention of COVID-19 among students (n = 273)

Items	n (%)		
	Never	Occasional	Always
Avoid unnecessary vacations.	6 (2.2)	18 (6.6)	249 (91.2)
Avoid handshakes, hugs, and kisses	4 (1.5)	49 (17.9)	220 (80.6)
Frequently wash hands	-	25 (9.2)	248 (90.8)
Pay more attention to personal hygiene than usual	2 (0.7)	17 (6.2)	254 (93.0)
Use disinfectant and solutions	1 (0.4)	19 (7.0)	253 (92.7)
Always wear a mask when going outside	2 (0.7)	4 (1.5)	267 (97.8)
Avoid going out	3 (1.1)	101 (37.0)	169 (61.9)
Avoid consuming outdoor food	30 (11.0)	144 (52.7)	99 (36.3)
Avoid public transportation	7 (2.6)	53 (19.4)	213 (78.0)
Avoid going to work	97 (35.5)	108 (39.6)	68 (24.9)
Use herbal products	203 (74.4)	48 (17.6)	22 (8.1)
Take vitamin supplements	115 (42.1)	96 (35.2)	62 (22.7)
Mean score ± SD		30.06 ± 3.03	
Range score		20-36	

The mean score of practice on COVID-19 prevention among students were 30.06 ± 3.03 with a minimum score of 20 and a maximum score of 36. The study revealed 58.6% of the students in the Health Campus have good practice and 41.4% had poor practice of COVID-19 prevention.

Association between selected variables and practices of COVID-19 prevention

There was no statistically significant correlation between knowledge on COVID-19 and the practice towards prevention of COVID-19 (r = 0.031, p = 0.615). In addition, gender did not show statistically significant association with both knowledge and practice of COVID-19 prevention. There is a statistically significant association between the course of program and academic year with knowledge regarding COVID-19. Likewise, there is also a statistically significant association between the course of program with practice of COVID-19 prevention (Table 5).

Table 5: Association of selected variables with knowledge on COVID-19 and practices of its prevention and control among students in the Health Campus USM (N = 273)

Variables	Knowledge Median (IQR)	Test statistics	p-value
Gender			
Male	23 (2)	-0.011[a]	0.991
Female	23 (2)		
School			
Nursing	23.00 (3.00)	19.28[b] (2)	<0.001*
Medical	24.00 (3.00)		
Dental	24.00 (1.00)		
Academic Year			
Year 2	22.00 (5.00)	30.90[c] (3)	<0.001*
Year 3	23.00 (1.75)		
Year 4	24.00 (1.00)		
Year 5	24.00 (2.00)		
Variables	**Practice Median (IQR)**	**Test statistics**	**p-value**
Gender			
Male	30 (4)	-0.175[a]	0.861
Female	30 (4)		
School			
Nursing	31.00 (5.00)	13.10[d] (2)	0.001*
Medical	30.00 (4.00)		
Dental	30.00 (4.75)		
Academic Year			
Year 2	31.00 (3.00)	2.29[b] (3)	0.515
Year 3	30.50 (6.50)		
Year 4	30.00 (4.00)		
Year 5	30.00 (5.00)		

[a]Mann-Whitney test, *significant at $p < 0.05$

[b]Kruskal-Wallis test – Mann-Whitney test of individual pairs showed significant of nursing and vs. dental and nursing vs. medical after Bonferroni correction for knowledge.

[c]Kruskal-Wallis test – Mann-Whitney test of all individual pairs showed significant except year 3 vs. year 4 and year 4 vs. year 5 after Bonferroni correction for knowledge.
using Kruskal-Wallis test

[d]Kruskal-Wallis test – Mann-Whitney test of individual pairs showed significant of medical vs. dental and nursing vs medical after Bonferroni correction for practice.

DISCUSSION

This study intended to assess knowledge on COVID-19 and the practice towards prevention of COVID-19 among university students in the Health Campus. Most of the students in the current study had good knowledge on COVID-19 but only about two-thirds of the students had good practice towards the prevention of COVID-19. Most of the knowledge items were given correct responses by the participants, except for domains on prevention and control of the disease. This finding is in line with studies done in Uganda, Jordan, and Iran that revealed the good knowledge among participants regarding COVID-19(20,23,24). Prior studies also highlighted that the knowledge level on COVID-19 was high among students due to their exposure to government information about COVID-19 before the implementation of quarantine (20,23,25). The student in this study had better knowledge than those reported by study in India in which their respondents only had satisfactory knowledge of COVID-19(26). The gap of the result between these two studies could be because the study in Southern Haryana, India recruited study subjects among medical

students from 1st year to prefinal year whereas this study excluded the first-year students. First-year students and non-medical specialty students had lower knowledge levels than others because of lack of medical education. In addition, self-protection from infectious disease were included in the training programs of health students as well (27).

Overall, 58.6% had good practice about the COVID-19 prevention methods and took proactive measures. This is in line with a study from Ethiopia (42.8%) (28) and Uganda (57%) (24), but not with studies from Iran (99.6%) (20). This variation may be due to the differences in the tools used to evaluate students' practice (28). The gap of the results between these two studies could be because the Iran study recruited more senior students in their clinical years which are fifth- to seventh-year medical students while the study in Uganda enrolled first- to fifth-year medical students (24). The findings of this study are consistent with the findings from Iran, Jordan and Mangolore study that revealed the students had good practice of hand hygiene and avoiding handshakes, hugs, and kisses or being close contact from others (20,25,29). This could be because WHO advised that everyone should practice good hygiene such as hand washing regularly, avoiding touching mouth, nose, or eyes with hands, and avoiding contact with sick people and animal (30).

Always wear a mask when going outside is the highest item practiced (97.8%) by the students. Meanwhile, studies from Iran and Pakistan recorded only 3.7% and 18.3% of respondents who always wear masks when out of the house, respectively (17,21). This could be due to the differences in state-enforced regulations, cultural experience from previous pandemics, and the subpopulations' educational levels (31). Despite the campaign of Ministry of Health Malaysia not to leave the house, except for important matters and the hashtag #stayhome has been widely used in the media (11), the current study showed as many as 37% of students are still going out.

The least practiced among students in this study were the use of herbal products and taking vitamin C supplements. The finding of using herbal products is not in line with the studies from Iran and Jordan (21,25). A study in Central Uganda stated that young people had the opinion of never using herbal products because herbal products were deemed ineffective, and healers might be profiteering by selling ordinary plants as medicine (32). A study from Saudi Arabia reported 94.4% of participants had used or were currently taking vitamin C and 29.3% of the participants believed vitamin C had a role in treating or reducing the chances of contracting COVID-19(33). The Health Minister of Saudi Arabia encouraged the intake of herbs and vitamin C supplements as a preventive measure of COVID-19 because of its previous effects in the prevention of Middle East Respiratory Syndrome (MERS) epidemic in 2012.

At present, good knowledge is not significantly associated with good practice of COVID-19 prevention ($p > 0.05$). This finding is supported by a study from Jordan which showed no significant association between the level of knowledge about COVID-19, attitude, and practices towards preventing COVID-19 (25). This is expected due to the widespread media coverage of COVID-19 and the swift implementation of strict measures by various governments following the declaration of the virus as a pandemic by WHO. However, contradictory findings were revealed in a study in Iran that showed there was a significant association between the knowledge, attitudes, and practices of participants ($p < 0.001$). The findings highlight the importance of health education programs in improving the knowledge of COVID-19 among the general public, which would improve their attitudes and practices of COVID-19(21). The findings revealed some areas where dental, medical, and nursing education, as well as the Ministry of Health and other health agencies, should focus on to ensure that the population has adequate knowledge and correct prevention behavior.

Gender did not significantly impact the knowledge and practice in this study findings which contradicts few studies among university students (16,34). The imbalanced gender groups may influence this result. There is significant association between academic program, academic year and knowledge. But in terms of practice towards COVID-19 prevention, only academic programs showed a significant association. This study findings highlight that there are differences of knowledge and practices between academic

programs although it is in the same core discipline of health science. This is consistent with a previous study in Japan which reported major subjects among university students gave influence on their knowledge regarding COVID-19 (34). This also indicates the route of obtaining basic information for disease may be different among those programs such as exposure to different curriculum or training experiences during the clinical hours. It is indirectly related to academic year as the significant associations were found between students in junior year (year 2) and senior year (year 4 and 5). In terms of practice, the significant associations were found between medical and other courses (nursing and dental). These factors gave alarming points that university students from the health discipline should imply more strict precautions in protecting themselves first before taking care of others.

LIMITATION

The respondents' practice level was based on the respondents' subjective self-evaluation. As a result, their response may not accurately reflect their true practice, as they may have reported a higher level of practice than was the case. This study only represented three courses of university students in the Health Campus of USM. There are several courses which are not included in this study due to some limitations during the pandemic. The study used two level of nursing students as the nursing school include diploma in the analysis as compared to other school. This may give bias as there is discrepancies of the samples' knowledge background and preparation among respondents. The recommendation for future research is to conduct an observational study to overcome these limitations.

CONCLUSION

The students had a high knowledge towards COVID-19 meanwhile had moderate practices towards preventing COVID-19. This proves most Health Campus USM students understood the basic information regarding COVID-19. Students will be better prepared to respond to similar public health crises in the future if they have adequate knowledge and the proper preventive behavior against COVID-19. Since the practice levels were found to be lacking, this can be fixed by a well-structured continuous education program. In addition, hospital administrators and other parties involved should continue to emphasize the educational needs of the student population in terms of infectious disease prevention.

CONFLICT OF INTEREST

The authors report no conflicts of interest in this work.

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